Infra-red installation employed to finish bake completely fabricated oil burner units. Page 76

STEEL

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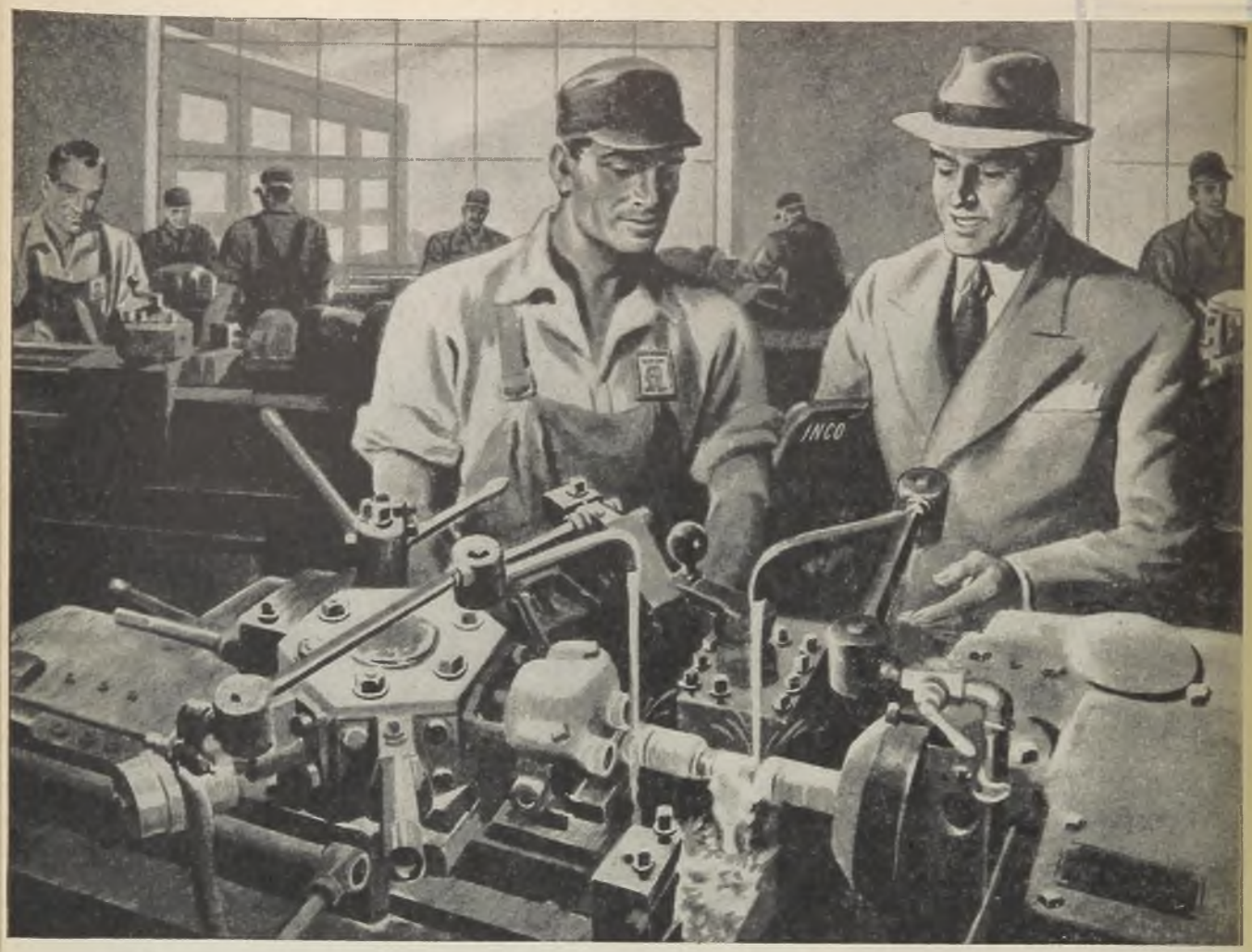

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THE INTERNATIONAL NICKEL COMPANY, INC., 67 Wall St., New York 5, N. Y.

STEEL
January 17, 1944

We Missed the Boat

In his message to Congress, President Roosevelt recommended that the lawmakers adopt (1) a realistic tax law, (2) a continuation of the law for the renegotiation of war contracts, (3) a cost of food law, (4) early re-enactment of the stabilization statute and (5) "a national service law—which, for the duration of the war, will prevent strikes and . . . make available for war production . . . every able-bodied adult in the nation."

From the general tenor of the President's message it is apparent that he places major emphasis upon the national service act. Yet he has made the service act conditional. He said "These five measures together form a just and equitable whole. I would not recommend a national service law unless the other laws were passed to keep down the cost of living, to share equitably the burdens of taxation, to hold the stabilization line and to prevent undue profits."

From the foregoing it is not easy to understand whether the President is "all out" for national service or not. He must know that the administration and Congress cannot agree upon what is a realistic tax law. Nor can they see eye to eye on renegotiation, subsidies and stabilization. In view of the futility of expecting Congress to meet the President's views on these issues, the conditional espousal of the national service act by the President looks academic.

Nevertheless, his arguments for national service are unanswerable in theory. A majority of the people have favored a practical service act since Pearl Harbor. The only reason we do not have it is that Mr. Roosevelt himself opposed it. He opposed it partly because he thought it would offend labor. When national service was proposed, he airily waved aside strike threats, saying in effect "Leave the strike problem to me; I can handle labor disputes."

Had a national service law been enacted two years ago, it would have been administered alongside of taxes, wages, prices, stabilization, etc. and—under good administration—we might now have had a smooth-running organization for handling our internal economy.

But now, with taxes, wages, prices and stabilization all badly out of balance due largely to faulty administration, lack of co-ordination and inopportune meddling by the Chief Executive, to dump a national service act upon the existing mess would simply compound the confusion.

We missed the boat on national service. The best we can do now is to untangle the mess we are in.

MAKES IT 4 STRAIGHT: In producing 88,872,598 net tons of steel ingots in 1943, the American steel industry set a new record in output for the fourth consecutive year.

Breaking records four years in succession is a new experience for the industry. Since 1887 annual records of output have been broken 26 times. New records were established in three consecutive years in 1897, 1898 and 1899 and again in 1915, 1916 and 1917. There is nothing in the 57-year period to match the four-year run of new records in 1940, 1941, 1942 and 1943. Curious also is the fact that the quartet of records follows a 10-year period in which no records were broken—the longest record famine in the industry's history.

The achievement of producing almost 3,000,000 more tons of steel in 1943 than in 1942 is noteworthy on two counts. First, it was done in spite of disastrous coal and steel strikes. Secondly, the experience of World War I, when steel output declined in

(OVER)

1918 after a record peak in 1917, furnished historical precedent for a slight dip in 1943 from the high output of 1942.

To the industry's credit, it overcame the strike menace and ignored the precedent. —p. 66

° ° °

MAINTAIN COMPETENCY: From Washington comes word of a predicament developing in various government agencies. In the Steel Division of WPB, for instance, are a number of steel company executives of great ability and sound experience. They have done a marvelous job. The value of their contribution to the war effort is beyond calculation.

Now, for reasons that are easily understood, some of these men wish to return to their regular posts at an early date. Their companies would like to have them back as soon as possible. But if a general exodus of these men should occur, and if they were replaced by men of mediocre ability, the administration of steel industry problems by WPB might be weakened dangerously. With the uncertainties of the war and transitional periods ahead. such weakening of personnel is a risk that should be avoided.

We trust that WPB officials and industry leaders can find a way to maintain a high standard of competency in the industry's representation at Washington without imposing undue hardships upon any of the co-operating companies or individuals. —p.51

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SCRAP OUTLOOK FOR '44: Judging from opinions expressed at the sixteenth annual convention of the Institute of Scrap Iron and Steel, Inc., held in Cleveland last week, the supply of scrap in 1944 will be adequate for reasonably expected consumption. Painstaking studies indicate that approximately 24,000,000 tons can be made available to consumers. This compares with an estimated consumption of purchased scrap in 1943 of 23,600,000 tons.

Chief factor on the unfavorable side of the picture is the continuing unsatisfactory labor supply in the scrap industry. On the favorable side is the important influence of the increased blast furnace capacity, which will permit an easing of the pressure on scrap supply.

On the whole, the scrap industry has done a magnificent job under extreme difficulties. In co-operation with other interests it has managed to keep material flowing to steelworks and foundries with gratifying regularity. The task is not finished, but the record thus far makes for confidence in the future. —p. 46

SUPER PAINT SHOP: Indicative of the length to which airplane manufacturers have gone to place operations on a mass production basis is the paint shop of the Boeing Aircraft Co. at Renton, Wash. Our correspondent writes that it "looks like a combination soda fountain, moving assembly line and science laboratory."

This description arises from the fact that paint is piped to certain spots where workmen can plug in a hose, turn a tap and apply any one of the five colors available to bomber parts which move along on a steel conveyor belt. The conveyor carries the painted parts into a tunnel of near infra-red lamps for drying and then under fans for cooling. This mechanized paint shop turns out 30.000 paint jobs per shift.

Wartime volume demand has brought to the airplane industry methods which otherwise would not have been adopted for a decade or more. —p. 60

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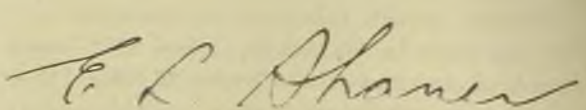
PROGRESS IN HEATING: Infra-red heating has made rapid progress during the war. First employed industrially in 1939, the process soon gained favor for baking and drying and more recently has been adapted to numerous other operations. Among these newer applications are preheating and maintaining heat in pieces to be welded, dehydrating metal products to minimize rust, dehydrating foundry molds and cores and heating for expansion fits.

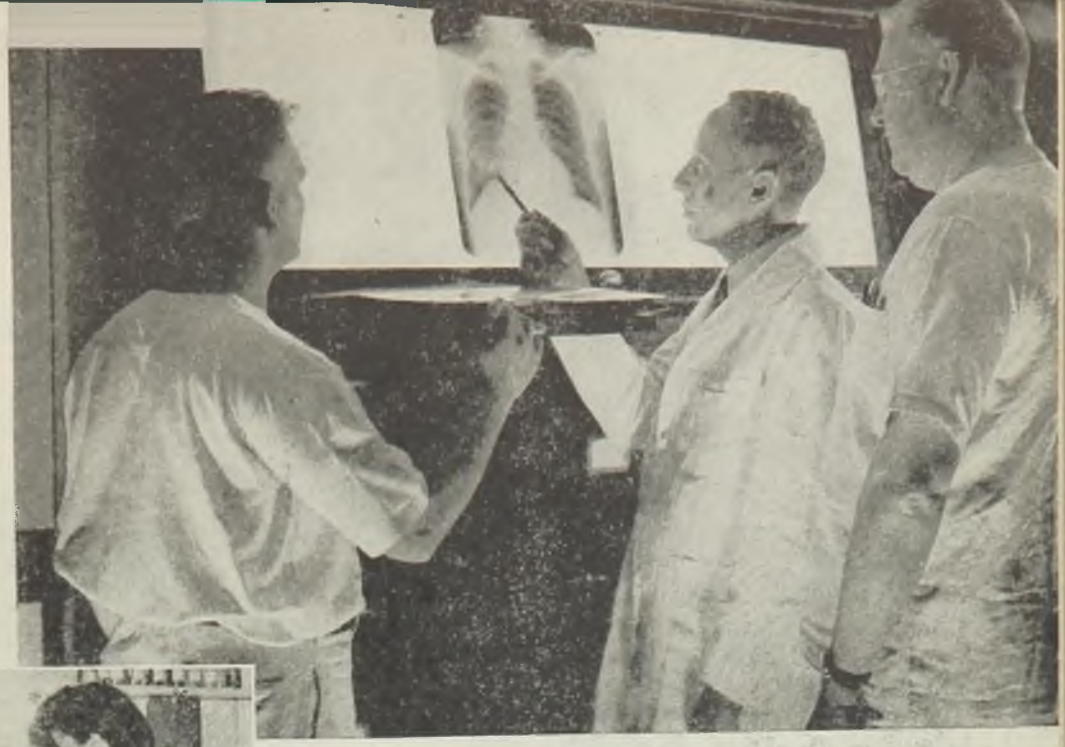
Several factors have accelerated the utilization of the radiant energy of near infra-red lamps in manufacturing operations. First, of course, is the pressure of wartime necessity which has speeded the adoption of many new developments. Second is the time factor, inasmuch as a near infra-red installation can be made available in a few weeks' time. Third is flexibility, arising from the ingenuity of equipment manufacturers in developing mountings for lamps to fit widely varying requirements.

Near infra-red lamps have saved so many million hours on war jobs that they will be strong contenders for a prominent place in postwar manufacturing.

—p. 76



EDITOR-IN-CHIEF



Inland medical staff discussing an X-ray film.

Blood tests often suggest corrective treatments that keep men at work.

The X-ray is extremely useful in preventing the loss of man-hours.

The knowledge of heart action is useful in placing workers and extending their work years.

INLAND CLINIC HELPS SOLVE MANPOWER PROBLEM

The Inland clinic, established long before Pearl Harbor, has taken on added importance during the war by helping to solve the vital manpower problem.

Working closely with the Inland industrial relations and safety departments, the clinic appraises the usefulness of many handicapped people—suggests types of jobs they can perform, —helps find work they can do in the Inland mills to replace workers who have gone to war.

The clinic staff speeds men back to jobs by assisting them in obtaining needed outside medical attention. It recommends and arranges for special treatment. It helps find medical service for workers new in the vicinity and for those whose regular physicians are away at war.

The 24-hour dispensary provides medical attention quickly and keeps many a man producing who otherwise might be absent from work because of slight injury or minor illness.

Finally there is the regular clinical work—free examinations that forestall illness, prevent accidents, speed the recovery of injured and sick employees. Although not compulsory, all but a very small percentage of Inland employees have taken advantage of this service.

Through its important work the Inland clinic has literally added thousands of man-hours to America's war effort, bringing Victory that much sooner.

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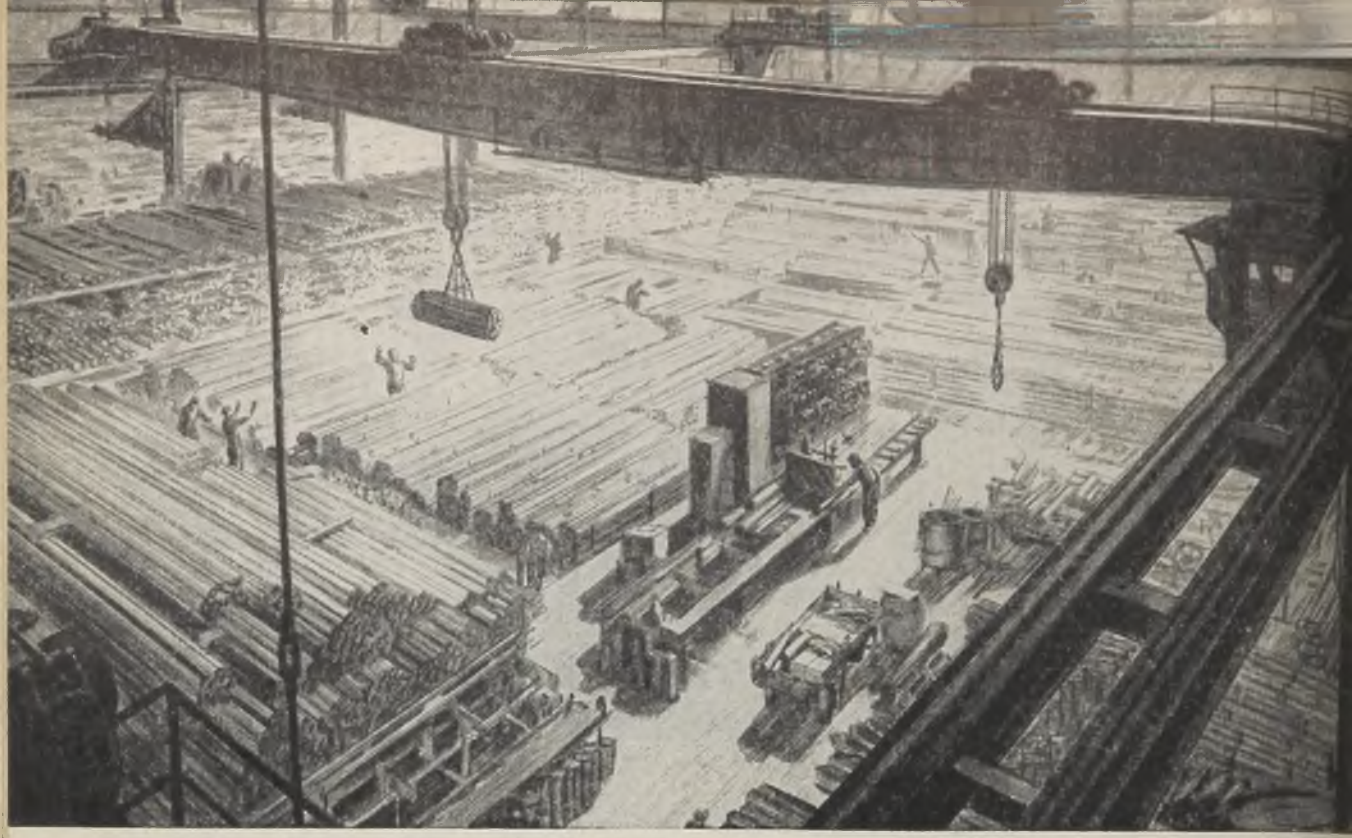

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Uniform Clause Offers Settlement Blueprint

Baruch formula expected to eliminate much confusion and conflict between manufacturers and procurement agencies. Provides for prompt payment for completed work. Limits profit on work in process

JAMES F. BYRNES

A BLUEPRINT to guide holders of fixed-price war contracts in planning for the time when all or part of their work is cut off was promulgated last week by James F. Byrnes, War Mobilization Director.

It is a uniform termination clause, drawn up by Bernard M. Baruch and his aide, John Hancock, advisors in the Office of War Mobilization. Implementing it is a statement of principles to be followed in determining costs.

Procedure set forth in the clause is neither complete nor perfect, according to Messrs. Baruch and Hancock. Yet to come are rules and regulations supplying the details of what now is a general outline.

The clause allows full payment at contract price for all articles completed by the contractor on termination date and limits profit on work in process to not more than 6 per cent, and 2 per cent on materials not processed.

In announcing the new formula, Mr. Byrnes warned that it was not to be interpreted as reflecting any official belief in an early ending of the war.

Its importance, however, is emphasized by the increasing number of cutbacks and shifts in war contracts and the expectation that such cutbacks and cancellations will increase through the year. The clause will assist those contractors whose contracts are reduced or canceled to free their funds and facilities for other war work or possibly some civilian production.

On the latter, government officials are not optimistic. The consensus of Army and civilian war agencies is that any return to civilian manufacture during the year, beyond the 2,000,000 electric irons and 50,000 bathtubs recently authorized by the War Production Board, will probably be goods necessary to maintain civilian economy. Railroads and motor transport systems already have been promised new equipment; manufacture of farm machinery will be increased to enable greater food production; communication systems are likely to receive some materials; some electric refrigerators and stoves for war housing are expected to be made during the year.

Types of war materiel to be produced will shift rather sharply, necessitating the termination of numerous contracts and the awarding of more. Chief cutbacks during the coming months will be in small arms and ammunition, certain types of antiaircraft equipment, noncombat aircraft and artillery fire-control equipment.

More than offsetting these reductions will be almost doubled production of combat aircraft, with greatly increased emphasis on bombers, a tripled requirement for high-octane gasoline, more merchant ships, electronic equipment, heavy guns, heavy artillery shells, ground ordnance and signal items.

The Navy's program will be about one-third greater in 1944 than in 1943—totaling nearly $16 billion, against $12 billion last year.

Thus despite cutbacks, the overall munitions program is expected to be 17 per cent greater than in 1943—barring an early end of war in Europe or unexpected successes in the Pacific.

Regardless of the often reiterated plans for increased war production, and despite denials by WPB officials, reports that steel and facilities will be freed for civilian goods persist. "Prospects were seen" in Washington last week that order M-126 would be revised and that manufacture of many of the items banned by the order would be resumed.

Beneficial to Manufacturers

Contract changes that will be necessitated by the shifting program will make the uniform termination clause and other procedure soon to be evolved beneficial to manufacturers, according to Messrs. Baruch and Hancock.

"It will assure uniform handling of their claims by all the agencies with which they have contracts, eliminating possible conflict and confusion over varying contract provisions; it will make for swifter and more equitable settlement, give manufacturers a clear definition of their rights; reduce litigation."

They summarized the uniform termination article and statement of cost principles as follows:

"The termination article provides that the government may terminate a prime contract at any time by giving notice, which is the common provision in existing contracts. What the contractor must do on receiving his termination notice is set forth. Contractors will be paid for all completed articles at the contract price.

"Two types of settlement are provided for: One, for the contractor and the government to agree upon a fair and reasonable settlement through negotiation; the second, if such negotiation proves unsuccessful for settlement through application of a specified formula.

"Of particular interest is the margin of profit allowed on work which the contractor has begun but has not completed. Clearly, the simplicity of a flat uniform rate of profit would yield enormous administrative benefits in easing the problems of settlement for both contractors and the government. However, under certain conditions, a single, flat rate might give excessive profits, as where a manufacturer's costs consisted largely of assembling an inventory of raw materials.

"Accordingly, a profit formula was devised which (a) limits the aggregate profit in all cases to a maximum of 6 per cent, and (b) further limits to a maximum of 2 per cent the profit on unprocessed inventory, and only to the extent that this inventory is properly allocable to the contract.

"Both these rates or profit are maximum and there will be instances where

only a fraction of a per cent profit will be allowed on raw materials. Obviously no profit will be allowed except on work done or costs incurred.

"We have felt that it would contribute to fair and speedy settlement, with protection for both the government and the contractor, to set forth a specified, though not too rigid, yardstick for measuring profit.

"The cost statement is based upon the recognition only of those costs that are properly allocable to the contract and only to the extent that they are quantitatively reasonable for the performance of the whole contract. In determining these costs, recognized accounting practices are to be used. The cost statement goes further to clarify some of the uncertainties that have arisen in the minds of contractors as to which costs are properly allocable to the contract and which are definitely excluded.

"In bringing the drafting of this termination article and cost statement to decision and conclusion, our thinking has been that the interests of both contractors and the government will be best served by a clear definition of their mutual rights and obligations and by preparing the ground for prompt settlement on the basis of those rights and obligations."

The uniform clause and cost statement "will not fit all cases perfectly," Messrs. Baruch and Hancock emphasized. They were not intended to cover and should not be confused with "such questions as payments and loans, settlement procedures, the keeping of adequate records and protection of the public interest, the special problems of subcontractors, appeals, company-wide settlements, the disposal of property and the need for legislation." All of these, they said, are enmeshed in many difficulties "which are being cut through and will be reported."

Messrs. Baruch and Hancock termed the uniform article and statement of costs "the first step in developing a full set of clear-cut, workable policies on contract termination."

Other problems on which they are thinking include: How to apply the principles of uniform termination to subcontractors; how the government can pay claims quickly; how safeguards for the government can be developed in both settlement and disposal of property; prompt clearance of government-owned property from the plants of contractors.

Text of Uniform Article on Contract Termination

ARTICLE—Termination at the option of the government. (a) The performance of work under this contract may be terminated by the government in accordance with this article in whole, or from time to time in part, whenever the contracting officer shall determine any such termination is for the best interests of the government. Termination of work hereunder shall be effected by delivery to the contractor of a notice of termination specifying the extent to which the performance of work under the contract shall be terminated, and the date upon which such termination shall become effective. If termination of work under this contract is simultaneous with, a part of, or in connection with, a general termination (1) of all or substantially all of a group or class of contracts made by the — — Department for the same product or for closely related products, or (2) of war contracts at, about the time of, or following, the cessation of the present hostilities, or any major part thereof, such termination shall only be made in accordance with the provisions of this article, unless the contracting officer finds that the contractor is then in gross or willful default under this contract.

(b) After receipt of a notice of termination and except as otherwise directed by the contracting officer, the contractor shall (1) terminate work under the contract on the date and to the extent specified in the notice of termination; (2) place no further orders or subcontracts for materials, services or facilities, except as may be necessary for completion of such portions of the work under the contract as may not be terminated; (3) terminate all orders and subcontracts to the extent that they relate to the performance of any work terminated by the notice of termination; (4) assign to the government, in the manner and to the extent directed by the contracting officer, all of the right, title and interest of the contractor under the orders or subcontracts so terminated; (5) settle all claims arising out of such termination of orders and subcontracts with the approval or ratification of the contracting officer to the extent that he may require, which approval or ratification shall be final for all the purposes of this article; (6) transfer title and deliver to the government in the manner, to the extent and at the times directed by the contracting officer (i) the fabricated or unfabricated parts, work in process, completed work, supplies and other material produced as a part of, or acquired in respect of the performance of, the work terminated in the notice of termination, and (ii) the plans, drawings, information and other property which, if the contract had been completed, would be required to be furnished to the government; (7) use his best efforts to sell in the manner, to the extent, at the time, and at the price or prices directed or used by the contracting officer, any property of the types referred to in subdivision (6) of this paragraph, provided, however, that the contractors (i) shall not be required to extend credit to any purchasers and (ii) may retain any such property at a price or prices approved by the contracting officer; (8) complete per-

MILLIONTH CARTRIDGE CASE: Lieut. Gen. William S. Knudsen receives the millionth steel cartridge case produced by the Norris Stamping & Mfg. Co., Los Angeles, from K. T. Norris, company president. Manufacture of steel cartridge cases now has been suspended by the Army due to the improved brass supply

formance of such part of the work as shall not have been terminated by the notice of termination; and (9) take such action as may be necessary or as the contracting officer may direct for protection and preservation of the property, which is in the possession of the contractor and in which the government has or may acquire an interest.

(c) The contractor and the contracting officer may agree upon the whole or any part of the amount or amounts to be paid to the contractor by reason of the total or partial termination of work pursuant to this article, which amount or amounts may include a reasonable allowance for profit, and the government shall pay the agreed amount or amounts. Nothing in paragraph (d) of this article prescribing the amount to be paid to the contractor in the event of failure of the contractor and the contracting officer to agree upon the whole amount to be paid to the contractor by reason of the termination of work pursuant to this article shall be deemed to limit, restrict or otherwise determine or affect the amount or amounts which may be agreed upon to be paid to the contractor pursuant to this paragraph (c).

(d) In the event of the failure of the contractor and contracting officer to agree as provided in paragraph (c) upon the whole amount to be paid to the contractor by reason of the termination of work pursuant to this article, the government, but without duplication of any amounts agreed upon in accordance with paragraph (c), shall pay to the contractor the following amounts:

(1) For completed articles delivered to and accepted by the government (or sold or retained as provided by paragraph (b) (7) and not theretofore paid for, forthwith a sum equivalent to aggregate price for such articles computed in accordance with the price or prices specified in the contract;

(2) In respect of the contract work terminated as permitted by this article, the total (without duplication of any items) of (i) the cost of such work exclusive of any cost attributable to articles paid or to be paid for under paragraph (d) (1) hereof; (ii) the cost of settling and paying claims arising out of the termination of work under the subcontracts or orders as provided in paragraph (b) (5), exclusive of the amounts paid or payable on account of supplies or materials delivered or services furnished by the subcontractor prior to the effective date of the notice of termination of work under this contract, which amounts shall be included in the cost on account of which payment is made under subdivision (i); and (iii) a sum equal to . . . per cent (*) of the part of the amount determined under subdivision (i) which represents the cost of articles or materials not processed by the contractor, plus a sum equal to . . . per cent (**) of the remainder of such amount, but the aggregate of such sums shall not exceed 6 per cent of the whole of the amount determined under subdivision (i), which for the purpose of this subdivision (iii) shall exclude interest charges on borrowings;

(3) The reasonable cost of the preservation and protection of property incurred pursuant to paragraph (b) (9) hereof; and any other reasonable cost incidental to termination of work under this contract, including expense incidental to the determination of the amount due to the contractor as the result of the termination of work under this contract.

The total sum to be paid to the contractor under subdivision (1) and (2) of this paragraph (d) shall not exceed the total contract price reduced by the amount of payments otherwise made and by the contract price of work not terminated. Except for normal spoilage and to the extent that the government shall have otherwise expressly assumed the risk of loss, there shall be excluded from the amounts payable to the contractor as provided in paragraph (d) (1) and paragraph (d) (2), (i), all amounts allocable to or payable in respect of property, which is destroyed, lost, stolen or damaged so as to become undeliverable prior to the transfer of title to the government or to a buyer pursuant to paragraph (b) (7)

(*Please turn to Page* 125)

*Not to exceed 2 per cent.

**To be established at a figure which is fair and reasonable under the circumstances.

Present, Past and Pending

■ FORECASTS POSTWAR MINING BOOM IN CANADA

TORONTO—Greatest expansion in history of Canada's mineral resources of all kinds in the postwar period is forecast by C. H. Dickens, vice president and general manager, Canadian Pacific Air Lines. He believes the airplane will be a key factor in opening up as quickly as possible postwar mining fields which will be required due to the present rapid rate of depletion of old mines.

■ PROPOSED BILL WOULD FOSTER STABLE PAYROLL

ALBANY—A "merit rating" bill has been introduced in the New York legislature which would provide a sliding scale of payments to the State Unemployment Insurance Fund by employers who have been subject to the insurance law for at least three years. Contributions would range from 1 per cent to the present flat rate of 2.7 per cent, depending on stability of employment.

■ TIN INDUSTRY SEEKS EXPANDED POSTWAR MARKET

LONDON—Major postwar problem facing the tin industry is to build up an organization which will create a market for upwards of £50 million worth of tin annually. This would maintain producers at a reasonable level of activity, says John Ireland, director of Tin Research Institute. The prewar market was about £30 million annually.

■ SHIFTS IN WAR CONTRACT CENTERS NOTED

NEW YORK—Baltimore, Boston, Cleveland and New York city have gained in relative importance as holders of war contracts during the 15 months through September, 1943, according to the National Industrial Conference Board. Buffalo, Seattle-Tacoma and Hartford lost ground, relatively. Los Angeles leads in volume of aircraft orders received, followed by Newark-Jersey City and Detroit.

■ CONTAINER OUTPUT IN 1944 TO DOUBLE PEACETIME RECORD

CLEVELAND—Anticipated steady increase in use of containers this year, to double the peak peacetime requirements, has prompted WPB to re-emphasize its conservation program on use of all types of containers. In 1943 about 5 per cent of the nation's steel was used in making containers.

■ RESTRICTIONS ON NEW CONSTRUCTION TO CONTINUE

WASHINGTON—War Production Board has decided to continue restrictions on new construction and facilities without modification until the probable future course of the war becomes clearer.

■ CENSORSHIP ON METAL STATISTICS EASED

WASHINGTON—Certain heretofore confidential information on the production of aluminum, bauxite, copper, lead, magnesium, mercury, and zinc in the United States is being made public through resumption of regular reports by the Bureau of Mines on these commodities.

■ FREIGHT CAR CASTING PRICES REVISED UPWARD

WASHINGTON—Ceiling prices for miscellaneous freight car castings have been increased 17 per cent by the Office of Price Administration, compensating for augmented production costs. Increase was necessary to provide unimpeded production on 60,000 freight cars scheduled for the first half of 1944.

War Fails To Halt Research Of Automakers

Engineers at Detroit reveal developments in materials and production methods. . . . . "Dream car" held not to be immediate postwar possibility

By GUY HUBBARD
Machine Tool Editor

CONVERSION: In the automotive industry, conversion to war work in many cases merely meant shifting from highly styled peacetime models to strictly utilitarian military vehicles, as exemplified by this die setup for fenders of Army cars. Speakers at the SAE meeting in Detroit last week expressed conviction that when manufacture of automobiles for civilians is resumed, their design still will be utilitarian—not highly futuristic. OEM photo by Palmer

DETROIT

ANYONE who suffers the delusion that the automotive industry as such has ceased to function because of its conversion to a wide variety of war work would have had this delusion thoroughly erased had he been one of the more than 4000 who attended the annual meeting of the Society of Automotive Engineers here last week. From Monday morning until Friday evening, in more than 50 papers and addresses, the industry's technicians revealed things which prove that never in its history has more intensive work in research, in engineering and material development and in production engineering gone on than has been the case during these war years.

The airbrush artist's type of dream car was effectively eliminated as an immediate postwar possibility by Edgar C. DeSmet, executive engineer, Willys-Overland Motors Co., yet forward-looking William Stout stirred the imagination by long-range predictions of such vehicles as roadable aircraft, as a result of research now quietly under way behind the scenes. All this must be based on careful experimentation and hard, practical work, however, which precludes any overnight revolution in the design of vehicles for sale to the general public. Such was the consensus.

That the war nevertheless has smashed traditions was indicated by a number of speakers, including Col. E. S. Van Deusen in his revelations as to the current status of amphibian jeeps and "ducks" (amphibian trucks). While rules of military secrecy preclude telling here many of the facts which he mentioned, it can be disclosed that through colored motion pictures he proved the "ducks" are able successfully to put out and to land through 15-foot surf.

Some of his pictures showed them doing things which the Coast Guard considered impossible with surf boats of conventional design. Incidentally, Colonel Van Deusen also showed these amphibian vehicles negotiating terrain which stopped land vehicles, their scow-shaped hulls enabling them to climb out of holes and ditches which hung up the strictly land vehicles. Amphibians now are playing a big role in invasion activities and will find important peacetime uses after the war. Incidentally, they are able to carry water cargoes in excess of their tire bearing capacity. Design of the amphibian vehicles, as far as hull structure is concerned, is an outstanding achievement in mass fabrication of steel and a striking example of the advantages of flat-rolled steel as an engineering material.

Forecasts Wider Use of Aluminum

While this meeting left no question in the minds of anyone as to the postwar importance of steel in the automobile industry, wider use of aluminum and its alloys was predicted by L. W. Kempf, Aluminum Co. of America, Cleveland. According to Mr. Kempf's predictions, aluminum production will reach the point permitting complete aluminization of 1,600,000 vehicles per year, or of putting 500 pounds of secondary aluminum in each of 3,000,000 vehicles. In other words, supply will be ample by the time the automobile industry is ready to produce vehicles of entirely new design, say five years after the war.

As to magnesium, Mr. Kempf said, "lack of a secondary market probably will hold the cost of the primary metal at the present level of primary aluminum. However, even with the wartime hundredfold expansion in production, magnesium castings and wrought products still will cost several times those of iron or steel."

In reviewing the steel situation, W. P. Eddy Jr., Pratt & Whitney Aircraft division, and until recently metallurgist with General Motors Truck division, stated definite wartime progress has been made along lines of fatigue endurance, heat treatment, casting and welding, alloy evaluation, hardenability and in development of NE steels. As to the latter, he predicted a definite postwar future provided certain out-of-line conditions as to pricing are corrected.

"Classification of steels on the basis of performance requirements will lead to more precise evaluation of alloying elements," he said. This will result in continued conservation of alloy material, more intelligent specification by engineers, and more intelligent and economical selection of steels by metallurgists. Among promising trends are development of hardenability specifications, based on new ability to control hardenability within desired ranges.

Extent to which modern "putting-on" techniques have resulted in saving of war-scarce materials through parts reclamation, was brought out in two papers. Norman Hoertz, Thompson Products Inc., Cleveland, showed many examples of apparently hopelessly split, pitted, burned and worn valves which were given new lease on life by electrolytic cleaning, grinding away of damaged

metal, its replacement by welding, and subsequent re-machining. While these reclaimed valves are not as good as new ones, they serve a highly important role under present conditions of shortages.

Brake drums, on the other hand, can be made practically as good as new for light and medium duty, according to J. V. Bassett, Raybestos-Manhattan Inc., Passaic, N. J. This is done most successfully by the sprayed metal process, followed by re-machining to original limits. This method is in use on ordnance vehicles and may be a factor after the war. Low-carbon iron is the spray metal recommended.

Aircraft engineering came in for wide attention, with 14 papers being devoted to various phases of this subject ranging from fuels to air cargo carriers. Incidentally, it was brought out that it will be a long time before high-octane aviation gasoline can be used in motor cars, because of the broad design changes in engines which will be involved. Military experience with synthetic rubber, both on planes and on land vehicles, indicates a bright future for this material in postwar civilian tires—even though it does not possess the wide characteristics of natural rubber.

Highlight of the meeting was the revelation by Maj. Gen. G. M. Barnes, Ordnance Department, of the nature of German and Japanese military *materiel.* Before launching his talk, General Barnes, acting for Maj. Gen. L. H. Campbell, Chief of Ordnance, presented to the Society of Automotive Engineers the ordnance distinguished service award, the first such award to any professional society. This was in recognition "of outstanding engineering advisory service."

While much of General Barnes' talk necessarily was off the record, it can be stated that studies of captured Japanese *materiel* reveal it not of high quality and primarily useful only for jungle fighting. Automotive equipment is not up-to-date nor in any way outstanding, and heavy tractors are scarce. As to arms, in the midst of the war the Japanese have found it necessary to switch from the 0.25-caliber infantry weapons to those of 0.303-caliber, a most serious production matter to them and an admission of the superiority of our own Garand rifle.

Study of German automotive military equipment reveals a high degree of standardization, excellence of manufacturing methods, and no skimping on materials. However, our own developments have punctured the myth of the invincibility of the panzer divisions and things to come promise to equal or surpass any "secret weapons" which the Germans may have up their sleeves. It is now apparent Germany's ordnance preparations by this war began immediately with the ending of the last war, which makes our own achievements that much more remarkable, considering how late we got our eyes open. General Barnes made a strong plea that never again should our Ordnance Department be allowed to shrivel up as Congress caused it to in the period of the "long armistice."

In closing he said, "To my mind the greatest possible compliment was paid to American industry by Premier Stalin at the recent meeting with President Roosevelt and Mr. Churchill. Premier Stalin said, 'Without American production the United Nations could never win the war.'"

The shape of things to come in the automotive industry was forecast by election of a research man, Chief Engineer William S. James of Studebaker Corp., as 1944-45 president of the Society of Automotive Engineers. Research has been behind the great contributions of this industry to the war effort and holds the key to great things in transportation in the postwar era—on land, in the water and in the air. Even though it is true the immediate postwar automobile will be of conservative, utilitarian design, the next few years will bring transportation developments beyond anything now available. However, these things will come through research plus American ingenuity.

WILLIAM S. JAMES

William S. James, chief engineer, Studebaker Corp., South Bend, Ind., has been elected president of the Society of Automotive Engineers, succeeding Mac Short, Vega Aircraft Corp., Burbank, Calif.

B. B. Bachman, Autocar Co., Ardmore, Pa., was elected treasurer, and A. W. Herrington, Marmon-Herrington Co., Indianapolis, SAE president in 1942, was elected a life member of the group.

The following were elected vice presidents, each of whom will direct a professional activity: Aircraft, R. D. Kelly, United Air Lines Transport Corp., Chicago; aircraft engine, A. T. Gregory, Ranger Aircraft Engines, Farmingdale, N. Y.; diesel engines, A. J. Blackwood, Standard Oil Development Co., Elizabeth, N. J.; fuels and lubricants, J. R. Sabina, E. I. du Pont de Nemours & Co., Wilmington, Del.; passenger car, E. H. Smith, Packard Motor Car Co., Detroit; passenger car body, E. C. DeSmet, Willys-Overland Motors Inc., Toledo, O.; production, J. E. Hacker, Cleveland Diesel Engine division, General Motors Corp., Cleveland; tractor and farm machinery, O. R. Schoenrock, J. E. Case Co., Racine, Wis.; transportation and maintenance, E. W. Templin, Dower & Light, Los Angeles; and truck and bus, E. M. Schultheis, Clark Equipment Co., Detroit.

They Say:

"We Americans must not permit hope alone to dim our vision. The road to Berlin is still long and rugged. We still face a strong, stubborn, skillful enemy. We must continue to show the boys in the armed forces by our deeds—not our words—that they can count on us."—**Charles R. Hook,** president, American Rolling Mill Co.

* * *

"The presence of some surplus war materials and labor, raises the question of what should be done with these surpluses. Returning to civilian production sounds like an obvious solution but not all materials are available, and in many parts of the country there is no surplus of labor."—**William L. Batt,** vice chairman, War Production Board, Washington.

"Engineering under wartime conditions of maximum severity is yielding by-product results which have extensive peacetime applications. We are applying the war-developed technique of conservation of materials to the conservation of ideas for peace. We hope that wise application of the engineering lessons of war will serve to make it a better peace."—**John A. C. Warner,** general manager, Society of Automotive Engineers.

* * *

"Expanding job opportunities are a social, political and economic essential in the postwar era which can be achieved only by a virile and expanding system of American enterprise."—**Alfred P. Sloan Jr.,** chairman, General Motors Corp.

Dealers Told Potential Supply Will Equal 1943 Consumption

Industry congratulated on contribution to war effort. Larger volume handled during past three years than during any previous similar period in spite of manpower shortages and government-imposed price ceilings

IF the war in Europe ends some months hence there will be an immediate and perhaps drastic change in the iron and steel scrap picture regardless of the fact war with Japan will continue, delegates to the sixteenth annual convention and victory conference of the Institute of Scrap Iron and Steel Inc. at Hotel Statler, Cleveland, were warned last week.

Speaking at the scrap requirements session, C. E. Wright, vice president, Charles Dreifus Co., Philadelphia, said that still another factor almost as uncertain as the end of the war in Europe is whether military needs for steel and castings, and necessarily scrap, will be as great this year as in 1943 considering the fact that in some categories war production shows indications of having passed its peak.

"Until the war is ended, or at least until Hitler is defeated, it would not be safe to assume that the country's scrap needs will be materially lower," said Mr. Wright. "With the war about to enter its most critical phase, this is, of course, no time to relax efforts to obtain all of the scrap that possibly may be needed.

Scrap Loss Greater

"One of the most important factors in our total scrap supply is the large volume of prompt industrial scrap that is flowing back to mills and foundries as a result of the rapid conversion of steel and iron into implements of war and the relatively small amount of steel that is going into capital goods where the scrap return would not be available for many years. Moreover, the scrap loss in making many of the implements of war is undoubtedly greater than in normal peacetime manufacturing, in some instances amounting to as much as 35 per cent. Competent authorities agree that under present conditions not less than 20 per cent of the steel being shipped is returned in the form of scrap.

"On the basis of 20 per cent scrap loss in manufacturing processes, the amount of carbon steel scrap available from this steel is 8,683,000 gross tons. From alloy steel figured on the same basis, 1,590,000 gross tons of scrap could be expected. Thus prompt industrial scrap available from rolled steel would total 10,273,000 gross tons. Adding to this a somewhat lower percentage return from steel and iron castings, the total of all prompt industrial scrap may be perhaps safely estimated, on the basis of last year's production, at 12,000,000 gross tons.

"The next big item is railroad scrap. Reports from 15 leading railroads show that in 1943 they marketed 1,510,273 gross tons of scrap, while for 1944, they estimate they will market 1,482,680 tons. Projecting these figures for 100 per cent of trackage we have arrived at a figure of 2,750,000 gross tons as a reasonably safe estimate of 1944 railroad scrap total.

"Recovery of slag from dumps and current slag output totals about 500,000 tons on an annual basis. From the detinning of cans we are now getting about 250,000 tons a year. In addition we can count on so-called battlefield scrap coming in at a rate of about 250,000 tons a year so long as it may be needed.

CARL A. ILGENFRITZ

"These various known factors in the scrap supply total 15,750,000 gross tons. To recapitulate: Prompt industrial scrap, 12,000,000 gross tons; railroads, 2,750,000 tons; slag, 500,000 tons; detinned scrap, 250,000 tons; battlefield scrap, 250,000 tons.

"The difference between this total and the country's consumption this year must be obtained from the maintenance and obsolescence category, including auto wreckers.

"On the basis of estimated potential supplies that will be available this year, and assuming that consumption of scrap is as large as it was last year, it would appear that total demand and total available supply would be about a standoff."

Complimenting the scrap industry for its contribution to the war effort through supplying more scrap over the past three years than ever handled before in a like period, Walter S. Tower, president, American Iron and Steel Institute, speaking on "Steel Capacity and Scrap Supply", pointed out that the huge steel capacity which the nation will have when the war ends poses some interesting questions for the future. He said one may fairly question whether all the available capacity will survive beyond the end of war demands, and that unless the clamor for steel continues unabated, as seems unlikely, it is reasonable to expect that some of the oldest and least efficient steel furnaces will be discarded. A somewhat random guess, he said, would put the likely aggregate of such early changes certainly at less than 10 per cent of the capacity now available, however.

"It seems probable that the steel industry will emerge from the war period with a total ingot capacity in the vicinity of 90 million tons a year," said Mr. Tower, "after the expectable process of elimination has been completed. How that capacity to produce will compare with postwar actual demand is a question on which opinions differ widely. I am told, for example, that some semi-official calculations figure as high as 120 million tons of steel demand, 85 million tons in terms of finished products in the early years of return to peacetime pursuits in this country.

"Paper Production Figures Unlikely"

"Fortunately that is only a paper figure, supposedly based on the assumed volume of industrial activity which would be needed to give full-time employment to all available workers. I do not believe that you men could find or handle the scrap required for present steelmaking practice to make 120 million tons of steel in a year. I doubt whether the mines could produce the necessary ore, even if blast furnace capacity were available to convert it. And to me it seems quite certain that the chief users of steel would not know what to do with any such tonnage if it were put before them.

"Actual experience has never produced a peacetime demand for steel as high as 65 million tons of ingots, or say 45 million tons of rolled products in the forms as used by consumers.

"More critical appraisals of future demand for steel, based on probable scale of activity in the principal steel consuming industries, indicate variable prospects. Some of those consuming industries give promise of rising to new high levels of output, and therefore in use of steel products. Others of them, as a result of carryover effects of war influences, are not likely to show early return even to the top tonnages of prewar years. From that angle of approach, such appraisals show that reasonable estimates of needs for steel when war demand gives way to peacetime activity, are not likely to go beyond the range of 45 to 50 million tons of finished products."

That uncertainty pervades the outlook in 1944 for new steel and castings in the manufacture of which scrap is almost

50 per cent of the raw materials, was the opinion expressed to the convention by Edwin C. Barringer, president and executive secretary of the institute, in his remarks opening the convention.

"The scrap industry can look pridefully on the record it wrote in 1943," said Mr. Barringer. "Notwithstanding a large increase in the capacity for making pig iron, a relatively greater supply of home scrap, and the limitations placed upon our industry by the OPA schedule, the consumption of purchased scrap in 1943 at approximately 24,000,000 gross tons was almost identical with that for 1942."

Manpower problems of the scrap industry were discussed in a forum by Lieut. Col. K. D. Pulcipher of Selective Service and Archie M. Palmer, assistant to the director, Salvage division, War Production Board. Prospects are not promising for an early improvement in the scrap labor situation.

That the scrap industry is concerned for the future was evidenced by the deep interest shown in the session devoted to postwar planning. Addresses at this session were devoted to such subjects as termination of contracts, disposal of surpluses, stockpiling, etc., speakers including President Barringer, Julian C. Hammock, general counsel for the institute and Commander J. G. Dean, Bureau of Supplies and Accounts, Navy department.

William Broadgate, secretary to the Senate Committee on Small Business, discussed the problem to be created by surplus materials after the war and also the stockpiling bill introduced by Sen. James Scrugham. An amendment to the bill now being considered would provide for the stockpiling of nonferrous scrap, and possibly ferrous scrap.

Toastmaster at the annual dinner was Carl A. Ilgenfritz, manager of purchases and raw materials, Republic Steel Corp., Cleveland. Featuring the dinner was the presentation of the institute's award of merit to William J. Wolf.

Mr. Barringer was re-elected president and executive secretary. William J. Wolf, Wolf & Co., Hamilton, O., was elected vice president, and Walter Erman, Erman-Howell & Co. Inc., Chicago, was named treasurer. Directors-at-large were re-elected and two additional directors named—Milton Mahler, Mahler Steel Co., Detroit, and William J. Ross, Hyman-Michaels Co., Chicago.

Official registration for the convention exceeded 400.

Auto Wreckers Urged To Seek New Manpower Source

The auto wrecking industry must seek new sources of manpower to meet the labor shortage, delegates to the National Auto Wreckers' Association's convention in Cleveland were told recently by Archie M. Palmer, executive assistant to the director, Scrap Processors Branch, WPB.

Licensing Exceptions Possible

Alien property custodian prepared to consider requests for exclusive rights to firms or individuals where conditions indicate fullest utilization would be prompted

DESPITE its policy of granting non-exclusive, royalty-free licenses for the use of seized patents by any reputable American firms or individuals upon payment of a fee of $15 for each patent, the Office of Alien Property Custodian is prepared to consider exceptions in some cases.

"There are certain conditions under which the custodian might be justified in modifying his licensing policy to overcome some of the difficulties which in exceptional circumstances appear at present to prevent the fullest utilization of the vested patents," according to Dexter North of the APC's Division of Patent Administration.

"Examples of such cases," he says, "are (a) investment of large sums of money in development requires some measure of protection for recouping the sunk cost, (b) specifications or know-how developed at considerable cost by the original licensee may prove a windfall to later licensees competing in the same field, (c) instances of an inflexible demand for a patented product.

Hesitate To Risk Funds

"As to recouping development expense," says Mr. North, "we know that some firms, particularly small ones, have hesitated to apply for licenses because they felt that they could not risk the necessary funds for development if others could also compete in the field. We have given considerable thought to modification of our licensing policy to take care of such situations, and have discussed two alternatives to permit recouping of development costs, one for a license to be exclusive only until development costs are absorbed, and the other for granting of additional licenses over the original only on condition that the licensees share development costs equally with the first licensee.

"Where a vested patent requires preparation of working drawings or the building of an expensive unit, it may be said that the original licensee might spend a considerable sum for this purpose, only to have licensee No. 2 copy the unit at a fraction of the cost to the original licensee. It is in such cases too that the custodian might consider modifying his licensing policy to provide for equal sharing of development costs."

Mr. North also makes it clear that while the custodian has vested patents to which American companies held exclusive licenses, he continues to allow these companies exclusive rights without any disturbance. However, where the companies are not exploiting these patents the APC is seeking to have them made available to others on a non-exclusive, reasonable-royalty basis. In conformity with this policy, said Mr. North, the Schering Corp. has issued a list of patents it is willing to license on such terms. Also, General Aniline & Film Corp. has licensed some of its patents to American firms on a non-exclusive, reasonable-royalty arrangement. Incidentally, the custodian has not been able as yet to determine on a policy for handling patents held by General Aniline & Film Corp. because of complicated considerations involved.

Mr. North discloses that the APC has vested in whole or in part about 20 patent holding companies which own about 1000 patents. Where these patents had not been exclusively licensed prior to vesting, the APC is making every effort to put them to as wide use as possible on non-exclusive, reasonable-royalty terms.

Lists of the latter patents now are available in mimeographed forms and inquiries about them should be addressed to Walter M. Russell, Alien Property Custodian, 120 Broadway, New York. Among these patents, says Mr. North, are a number that cover stainless steel alloys, powder metallurgy, beryllium extraction and various alloys and alloying elements.

As before, information about all other vested patents may be obtained by addressing the Alien Property Custodian, room 311, Field building, Chicago.

Many manufacturers interested in getting licenses to use seized patents wonder whether after this war most patents will not be returned to their former owners as after the last war. The alien property custodian takes the attitude that this question was decided by President Roosevelt on April 22, 1942, when he announced specifically that vested patents would never be returned, but would become a "permanent possession of the American people." Actually, of course, there are no indications whatever as to the nature of the peace terms to be drafted after this war. The matter of patent ownership will be discussed at the peace table.

Pricing Procedure Simplified by OPA

Office of Price Administration has simplified procedure by pricing steel products sold by warehouses in carload quantities. The new procedure permits warehouses to calculate their ceiling on carload shipments according to methods provided by OPA and eliminates the formal requirement of certification for amounts of 40,000 pounds. The general price level of the trade remains substantially unchanged. The amendment is No. 20 to Revised Price Schedule 49, effective Jan. 13.

Suspension of Geneva Structural Mill Arouses Far Westerners

McCarren committee may hold hearings in Nevada in February to air War Production Board's reasons for abandoning project, which figured in westerners' postwar plans. Sessions expected to receive much attention

INDICATIONS are that Sen. Pat McCarren (Dem., Nev.) will arrange to hold hearings in the far west in February to ascertain reasons for the action of the War Production Board in suspending construction of the 24-inch structural mill originally scheduled to be part of the government-owned iron and steel plant of the Geneva Steel Co., Geneva, Utah. The Senate acceded to his request for an appropriation to be expended in investigating the possibilities of decentralizing the steel industry, and designated him as chairman of a special committee. Other members of the committee still are to be named.

Senator McCarren will return to Washington the latter part of this week. He was delayed in returning from the holiday recess because of an aroused public opinion over the Geneva cutback. Some House members who are interested in the future of the steel industry in the far west also did not arrive for the Jan. 10 opening session for the same reason. Included among the latter was Rep. Cecil R. King (Dem., Calif.) who recently was designated by the Special Cases Subcommittee of the House Steering Committee to serve as House liaison representative with the McCarren committee. Mr. King expects to attend the coming hearings.

May Hold Hearings in Nevada

It is probable the hearings will be held at Reno or Carson City, Nev. This is at the suggestion of Robert W. Kenny, California attorney general, and chairman of California's commission on interstate co-operation, who points out that Nevada is the centrally located state of the three that are interested in the future of the Geneva plant, California, Nevada and Utah. Mr. Kenny recently alluded to the Geneva plant as the "keystone" of California's heavy industry after the war.

The structural mill, which has capacity for rolling some 200,000 tons of shapes annually, has been built so that the suspension order prevents only the final step—installation of the mill. It is this fact, plus the realization that the resulting financial saving will be only around $1,000,000, compared with a total outlay of some $190,000,000 for the entire Geneva program, that particularly irks the westerners. In planning the postwar economy in which their expanded population will function they have built largely on having a rounded out iron and steel industry upon which numerous heavy industries would be based—industries producing products which they formerly have imported from eastern and mid-western sections of the United States and on which they have had to pay high freight rates. They also have visualized actively selling such products on a large scale all through the Pacific export area.

WPB spokesmen declare that cutbacks in the expansion program during the present "easier steel" period are not made with any geographical considerations in mind—that they are made only on the basis of needs. While the structural mill has been suspended, they point out that this suspension does not apply to any other parts of the Geneva program. They point out that the second cutback to be ordered affected plants of the Carnegie-Illinois Steel Corp. at Gary, South Chicago, Munhall and Braddock—certainly not located in the far west. They point out that just as the steel consumption program no longer necessitates completion of the Geneva structural mill, so current needs for steel of forging quality do not justify the installation of facilities originally thought necessary at Gary, South Chicago, Munhall and Braddock.

It is pointed out that there is no assurance whatever that any of the iron and steel projects now under way will be carried through to completion. The current review of this program may result in numerous additional cutbacks. For example, just as soon as the claimant agencies say they are getting enough plates, any plate mill projects still under way will be suspended. WPB officials are not minded to spend one cent more for facilities when it is shown they are not needed in the war effort, and it does not propose to encourage any unnecessary use of manpower or transportation or other facilities.

The hearings to be conducted by Senator McCarren probably will be noisy ones; he has a genius for obtaining publicity. His associates in the Senate have a high respect for his ability to get things done. Asked for his opinion as to what Senator McCarren could hope to accomplish with the meager $5000 appropriated by the Senate for the purpose of making his steel investigation, this colleague predicted: "You will be surprised at what he will be able to do!"

The hearings, it is expected, will be featured by numerous charges that the steel industry has used the WPB as an instrument to favor existing steel locations largely at the expense of other sections of the country, particularly the far west. In particular, this question will be explored: "Why are there no far westerners on the WPB Steel Industry Advisory Committee?"

Wheeled Tractor Production Rises to New Two-Year High

Production of wheeled tractors, used principally on farms, is responding favorably to the combined efforts of the manufacturers, the War Food Administration, and the War Production Board to obtain increased output, according to Donald M. Nelson, chairman, War Production Board. Production in December rose to over 20,000, the largest for any month in two years, compared with an output of only 4200 in December, 1942.

Production showed a steady increase in each quarter of 1943. In the first quarter, 15,000 wheeled tractors were built; in the second quarter, 18,000; in the third quarter, 33,000; in the fourth quarter, 56,000.

Mr. Nelson pointed out, however, that the current rate of production must be maintained in order to meet the tractor quota for the 12 months that will end June 30, 1944, which has been set at 209,000. This, he said, will not be easy, especially in view of the fact that many of the components needed for tractor production are used also in landing craft, which are now in urgent demand by the armed services. Consequently, if a conflict were to arise, landing craft would have first call on components, as invasion vessels have been assigned the highest priority ratings possible.

Every effort is being made by WPB to provide enough components for both the landing craft and tractor programs, as well as for other approved programs, and with full co-operation between industry and the government it is believed that the nation's requirements can be met.

"Bill" and "Eric" Agree on Postwar Enterprise System

Reconversion Production Board proposed by Green to deal with cutbacks and return to peacetime operations

A DEVELOPMENT of the past year, real significance of which is not yet widely appreciated, is the much better understanding that now prevails between a majority of employers on the one hand and a majority of union leaders on the other. That something important had happened was revealed when representatives of the labor unions and of industry discussed their economic problems and made recommendations for directing the postwar changeover to a number of congressional committees during the latter part of 1943.

Analysis of what they said revealed that leaders of industry and of the American Federation of Labor see almost eye to eye in arguing as to what policies are necessary for a prosperous future for the country. The viewpoints expressed indicated that the railroads and the railroad brotherhoods are not far apart. The coal operators and the miners understand each other pretty well. In these instances the friction that developed was largely due to the position of the government in standing between employers and employes.

The record reveals that the widest gap in thinking now is that between employers and leaders of the Congress of Industrial Organizations.

As an instance of the progress made in labor-management relationships, something happened Jan. 9 that not so long ago would have been considered almost impossible.

The Victory Hour radio broadcast featured a discussion between Eric Johnston, president, Chamber of Commerce of the United States, and William Green, president, American Federation of Labor, in which these two influential spokesmen agreed upon a reconversion program aimed to benefit both industry and labor! They called each other "Bill" and "Eric" and it all sounded very friendly and informal.

Actually, however, this event was far from being of a spontaneous character. It was possible because of the fact that the two groups have been in active contact for well over a year and because they actually have discovered a platform upon which they are mutually agreed. During this period there has been compromise on both sides. That both groups take this platform with entire seriousness is proven by the printed records of discussions at the recent conventions of the chamber and the federation, at New York and Boston, respectively.

Establishment of a Reconversion Production Board to deal with cutbacks and the return to civilian goods manufacture was suggested by Mr. Green. Mr. Johnston immediately agreed with the idea "in general."

POSTWAR PREVIEWS

TERMINATIONS—Postwar as well as present confusion and conflict between manufacturers and government agencies should be greatly reduced as result of the Baruch clause added to government war contracts as a yardstick for termination settlements. Clause provides for prompt payment for finished products, and limits profit on in-process work. See page 41.

VEHICLES—While fantastic "dream cars" will not be thronging the highways immediately after war ends, amphibious motor cars and roadable aircraft are among the vehicles some automotive engineers anticipate for the relatively near future. Necessary engine design changes make it appear that automobiles will not be burning high-octane aviation gasoline for a long time. See page 44.

MILL CAPACITY—Sen. Pat McCarran, Nevada, will hold hearings in that state next month to investigate WPB action in suspending construction of 24-inch structural mill of Geneva Steel Co., Geneva, Utah. Industrialists of California, Nevada, and Utah consider the Geneva plant the backbone of the Pacific Coast's postwar heavy industry. See page 48.

PATENTS—Information covering more than 7000 U. S. patents on new processes, new and improved machines, and other devices, held secret during the war by the Patent Office because of their military value, will be made public after the war. Assistant commissioner of patents says many of these developments are of "immeasurable importance in production." See page 50.

TAXES—A tax study by the Brookings Institution, Washington, recommends refocusing of federal tax policy after the war which would lead to repeal of the excess profits tax. Cornerstone of the tax system would be a single normal tax on all taxable income, personal and corporate, with a corporate rate possibly in the range between 5 and 10 per cent. See page 51.

MACHINING TECHNIQUES—New methods in machining departments of automotive plants hold excellent possibilities for postwar production economies. Thread rolling instead of grinding crankcase studs has increased output astronomically and improved accuracy. A rubber-bonded grinding wheel of extremely fine grit removes only about 0.0002-inch of stock and reduces grinding time. See page 57.

INFRA-RED HEATING—Development of near infra-red process for preheating metals and maintaining heat during welding, for dehydrating foundry molds and cores, and for expansion fitting adds new luster to a reputation for rapid baking and drying of finishes. See page 76.

FORGED-COINED GEARS—Proper utilization of forging and coining dies enables war plant to meet tremendous demand for pinion gears, with lower costs, less material and no special machines. Tailored for volume, method appears to have acquired a permanent position as a production procedure. See page 78.

Uniform Wages Will Be Sought in Auto Industry

Uniform wages throughout the automobile industry will be sought by the United Automobile Workers, R. J. Thomas, president, said last week in Chicago. The union will ask for a nationwide agreement applying to all its membership and would provide equal pay for equal work.

"Our present contracts," he said, "cover 1200 plants, entailing 1200 separate negotiations. This has slowed down the War Labor Board procedure and has created unfair wage differentials."

The UAW executive board has also recommended that steps be taken to insure industry-wide application of the following five points: A 48-hour guaranteed work-week or a 48-hour guaranteed weekly wage; creation of a postwar employment security fund; provision for severance pay; $1 an hour minimum and provisions for the establishment of a guaranteed annual wage.

More Studies

GRAVELY concerned with the future of small business in the United States, the Bureau of Foreign and Domestic Commerce, at the request of Secretary of Commerce Jesse Jones, is launching a program of external studies which will apply to all industries and trades collectively, and internal studies which will apply to specific industries or trades or individual enterprises. Mr. Jones feels that the small companies do not have the managerial resources that enable corporations to plan for the future. He hopes the new studies will compensate for this lack of research and statistical facilities, plus other managerial skills possessed by large companies. In the meantime, small businessmen and manufacturers are urged to submit their problems to the nearest Department of Commerce field service offices. There are 26 scattered over the country.

Aid for Business Planners

The 1943 Statistical Abstract compiled by the Bureau of the Census now is available and copies may be had at $1.75 from the Superintendent of Documents, Washington 25, D. C. It comprises 35 sections coming to 1097 pages of data relating to the social and economic condition of the population, and to the commercial, industrial and governmental activities of the nation.

Tax Dilemma

Concern over the complicated task of filing income tax returns under the present and proposed revenue laws is mounting in Congress. Rep. Frank Carlson (Rep., Kan.), member of the House Ways and Means Committee and author of the Ruml pay-as-you-go bill, is sponsor of a plan under which income tax returns would be entirely eliminated; most income taxes would be automatically deducted from wages and salaries. "This could be done," he says, "by adopting a graduated withholding from wages and salaries, at the same time allowing a percentage of income exemption" in lieu of the present deductions for other taxes paid, interest and contributions to churches and charity. He would combine existing personal income tax laws into one base and rate, and would repeal the earned income credit because of the complicating effect it has.

Assembly Plant

A railroad car assembly plant is among United States Army installations in Britain. Manned by a battalion of soldiers with railroad or carbuilding experience, the plant is producing 30 cars a day, including box cars, flat cars, refrigerator cars and cabooses used either to carry supplies to troops stationed in the British Isles or held in reserve to be sent to continental ports to serve the invasion army. Wheels, trucks, frames and other parts are shipped from the United States and assembled on six tracks, each employing 155 men. When the plant reaches production peak each of the six lines will be able to turn out a completed railroad car every hour. The battalion doing the job is a part of the Army Transportation Corps and is commanded by Lieut. Col. Howard U. Bates, formerly general foreman at the shops and engine house of the Pennsylvania railroad at Canton, O.

TRAINING FILMS

In addition to the nearly 100 war production training films produced by the United States Office of Education in co-operation with the War Manpower Commission, an additional 150 new films are under preparation. Some of them are already available. Of the 150 new films, 46 cover machine shop practice, 30 shipbuilding operations, 25 aircraft work, 20 supervisory training, 10 engineering, 6 optical craftsmanship, 5 welding, 3 forging. Manufacturers may obtain more information about them by writing to Castle Films Inc., 30 Rockefeller Plaza, New York 20, N. Y.

WMC Commissioner Paul V. McNutt reports use of the training films cuts the time of training new workers by 25 to 33 1/3 per cent. More than 30,000 of these films have been sold. In addition, Canada and South Africa have each purchased over 1000 prints.

Steel Wire at War

The Army recently developed a new use for steel wire. Coils of heavy square wire are wrapped around fragmentation bombs that are used by low-flying airplanes against enemy infantry. When the bomb strikes, the explosion rips the wire wrapping into bits and sends them zinging out in all directions like so many bullets.

Retiring Old Vehicles

Since May, 1943, the Army gradually has been retiring commercial vehicles of 1939 and earlier models, mostly trucks, but including also some passenger cars and motorcycles. Because of the urgent need for trucks for civilian use it has decided to accelerate the program. They are to be sold on competitive bids. Businessmen interested in buying them may obtain full information, either from the regional and district offices of the Office of Defense Transportation, or from the eleven regional offices of the Treasury Procurement division.

Military Secrets

After the war a vast amount of information about new processes, new and improved machines and other devices will become public for the first time. Under powers authorized by public law No. 700, passed by Congress, July 1, 1940, the Patent Office is holding as military secrets information about more than 7000 patents and patent applications. Even the nature of these patents cannot be indicated. Conder C. Henry, assistant commissioner of patents, says that many of them are of "deadly effectiveness in battle and of immeasurable importance in production." In determining what patents should go into the secret classification, the Patent Office works with the Army and Navy, the War Production Board, Petroleum Coordinator for War, The Office of Scientific Research and Management and, occasionally, with other agencies.

Dies Easier

Facilities are now deemed ample and sufficiently flexible to meet all likely requirements of dies needed to draw the superfine wires (0.0015-inch and less) of all types essential to production of electronic devices and other critical war products, it was revealed at a recent meeting of the WPB Small Diamond Die Industry Advisory Committee. Resistance wire drawers do not see any indication of the return to last summer's large requirements for dies. Tungsten wire drawers anticipate die requirements for 1944 several times larger than those of 1943.

Sponge Iron Experiments

Under a contract with the Bureau of Mines, the Stark Brick Co., Canton, O., now is operating six periodic brick kilns in production of sponge iron. Arrangements have been made with a number of steel companies to use the output and report on results. A 10-ton charge of this sponge in one of the electric furnaces of the Rustless Iron & Steel Corp. of America, according to reports received in Washington, was used successfully in production of stainless steel. Occasional runs on sponge iron also are being made for the bureau in a rotary furnace at the plant of the Plastic Metals Co., Johnstown, Pa. The bureau has arranged with Mifflin Hood Co., near Chattanooga, Tenn., for experimental production of sponge iron. It now is considering award of a contract to a plant in Salisbury, N. C.

Outstanding Development

Steel landing mats for airfield runways are alluded to by Gen. Henry H. Arnold, Air Forces commander, as "one of the outstanding developments of the war." Approximately 175,000,000 square feet of steel landing mats have been sent to combat theaters and 300,000,000 more square feet are on order for 1944.

Loss of Key Personnel Threatened

Retention of experienced steel men in WPB organization held advantageous to industry

Experienced steel men in WPB Steel Division. Left to right, front row: J. L. Block, executive vice president, Inland Steel Co.; N. W. Foy, general manager of sales, Republic Steel Corp.; J. T. Whiting, director of the division and president, Alan Wood Steel Co.; Miles K. Smith, chief metallurgist, Latrobe Electric Steel Co. Back row: C. W. King, research engineer, Bethlehem Steel Co.; C. W. Meyers, district manager, Central Alloy Division, Republic Steel Corp.; C. H. Longfield, general manager of sales, Youngstown Sheet & Tube Co.; J. V. Honeycutt, assistant vice president, Bethlehem Steel Co.

IN RECENT months, a number of experienced men who had a large share in shaping policy in the War Production Board Steel Division have returned to their former posts in the steel industry. Often the companies employing them have held they loaned these men to Washington to do a job, the job has been done, and the men therefore should be released. In other instances, men have resigned of their own volition.

Indications are this exodus of experienced men from the Steel Division may be accelerated. Men who have been away from their former jobs for one or two or more years realize other men have been trained for duties. Many have lost touch to a large extent with the activities of their companies and wonder where they will fit into their normal employers' staffs in the postwar era.

Now that we are taking the offensive in all the theaters of war, there is a growing desire on the part of these men to shake off the dust of Washington and go back home and look after their own future security. They believe the job of producing iron and steel for war has been well organized and that they no longer are necessary.

This viewpoint spells possible danger for the steel industry and should have most serious consideration by the industry's executives. Some of these executives apparently do not realize the need for keeping the Steel Division ably staffed, for they are exerting pressure to get back certain key men still in the Steel Division. They fail to take into consideration the possibility that when experienced steel men leave the Steel Division they must be replaced—possibly by men who have nothing more than a paper knowledge of the steel industry, or possibly by men who qualify as economists, liberals or representatives of labor or some other group.

Right now the policy-making men in the Steel Division are few. All are men of life-long experience in the steel industry. All have great ability; all are missed by their regular employers, and yet the resignation of even one of them would mean a serious loss to the Steel Division. There is no assurance that this group will remain intact. As a matter of fact, there is a feeling of resentment in some quarters because of the impression that certain companies have called more men back from the Steel Division comparatively than others—and if your competitor calls his men back you are likely to feel justified in calling back your own.

There are two principal reasons why it would be unwise to strip the Steel Division of any more of its experienced men. One is unselfish, while the other is highly selfish from an industry standpoint. The unselfish reason is that we may have reverses in the war that will call for more than routine procedure. In such an event it will be desirable to have men in the Steel Division who know the steel industry and can get needed action.

The selfish reason is that the steel industry can best look out for its own interests by keeping experienced steel men in policy-making positions in the Steel Division not only during the remainder of the war but in the postwar period. The immediate postwar period is not going to be one of smooth sailing. Rate of steel production probably will fall sharply. A lot of pulling and hauling will ensue. Arguments will follow as to whether this or that company or area is getting a better share of the reduced amount of business at the expense of other companies or areas. Under such conditions it certainly will be better for the steel industry as a whole to have the allocation of business handled by men of experience.

Current belief is that WPB, perhaps under some other name, as the Office of Reconversion, will have charge of the reconversion job. This is based on a general assumption, supported by the opinion of Bernard M. Baruch that the agency that had charge of mobilization should have charge of demobilization.

Following recent withdrawals, efforts now are being made by their employers to recall at least two more experienced steel men from the Steel Division. Three others are being drafted by the Army and Navy. The staffs of certain important units in the Steel Division have been diluted to the extent that some of them have only one man of experience in the industry.

Study Urges Refocusing of Postwar Federal Tax Policy

Refocusing of federal tax policy after the war, designed to stimulate economic expansion and thus provide adequate employment, is recommended in a study by the Brookings Institution, Washington. Proposed change would amount to a reversal of the tax trends in the 1930's by the adoption of a firm policy calling for repeal of the excess profits tax.

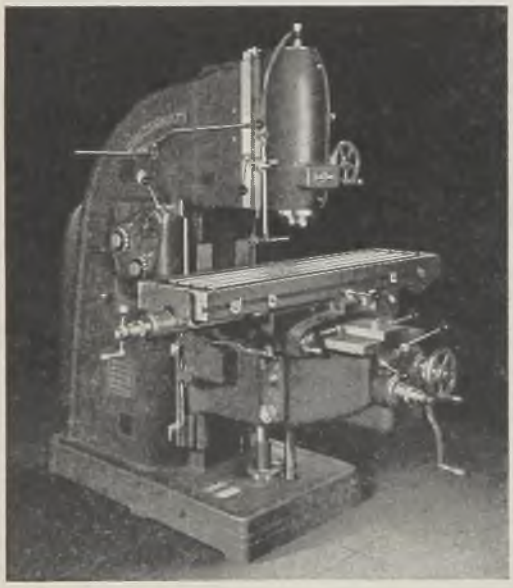
The study was conducted by Lewis H. Kimmel and financed by the Falk Foundation, Pittsburgh. It represents one phase of the institution's collaboration with the special Senate Committee on Postwar Economic Policy and Planning.

The study urges that the cornerstone of the postwar federal tax system should be a single normal tax, collected on all taxable income—personal and corporate. The corporate tax, the study concludes, should be imposed as a moderate rate tax, perhaps in the range of 5 to 10 per cent.

It also suggested that new manufacturing industries be exempted from the corporate income tax for the first three years and that they be taxed at one half the regular rate for the next two years.

How to use a gang of cutters on a VERTICAL MILLING MACHINE

Below: CINCINNATI *No. 3 Vertical Dial Type Milling Machine. Complete specifications of the Dial Types may be obtained by writing for catalog M-970-2. A copy is yours for the asking.*



Here's a job — form mill bolt bosses of crankshaft — that evidently requires the advantages of a gang of cutters to complete the operation at a satisfactory rate of production. ¶ Mention of a gang of cutters suggests a horizontal miller, but this part would be too tall and require too much fixture if located on its end. On its side, it must be milled on a vertical machine, but the verticals also present an obstacle . . . they lack the arbor supporting elements furnished with horizontal millers. Nevertheless, the job was tooled up by CINCINNATI Service Engineers in the most rigid manner possible . . . *on a vertical machine equipped with specially designed cutters and a special outboard arbor support.* With this type of tooling, the machine — CINCINNATI No. 3 Vertical Dial Type — takes the cut in its stride. Square gibbing for the vertical head, with full length single lever clamping contributes greatly to the rigidity required for such heavy cuts. ¶ This is typical of the wide variety of parts which can be handled efficiently on CINCINNATI Dial Types. These machines are essential equipment for your general milling work, and you may be sure they will give dependable service over a long period of time.

CINCINNATI Dial Types are made in Plain, Universal and Vertical styles, Nos. 2, 3 and 4 sizes, medium and high speed ranges. Look in Sweet's Catalog File for illustrations and brief descriptions of the CINCINNATI Line.

Navy E awarded March 6, 1942. Renewal star awarded August 29, 1942, along with Army-Navy E. The second star was awarded February 23, 1943, and the third star September 27, 1943.

THE CINCINNATI

MILLING MACHINES

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

CONTROLLED MATERIALS: Two changes in the designation of controlled materials have been announced. They are: Aluminum slugs become controlled materials; powders made from copper or copper-base alloys, which were classified as controlled materials under CMP during the fourth quarter of 1943, are not controlled materials as of Jan. 1, 1944.

Designation of aluminum slugs as controlled materials permits the allotment of this form of aluminum for the manufacture of collapsible tubes, which may be made under the terms of order M-1-i. This is significant to manufacturers of household and domestic products.

During the first quarter of 1944, producers of copper or copper-base alloy powders may make deliveries of them either on (1) authorized controlled materials orders or (2) on orders placed by customers who have been authorized on form WPB-2959 to receive such powders. However, beginning with the second quarter of 1944, producers of such powders may make deliveries on orders placed pursuant to this authorization form only. Both applications by (1) producers of copper and copper-base alloy powders for materials from which to make them and (2) users of such powders for permission to purchase them, regardless of whether the powders are metallurgical or flake, must be filed on form WPB-2959.

In any case where a user of such powder who has already received an allotment of copper or copper-base alloy foundry products elects to file an application for the first quarter of 1944 on form WPB-2959 for powders, the amount of such powders that he is authorized to purchase shall be limited by the form, regardless of the amount allotted to him. However, users of powders may elect either to (1) file the form or (2) use their allotments during the first quarter.

BOILERS: Without specific authorization of WPB, no manufacturer is permitted to begin construction of certain types of stationary boilers, boiler units or auxiliaries, if he has reason to believe the product will be held in stock by a wholesaler, dealer or other person rather than shipped directly for installation. The following items are covered: Water-tube steam boilers having 500 or more square feet of boiler heating surface, designed to withstand a safe working pressure in excess of 15 pounds per square inch; fire-tube steam boilers for waste heat service, dowtherm vapor boilers, mercury vapor boilers, and electric boilers; fire-tube steam boilers not included above, which are designed to withstand a safe working pressure in excess of 15 pounds per square inch; superheaters, desuperheaters, economizers, airheaters, water walls and water-cooled furnaces. (M-293)

WATER WELLS: All materials needed for water wells now may be obtained under order P-148, governing materials for rural and suburban wells, or by filing form WPB-617 (formerly PD-200) or other appropriate construction forms for other than rural and suburban wells.

INTERCOMMUNICATING SYSTEMS: Blanket MRO ratings may be used now to add stations to an existing wire intercommunicating system to bring it to its designed capacity. Signal and alarm equipment generally is installed without a specific margin of unused designed capacity and, therefore, no additions or extensions by use of blanket MRO ratings are permitted. These ratings may be used to get parts and materials for repair and maintenance of existing equipment.

L ORDERS

TRUCKS AND TRUCK TRAILERS: Production of trucks, truck trailers and other vehicles is prohibited unless specifically authorized by WPB. Authorizations have been established for 1944 providing for more than 1,000,000 trucks and trailers for military and civilian use. Production and shipment of these vehicles must be made without regard to preference ratings or directions of any governmental agency other than WPB. WPB will issue specific directions to suppliers of components which will fit the timing of their production into the schedules for the end products. The components covered at present are: Axles, clutches, brakes, propeller shafts, rims, transfer cases, transmissions and wheels.

No producer or supplier will be permitted, except when authorized by WPB, to accept an order for any product, the production of which will delay or interfere with his "frozen" schedule under the order, nor may any producer or supplier place an order with another supplier for a total quantity of any component in excess of his actual requirements.

A preference rating of AA-1 has been assigned to producers of motor trucks and truck trailers and suppliers of components for material entering into the production of these items. All vehicles produced under the terms of the order, except those on orders for the Army or Navy, will be held upon completion to the rationing procedures of order M-100.

Order L-1-g, which had prohibited the production of truck trailers after June 30, 1943, except for the war agencies and as specifically authorized by the director general for operations, has been revoked. (L-1-e,—g)

GALVANIZED PRODUCTS: Each manufacturer of galvanized pails and buckets, wash tubs, wash boilers, funnels, fire shovels, and storage cans for petroleum products has been granted for the first quarter of 1944 a supplementary quota of iron and steel, which brings his total permitted rate of usage to 92½ per cent of the average quarterly usage in the year ended June 30, 1941. Whether production actually will reach the permitted rate, however, will depend upon the availability of raw materials. The previous first-quarter quota permitted use of iron and steel for these items at the rate of 50 per cent of the amount used in the base period. (L-30-a)

ENAMELED WARE: Manufacturers of household, cooking and hospital enameled ware are permitted to make three items in addition to those they have been making. Separate quotas also have been set up for the use of iron and steel to fill civilian orders for enameled ware and to fill military and export orders for enameled ware and to fill military and export orders. In making the permitted articles for civilian use, each manufacturer may use 70 per cent as much iron and steel as he used in the year ending June 30, 1941. The number of roasters produced by a manufacturer may not exceed 15 per cent of the number he produced in the base period.

As an alternate to the present general rule, a manufacturer may choose to use iron and steel for hospital ware at the rate of 100 per cent of his rate of usage in the base period, if he reduces his production of household and cooking ware to 60 per cent.

For military and export orders, each manufacturer may use a maximum of 55 per cent of the total amount of iron and steel that he used in the base period. All restrictions on specifications have been removed for all orders placed by the Army, Navy, Maritime Commission or War Shipping Administration. Manufacturers' reports on production, shipments, and inventories are now required to be made quarterly instead of monthly. The simplified list of hospital items permitted to be made, which formerly appeared as schedule 1 of L-214, has been incorporated into table A of L-30-b, and the former schedule simultaneously revoked. (L-30-b, 214)

CONSTRUCTION: Extensions of public sewerage systems costing less than $5,000 may now be made to building projects authorized under L-41 with a minimum of preliminary paper work. Sewerage systems may be connected with approved projects now upon certification by the system operator, delivered to the builder, for attachment to the latter's application for approval to begin construction. A preference rating of AA-3 and an abbreviated CMP allotment symbol are assigned to orders for materials required by an operator to install extensions. (L-41, P-141)

GLASS CONTAINERS AND CLOSURES: A new glass container limitation order, L-103-b, has been issued which incorporates the metal closure limitation order M-104, now revoked. Subject to specific exceptions, it lists the only products that may be packed in glass containers and with metal closures, and the closure materials that may be used in each case. Quotas permit the use of metal closures on glass containers for certain cosmetic preparations in the ratio of 50 to 85 per cent of the glass containers allowed for 1944. A quota of metal closures for coffee containers has been established at 50 per cent of the glass containers allowed for 1944. Glass container use for home canning remains unlimited, as do metal closures therefor. The manufacture of zinc mason closures of 70 mm or over is now allowed at 60 per cent of the 1941 production, and certain top seal metal lids larger than 70 mm may be made to the extent of 6 per cent of production in the base period. The manufacture of other home canning closures is unlimited. (L-103-b, M-104)

WHEELBARROWS: Two types of wheelbarrows for use in coal delivery and coke handling have been added to the types that may be manufactured. Action was taken by an amended version of schedule VII to the hand tools simplification order. (L-157)

RINGS AND BINDER PARTS: Use of metal in the manufacture of rings and binder parts for loose-leaf and blank books or covers has been increased for 1944 from 30 per cent to 75 per cent of 1941 usage. Amount of metal that may be issued to any manufacturer in each quarter of 1944 is 18.75 per cent of the iron and steel fabricated by him into metal parts and units in 1941. It is estimated that the allotments in the first quarter of 1944 will approximate 1100 tons of iron and steel and that in subsequent quarters 1600 tons will be allotted, whereas usage last quarter was less than 650 tons. (L-188)

VALVE PARTS: Manufacturers have been granted permission to use either brass or bronze in making nuts for several categories of valves. This permission was granted in specifications for nuts for packing gland flange bolts or studs in manufacturing iron gate valves and iron globe and angle valves. Previously, only carbon steel was permitted for these purposes.

Use of brass or bronze also is allowed in the

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manufacture of nuts for attaching the swing check disc to a hinge or arm of an iron check valve. Previously, only carbon steel or malleable iron was permitted for this purpose. (L-252)

CANNING MACHINERY: Unit quota regulations covering the manufacture of canning machinery and equipment have been changed from specific numbers of each piece of machinery to an overall tonnage basis. Manufacturers now may use up to 110 per cent of controlled materials in the fabrication of canning machinery and equipment as they used during their base period. Dehydrators have been excepted from the order (because of a lack of proper base period) and can be built only on approved orders and through special application forms. (L-292)

M ORDERS

COLLAPSIBLE METAL TUBES: Consumers of products packed in collapsible metal tubes will not be required after March 1 to turn in a used tube when purchasing a new one. Packing quotas for 1944 have been established at unchanged levels, except that the quota of tooth paste tubes is 75 per cent of the product (by weight) packed in 1941 rather than that packed in 1942, as provided last year. Use of aluminum now is permitted in tubes for which tin or a tin-lead combination is now permitted. (M-115)

BERYLLIUM SCRAP: Beryllium Corp. of Pennsylvania has been added to the list of approved smelters, thereby permitting it to buy beryllium-copper scrap without specific approval of WPB. (M-160-a)

METAL STRAPPING: Appeals from restrictions on metal strapping for shipping containers now may be filed in regional field offices of WPB and they may be made in the form of letters, filed in triplicate and explaining fully the grounds for appeal. (M-261)

PRICE REGULATIONS

SCRAP MATERIALS: Sales and deliveries of scrap metals (including iron and steel scrap) by the War and Navy departments and the Procurement Division of the Treasury Department to dealers purchasing for resale will be exempt from specific price control when the dealer certifies that he is purchasing for resale and that in reselling he will not exceed the applicable maximum prices. (Supp. Order 82)

REFRACTORY PRODUCTS: A specific pricing method has been established for certain essential refractory products. Items affected include fireclay, super-duty fireclay, high alumina, silica, and insulating refractory shapes. Manufacturers may determine maximum prices by use of the formula or method of calculation used in March, 1942, and by employing the same cost factors and margin of return that were in effect during that period. Manufacturers also will extend the same price differentials, discounts or other allowances that were established and in use during March, 1942. (No. 188)

Maverick Named WPB Vice Chairman To Head SWPC

Maury Maverick of San Antonio, Tex., has been appointed vice chairman of the War Production Board in charge of Smaller War Plants Corp. and a member of the board of SWPC. He has been associated with various war agencies since August, 1941, when he entered the Office of Price Administration and Civilian Supply, handling price and civilian supply problems for the United States territories.

He transferred later to the Office of Production Management to handle priorities for cities, towns, counties and states; then he served as chief of the Government Division, WPB, which he helped organize.

Restrictions Removed on Sale and Use of Hard-Facing Materials

Action is effected by revocation of limitation order L-223 and reflects current satisfactory supply-demand situation of cobalt, chromium, tungsten, nickel, molybdenum, vanadium. . . Prewar standard steel may be used for automotive valves

RESTRICTIONS have been removed by the War Production Board on the distribution, sale and use of hard-facing materials, as well as those on the use of chromium and nickel in automotive valves for civilian use.

Hard-facing materials are alloys containing chromium, nickel, cobalt, tungsten, molybdenum, vanadium or secondary aluminum. Restrictions on the delivery and sale of tungsten, vanadium, molybdenum and cobalt were removed recently, although allocation was continued for a few minor uses. Production and importation of these materials now exceed the amount used.

A year's experience with the hard-facing industry under L-223 seems to indicate clearly, WPB said, that the level of demand for these alloys is definitely limited. Actual usage figures taken from the hard-facing industry's report forms show an average monthly consumption of alloying elements for the production of hard-facing materials during the life of order L-223 approximately as follows in pounds and percentage of the present total available monthly supply of the particular material: Cobalt, 65,000 pounds, 16.3 per cent; chromium, 75,000 pounds, 0.35 per cent; tungsten, 26,000 pounds, 1.7 per cent; nickel, 29,000 pounds, 0.17 per cent; molybdenum, 3000 pounds, 0.06 per cent; vanadium, 50 pounds, 0.015 per cent; secondary aluminum, 110,000 pounds, 0.06 per cent.

Thus, it is evident that the amounts of alloys required for hard-facing materials, with the exception of cobalt, are insignificant under present supply volume. The cobalt supply-demand situation has been easy for some months and there seems to be no reason to believe that the supply will not be ample for future requirements, WPB officials said.

Automotive intake and exhaust valves for civilian use may be manufactured now with the prewar quantity of chromium and nickel, placing them on the same footing as the Army, Navy, Maritime Commission and War Shipping Administration, which have been exempt from the provisions of order L-128.

Prewar standard steel for valves contains an average quantity of chromium and nickel approximately as follows: Intake valves (passenger cars), chromium, 1.5 per cent and nickel, 1.5 per cent; exhaust valves (passenger cars), chromium, 19 per cent and nickel, 5 per cent; exhaust valves (trucks), chromium, 19 per cent and nickel, 10 per cent.

STEEL Index Ready

The index to Volume 113, STEEL, *for the last six months of* 1943, *is ready for distribution. Copies will be sent to all subscribers requesting them.*

Preference Ratings for MRO Supplies Modified by WPB

Preference ratings available to various industries for maintenance, repair and operating supplies (MRO) have been adjusted to reflect a revised pattern of relative urgency, the War Production Board announced last week.

The ratings have been adjusted by means of changes in the lists of CMP regulation No. 5. These industries which are included in list I are eligible to use an AA-1 preference rating, and those in list II an AA-2 preference rating to obtain MRO items.

The changes which are made by amendment No. 3 to CMP regulation No. 5, as amended Sept. 13, 1943, are as follows:

1. Batteries, dry cells have been moved from list II to list I, thereby making the AA-1 preference rating available to manufacturers of these products.

2. Lighting equipment and accessories for aircraft, airport and marine purposes have been moved from list II to list I, permitting manufacturers of such items to use the AA-1 preference rating. At the same time, a new listing has been included for lighting equipment and accessories other than aircraft, airport and marine, which permits the manufacturers of these products to use the AA-2 rating.

3. Use of the AA-1 rating has been limited to manufacturers of searchlights and flood lights, thus making manufacturers of spot lights and parts ineligible to use it. Formerly, manufacturers of all these products were eligible to use the AA-1 rating.

4. Public warehouses eligible to use the AA-2 preference rating have been limited to dry and open storage warehouses.

5. Refrigerated warehouses of perishable food products have been made eligible to use the AA-1 preference rating, by being included in list I.

There's still a big job for all of us to do

NOTHING MATTERS NOW except the swift and certain winning of the war.

Through the prodigious production accomplishments of American industry, our men and our Allies have been able to swing the initiative in fighting to our side.

To keep it...to continue a steady march on the bloody road to victory... we've got to give our men in the thick of the fight everything they'll need. And give it to them faster and faster!

For you and for us there's *still* a big job to be done. The history of the amazing production performance of American industry is *still* to be written.

Every single man-hour, every bit of brain power, every ounce of industrial energy expended for any purpose other than victory will damage the war effort.

The entire production of Hyatt Roller Bearings now goes into planes our men fly... into tanks they drive... into ships they sail... into guns they man... into equipment they need to win.

In the midst of pouring out a tremendous stream of bearings for this vital war use, we pause to again thank industry for its grand cooperation and understanding, and for helping us meet war's demands for super-precision production on a mass scale.

As soon as the war's won, and this job is done, Industry and Hyatt will have another big job to do together... when we can work in Peace.

Hyatt Bearings Division, General Motors Corporation, Harrison, N. J.

DIVISION OF

HYATT BEARINGS  **GENERAL MOTORS**

Nash-Kelvinator plants prepared to switch from war to peacetime production. Expectations are for manufacture of 1,000,000 refrigerators and a substantial increase in automobile output in first year after war ends

NASH-KELVINATOR plants, in Wisconsin and Michigan, now running full tilt on war production, are ready for the peacetime switch whenever it may come, George W. Mason, president, told a press group gathered at the Nash Kenosha, Wis., plant recently. The plans have been drawn, the schedules laid out, machinery and materials requirements listed, all details completed except for placing orders. Expectations are for production of 1,000,000 refrigerator units in the first year after the barriers are down, and for a "substantial" increase in output of passenger cars.

Mr. Mason did not elaborate on what he meant by substantial, but Nash production in 1940 was 62,131, and in 1941 increased to 85,054, so perhaps a good guess for the first forthcoming production year might be 125,000.

Inspection of the Kenosha plant indicates a fairly complete conversion of former automotive facilities to the present Pratt & Whitney aircraft engine job, the magnitude of which is surprising to anyone seeing it for the first time. Practically all automotive departments have been rearranged and re-equipped, and a new engine assembly building and test cells erected. The former gray iron foundry has been converted to production of aluminum cylinder heads, but this has been effected with a minimum of disturbance to earlier facilities so that resumption of gray iron production could be accomplished without too much trouble. The steel forge shop could be transferred to automotive work with practically no delay. Machining departments would take a little more time to rearrange.

The 2000-horsepower 18-cylinder engine, with two-speed two-stage supercharger, is being built for the Navy for use in Vought Corsair and Grumman Hellcat shipboard fighter planes. This suggests that a conclusion of European hostilities would not necessarily release much of the Nash plant space, since Navy orders might continue uninterrupted. Conceivably this could prove troublesome in any proposed reconversion, but it may well be that when such time comes enough engines will have been built for any possible emergency. Navy requirements in the future, and replacements can be supplied by Pratt & Whitney's own plants.

Production of these $20,000 engines already totals well into the thousands, and monthly schedules at Nash are being stepped up another 30 per cent. The aluminum foundry, for example, is aiming at output of 28,000 heads a month, including spares which run to appreciable quantities. Conversion of the foundry began just short of a year ago, and first castings were poured last May. Now it is operating close to 20,000 heads a month.

While both foundry and forge shop can be switched back readily to automotive operations, they are old structures, and Nash might be better off eventually to tear them down and erect new and larger plants for this work in the interests of handling enlarged production and improving working conditions.

New Techniques in Practice

In machining departments a number of relatively new techniques are in practice. One is thread rolling of crankcase studs as against the former method of grinding these threads. Production is stepped up astronomically by thread rolling, better accuracy is possible, along with less difficulty in driving the studs in the aluminum crankcases. New grinding setups include a polishing unit using a rubber-bonded wheel of extremely fine grit, removing only about 0.0002-inch of stock, and permitting appreciable reduction in the amount of grinding time formerly required on the steel part. Another innovation is wet tumbling of small parts with granite stones and soap to remove burrs and sharp corners.

Interesting method of assembling intake and exhaust steel bushings in the aluminum cylinder has been developed. The bushings are both threaded and shrinkfitted into the heads, but in shrink fitting are immersed in liquid air while the heads are heated before assembly. About the only possible way a fit like that could be wrenched apart is by dynamiting.

All magnesium machining operations are now in process of being transferred to a separate department where extra precautions will be taken to avoid combustion hazards. Magnesium castings are somewhat of a production headache, according to Nash engineers, rejections due to internal porosity running high (on some castings 20 per cent), ship disposal being complicated, fires fairly frequent, costs high. For example, one casting for a supercharger housing weighing 100 pounds was reported to cost in the rough $503. There is some feeling that aluminum might be substituted with considerable saving in cost and, by lightening sections, at small sacrifice in weight.

A few small gears are now being finished by shaving instead of grinding and the process appears favorable for further extension. One engine is now being type tested with shotblasted connecting rods and this peening treatment, about which so much has been written in recent

SHARING "KNOW-HOW": Battle-toughened Chinese army officers are working in U. S. automotive plants to learn construction, maintenance, and operation of military vehicles. Here Charles Strombeck, mechanic in Studebaker truck plant at South Bend, Ind., explains inspection of a crankshaft to Capt. Wan-chun Hsu, familiarly known as "Ben" to his American associates

months, also seems promising at Nash.

Most of the Nash production men are old-line automotive experts and, as is common to their breed, they shake their heads in wonderment at the "microfinishes" required on aircraft engine parts. "Maybe it is necessary," they conclude, "but we would go broke in a week if we tried anything like that on automobile engines."

Employment at the Kenosha plant, largest of the Nash operations, is roughly 2½ times the 3500 level of automotive days. There are many women, but the proportion is not unusually high. Considerable retrenchment doubtless will be called for in any reconversion. In view of the previously mentioned 30 per cent boost in engine schedules, and also the fact 11 new engine test cells are being added to the 21 now in operation, additional increases in employment might be looked for. Some of the Nash people, however, have their fingers crossed after noting the countrywide shaving of military production schedules.

A "high automotive source" disclosed for the benefit of the three local newspapers the other day his opinion that government authorizations to build some passenger cars this year might be forthcoming. He did not permit his name to be used, but he can be identified as not being associated with any of the big three companies. His reasoning was tied in with the functioning of the Controlled Materials Plan which requires commitments for materials some months in advance of their use date.

Parts Producers Very Active

So far no reports are heard of motor companies attempting to cover materials requirements, although this may prove to be even more important than ordering key machinery replacements. Machine tool builders are now in a relatively slack period, in contrast to materials and parts sources which are still fairly well occupied with war production schedules.

A local parts supplier last week received information from his plant headquarters that already requests have arrived from certain manufacturers for quantities of parts to be used in peacetime production still to be authorized, and suggesting the motor companies be canvassed for tentative commitments.

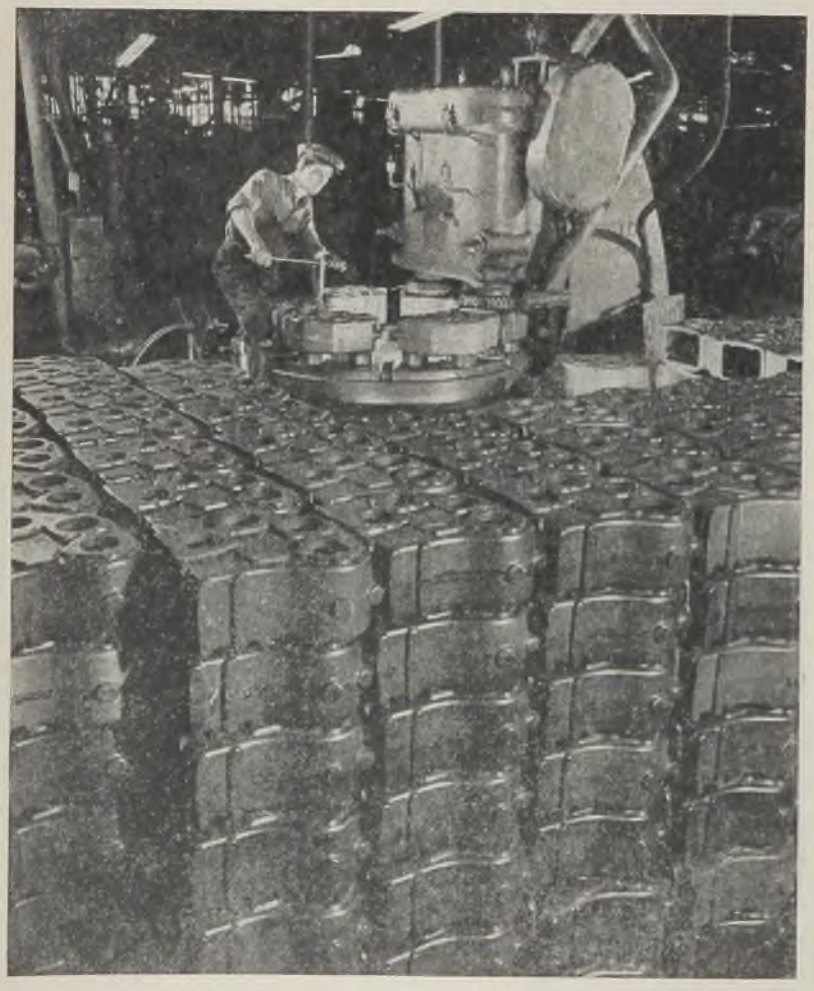
United States Rubber Co. reports it is spending $25,000,000 this year to increase the output of its tire plants to cover military requirements and what essential civilian requirements can be squeezed on top of them. When the expansion program is completed in the latter part of the year, U. S. Rubber will produce 30 per cent more tires, in point of tonnage, than at any previous time in its history. Plants involved in the program are at Chicopee Falls, Mass., Detroit, Eau Claire, Wis., Indianapolis, and Los Angeles. Major portion of the investment will be used to reconvert the Eau Claire ordnance plant from ammunition to tire production.

F. L. Jacobs Co. here recently announced acquisition, for cash, of Continental Die Casting Co., managed by C. M. Sorenson, son of Ford Motor Co.'s C. E. Sorenson. No change in management is contemplated, but the purchase will provide Jacobs with a manufacturing source for automotive hardware to supplement its own facilities formerly producing seat parts, instrument panels, glass channels, etc. The company also is experimenting with new engine designs as mentioned here recently. Jacobs' principal war job has been the fabrication of bogie wheels for tanks.

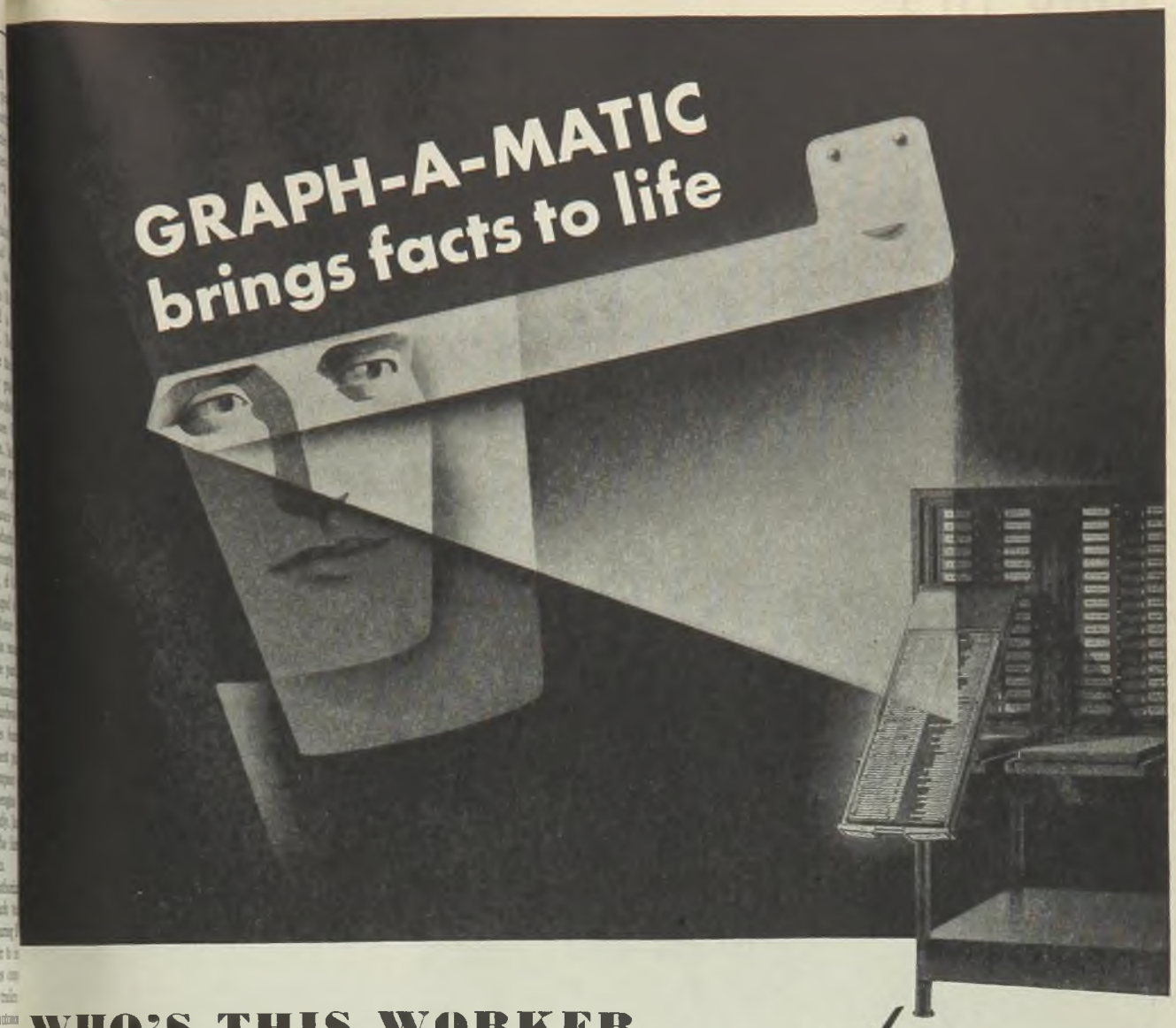
In connection with the authorization of 1,000,000 trucks and truck trailers for military and civilian use during 1944, it is pointed out that in order to insure production on time of various components going into trucks and trailers, as well as other products using automotive-type components, the manifesto provides for the WPB, as necessity arises, to issue specific directions to suppliers of components which will fit the timing of their production into the schedules for the end products. Components covered by the order are axles, clutches, brakes, propeller shafts, rims, transfer cases, transmissions and wheels.

Before directions are issued to suppliers of components, a thorough consultation will be made with them to ascertain the effect of the proposed production upon other important programs.

Much of the work in preparing component schedules will be done at the Tank-Automotive Center here in Detroit, although last week this agency was reported to have been dissolved and renamed Office of the Chief of Ordnance, Detroit. Actual schedules for components will be issued from the Automotive Division of WPB in Washington. The order assigns a preference rating of AA-1 to producers of motor trucks and truck trailers and suppliers of components or material entering into production of these items. The order is designated as Limitation Order L-1-E. Order L-1-G, prohibiting the production of truck trailers after June 30, 1943, except for the war agencies, has been revoked.



MILLING TRANSFER CASES: Both faces of cast transfer cases are rough and finish milled at Chevrolet's Toledo plant, using rotary-table machine equipped with both types of cutters. Toledo unit was a principal source of Chevrolet passenger car and truck gears and transmissions prior to opening of company's Muncie, Ind., transmission plant several years ago



WHO'S THIS WORKER offering you *balanced* production?

Industry today faces the urgent need of preparing for contract renegotiation or termination . . . of establishing inventory accountability in accordance with authorized production schedules . . . of avoiding potentially useless inventories of raw materials and work in process.

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This is the function of the Graph-A-Matic signalling method, an exclusive feature of the Kardex System of Visible Control. Graph-A-Matic makes recorded facts *chart themselves.* Whether they concern materials, men or machines, it presents them in a *graphic* form that enables executives to analyze and plan with speed and accuracy. And with operating savings as high as 50 per cent!

WE INVITE YOU to inspect the methods of administrative control now used by the management of 136 of the nation's foremost businesses. These are illustrated in the new 74-page brochure "Graph-A-Matic Management Control". Due to the nature of its contents and the many months of careful preparation entailed, we can offer this brochure only to responsible executives.

A wire, letter or phone call to our nearest Branch Office will bring "Graph-A-Matic Management Control" to your desk. One of our Systems and Methods Technicians whose work it represents will gladly discuss the application of these methods to your business.

SYSTEMS DIVISION

REMINGTON RAND

BUFFALO 3, NEW YORK

Boeing's paint shop turns out 30,000 jobs a shift. Resembles combination soda fountain, assembly line and laboratory. Infra-red drying lamps speed work. . . Navy's new dive bomber proves effective against Japanese at Rabaul

PAINT shop at the Renton, Wash., plant of the Boeing Aircraft Co. looks like a combination soda fountain, moving assembly line and science laboratory; it turns out 30,000 paint jobs per shift.

Three features are new to the aircraft industry: (1) Paints are piped to various conveniently located spots where they are available like refreshments at a "thirst emporium". The workman plugs in a hose and after turning the tap any one of five colors of paint gushes out ready for use. (2) Bomber parts move along a steel conveyor belt, more than 100 yards in length and as they pass, painters spray them. (3) By means of infra-red lamps, the parts are dried from the inside out.

The paint shop is divided into three sections: First, the spray painting department; second, the camouflage building, a unit reserved for finished planes, and third, a plating department.

At the time the 352-foot steel conveyor belt was installed in the spray painting unit it was claimed to be longer than any other similar belt anywhere. In an 8-hour shift it has often transferred more than 30,000 average-size plane parts. As the belt moves at even speed, painters are stationed at special points and they spray color on two sides of each part.

Painted parts pass under a bank of infra-red lights, 14 feet in length, then under two cooling fans. The next operation is done by workmen stationed alongside the conveyor, who turn the parts over exposing the unpainted areas. After this all the processes are repeated as the steel belt completes its circuit. As it moves along, the belt passes through a hot caustic solution which cleans and dries it for the next trip.

Paint is stocked in nine 75-gallon automatic mixing tanks which blend five different colors and supply the feeder system. Running under ground into the paint shop are five pipelines, each 450 feet in length. The paint makes the complete circuit back to the mixing tanks, tap valves being placed at strategic points.

Ample provision is made for insuring fresh air in the paint shop, fans exhausting 125,000 cubic feet of air per minute, while other fans supply conditioned fresh air.

The camouflage building contains three 45-foot water-wash spray booths and a complement of exhaust fans.

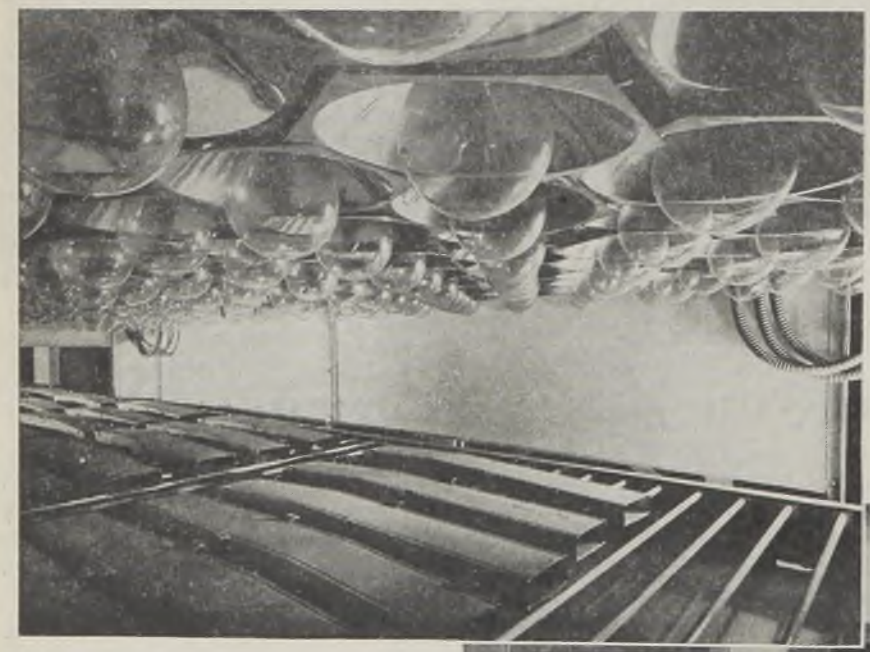
A feature of the plating shop is the equipment for hard chrome plating of router bits, saws and files to extend their service life up to ten times. It is possible thus to build up armature shafts and even bearing bolts to within a tolerance of 0.0001-inch. The plating process requires 17 tanks with a total capacity of more than 11,000 gallons.

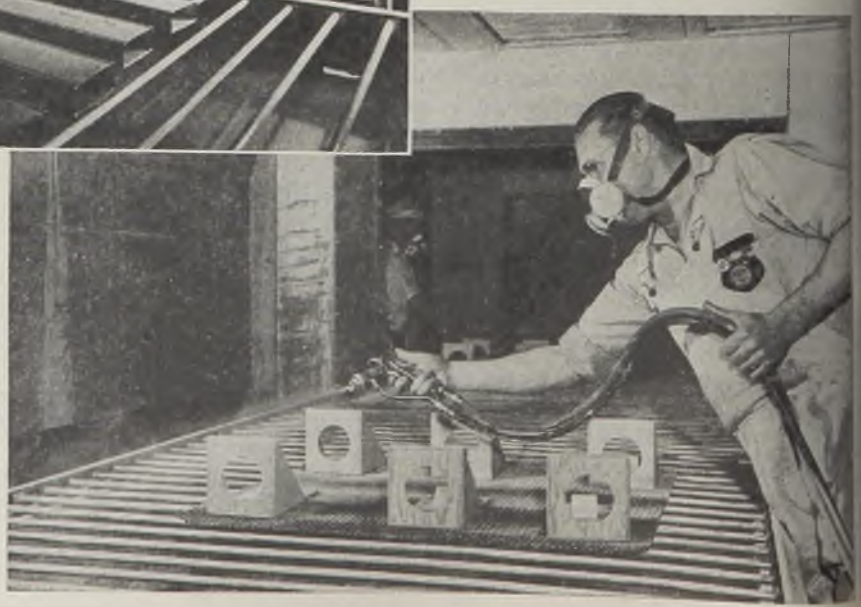
Jet Propulsion Features New Fighter Plane

Fragmentary details announced jointly by United States and British air forces concerning a new fighter plane powered by jet propulsion are so inconclusive as to be almost meaningless. Test flown in Britain for several months, the plane has been dubbed "the squirt" by those who have seen and heard it whistling over their heads. It is said to be propellerless, with twin engines and capable of extremely high speeds.

Army and navy air arms will buy unspecified quantities, with Bell Aircraft apparently scheduled to produce them. Little of a definite character is known about the type of engine used in such a craft, except that General Electric is supposed to have received one of the power plants some time ago and to have duplicated it for quantity production.

Jet propulsion has been in the experimental stage for a number of years, the only instances of actual use being an Italian military plane powered exclu-





Painted ducts, on conveyor line, above, pass under battery of infra-red drying lamps in mirrored reflectors in paint shop at Boeing Aircraft Co., Renton, Wash., plant

Right, parts on moving conveyor belt pass spray painters working in water-wash booths

OOLS WORK TWO EXTRA SHIFTS PER WEEK

SUNOCO
EMULSIFYING CUTTING OIL

increases tool life 35% . . . improves finish . . . at war plant

Machine tool men looking for ways to effect tool economies will find this case history valuable. It's about a plant producing armament parts, and how they increased tool life the equivalent of two extra 8-hour shifts in every 48-hour week.

Production was slowed because of trouble on machines using a competitive soluble cutting oil. Tool casualties ran high, finish of parts was inferior, emulsions showed a tendency toward rancidity.

Trouble stopped when they changed to Sunoco Emulsifying Cutting Oil upon the advice of a Sun Oil Engineer. Tool life increased 35% . . . finish was noticeably finer . . . rancidity stopped. And in addition, cutting oil costs were cut.

Now parts are speeded from the machines of this plant . . . and from hundreds of other plants that have found Sunoco Emulsifying Cutting Oil a spur to machine tool output. Sunoco's exceptional heat-absorbing quality and stability make it the answer for all metal cutting operations where a soluble oil is used.

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sively by the method, and certain German fighters which carry rockets under their wings to assist a speedy takeoff. The Italian design carried the "jet" at the extreme end of the tail, a small cone protruding from the center of the jet opening which was probably about 3 feet in diameter. Otherwise the craft was of conventional low-wing monoplane design. Nose and forward portion of the fuselage, in which the power generating system was enclosed, were somewhat longer than ordinary propeller-type planes. Nothing has been heard of this development since its first appearance, indicating that it probably never was put into production.

Idea back of jet propulsion is to step up speed, engineers figuring they have just about reached the limit with the best engines and propellers available.

New Navy Dive Bomber Makes Debut at Rabaul

New Curtiss (SB2C-1) Helldiver dive bomber made its debut in a destructive raid on the great Japanese stronghold at Rabaul. Navy announcement of the raid marks the first official disclosure that this new warplane—which carries a greater bomb load faster and farther than any similar type in the world—is now in action with the American battle fleets.

A squadron of Helldiver dive bombers is credited with sinking a cruiser and a destroyer, probably sinking another cruiser, heavily damaging another cruiser and probably damaging a second destroyer. The attack on Rabaul—a powerful Jap stronghold second only to Truk in the Pacific—marked part of the current American offensive directed at that base.

Designed by Curtiss-Wright engineers in response to the Navy's demand for a super dive bomber, the Helldiver was described by G. W. Vaughan, Curtiss-Wright president, as being a two-place, all-metal, low-mid-wing monoplane "plus a lot of striking power." It is powered with a high-output Wright Cyclone engine and equipped with a three-bladed Curtiss electric "full feathering" propeller.

The initial design of the new Helldiver was completed just before the Japanese attacked Pearl Harbor. As a result of combat experience, the Navy suggested changes to make it a greater fighting machine. Curtiss engineers completely redesigned combat equipment and combat loading features; 150 pounds of armor plate were added behind the pilot and around the gunner; self-sealing fuel tanks and protected fuel and oil lines were installed. Meanwhile, the new design was scheduled for production in a new Curtiss-Wright plant at Columbus, O.

Radio equipment was changed numerous times. The flap mechanism was completely redesigned to enable a pilot to open or close the flaps on the newest Helldiver three times faster than on the early experimental type; a tremendous advantage in the split-second timing of combat flying. Other major changes of a restricted nature were made.

The Helldiver is designed for rapid production. Aside from being in production at the corporation's Columbus plant, they are also being built in the Canadian plants of Canadian Car & Foundry Co. Ltd., and Fairchild Aircraft Ltd.

Curtiss engineers introduced a startling innovation in dive bomber design by housing the bomb load entirely within the belly of the fuselage, thereby making the lines of the fuselage bottom as aerodynamically clean as possible.

COMBAT DEBUT: Navy's new dive bombers, the Curtiss Helldiver, shown "on the line" here, recently made their combat debut in blasting Japanese shipping at Rabaul. The Helldiver is said by the Navy to be bigger and heavier than any dive bomber previously used by United States armed forces

New Troop-Carrying Glider Flight Tested at Dearborn

Test flight of the new CG-13 troop carrying glider was made recently at the Ford airport in Dearborn, Mich. A larger edition of the successful CG-4A, 15-passenger model now in quantity production at the Iron Mountain, Mich., plant of Ford Motor Co., the CG-13 wes designed by the Waco Aircraft Co. to fill a need for gliders capable of carrying larger combat units.

The new glider, an experimental model, is a high-wing monoplane, with plywood wings, of stressed skin design, externally braced. The fuselage is a framework of welded steel tubing covered with fabric. It is the first the Ford company will build for the Army Air Forces under the terms of a contract signed June 15, 1943.

Construction of the smaller glider will continue on a quantity basis at Iron Mountain in what may prove to be the nation's largest glider manufacturing plant, and this program will run concurrently with construction of the CG-13 models.

The first CG-13 was built at the Ford engineering laboratories to enable company engineers to make minor changes, cross-check engineering data and adapt it to Ford production methods before release to the plant at Iron Mountain where the remaining gliders will be built. Upon completion, the gliders will be trucked to Ford airport in Dearborn, re-assembled and towed to their destination by Army Ferry Command towplanes.

Although the new glider is only slightly larger than the CG-4A it is equipped with landing flaps to facilitate take-off and reduce landing speed, and a special nose section that permits rapid loading and unloading.

The smaller gliders are equipped with benches attached to the sides of the fuselage, while the new model is provided with individual folding chairs. In addition to pilot and co-pilot, there is room for approximately 30 fully equipped soldiers. There is ample clearance for two jeeps, or a howitzer and one jeep complete with crews and ammunition.

The CG-13 is equipped with regular flight instruments and radio, and is provided with two landing gears—a conventional wheel gear with hydraulic brakes, which can be dropped when desired, and a pair of fixed skids for use where landing area is limited.

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MEN of INDUSTRY

B. C. GOULD

ALFRED W. GREGG

RALPH H. HEBERLING

B. C. Gould, operations manager of Murray Corp. of America, Detroit, since June, 1942, has been elected vice president in charge of operations and a member of the board.

—o—

Alfred W. Gregg, executive engineer of the Equipment division, Whiting Corp., Harvey, Ill., has been appointed to supervise the new electric furnace department established last December when the Whiting organization acquired the Hydro-Arc Furnace Corp., La Grange, Ill. Mr. Gregg adds the new responsibility to his present duties.

—o—

James N. Morrell has been appointed sales manager, Limitroque Valve Control division, Philadelphia Gear Works Inc., Philadelphia, and **Thomas V. Withington,** former chief engineer, has become assistant sales manager of the division. **William F. Plume** succeeds Mr. Withington as chief engineer, and **Robert E. Richards** becomes assistant chief engineer.

—o—

George H. Sambrook, formerly assistant safety director, H. C. Frick Coke Co. and United States Coal & Coke Co., subsidiaries of United States Steel Corp., Pittsburgh, has been appointed safety director, succeeding **Clyde L. Lutton,** retired.

—o—

Harry H. Chapman, formerly manager of the Minneapolis office, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has been appointed manager of the company's transportation department.

—o—

J. S. Williamson has been appointed vice president in charge of operations, Weirton Steel Co., Weirton, W. Va., succeeding **E. J. Anglin,** who has resigned but continues as general consultant for the company. **C. E. Bayer** succeeds Mr. Williamson as general superintendent, and **E. O. Burgham** has been appointed assistant general superintendent. Other appointments are: **E. W. Rieger,** vice president in charge of engineering and development work; **W. A. Murphy,** vice president and secretary; **J. J. Munns,** vice president in charge of quality control; **P. R. Church,** manager of steel works department; **C. E. Carr,** assistant manager, steel works department; **A. E. Kadell,** manager of Weirton tin mill; **C. M. Eddy,** manager of the Steubenville tin mill; **J. D. Gold,** assistant vice president in charge of quality control, and **S. M. Newbrander,** chief metallurgist.

—o—

Ralph H. Heberling, for the past two years assistant to the president, Edward Valve & Mfg. Co. Inc., East Chicago, Ind., has been appointed vice president. Mr. Heberling continues to supervise all manufacturing activities of the company.

—o—

A. Maxwell Jones, vice president in charge of sales, Buffalo Bolt Co., North Tonawanda, N. Y., has tendered his resignation to the board of directors and soon will announce his future business plans.

—o—

Charles L. Turner has been elected vice president in charge of sales, Buffalo Bolt Co., North Tonawanda, N. Y.

—o—

A. V. Maday and **A. H. Sherman** are retiring from active management of the Gehnrich Corp., Long Island City, N. Y., which has been purchased by W. S. Rockwell Co., New York, and which will be operated as Gehnrich Oven division of W. S. Rockwell Co.

—o—

J. A. Downey, president, Eastern Rolling Mill Co., Baltimore, has been elected board chairman of the company, and **J. E. Weaver,** treasurer, was elected a vice president.

—o—

W. G. Midnight has been appointed manager, Metal & Thermit Corp., East Chicago, Ind., succeeding **Charles Lindmueller,** retired.

—o—

Grover E. LeVeque has been named vice president of Inter-State Iron Co. and Jones & Laughlin Ore Co., subsidiaries of Jones & Laughlin Steel Corp., Pittsburgh. Mr. LeVeque will be in charge of ore mine operations in Minnesota, Michigan and New York, with headquarters in Pittsburgh. **Robert Johnson** succeeds Mr. LeVeque as general superintendent of both companies, making his headquarters in Virginia, Minn., and **Adolph N. Wold** succeeds Mr. Johnson as chief engineer of both companies. **Jesse C. Madson,** superintendent of Jones & Laughlin Ore Co.'s Benson mines, located in St. Lawrence county, N. Y., has been appointed general superintendent of those operations.

—o—

A. L. Grinnell has been appointed special representative on special assignments for Rustless Iron & Steel Corp., Baltimore, and will make his headquarters in Detroit. **H. S. RuDesill** succeeds him as district manager of the Detroit office.

—o—

T. N. Anderson, executive vice president, director and member of the executive committee, American Can Co., New York, has retired.

—o—

Paul D. Mallay has joined the staff of Lukens Steel Co. and subsidiaries, By-Products Steel Corp. and Lukenweld Inc., Coatesville, Pa., as manager of the companies' railroad activities. Previously Mr. Mallay had been railroad representative in the Southeastern territory for Garlock Packing Co., Palmyra, N. Y.

—o—

David P. Finney has been named assistant general superintendent of the Clairton works of Carnegie-Illinois Steel Corp., Pittsburgh, succeeding **Hobart W. Seyler,** recently named general superintendent of the Clairton, Pa., plant. **James McIntosh** succeeds Mr. Finney as division superintendent in charge of coke plant operations at the Clairton works.

—o—

Henry Rowold has been appointed vice president, Mack-International Motor Truck Corp., Long Island City, N. Y.

—o—

Miles K. Smith, assistant director of the Steel Division and chief of the Ferro-

MARVIN G. SEDAM

Who has been appointed director of research, Alloy Rods Co., York, Pa., as announced in STEEL, Jan. 10, p. 66.

Alloys Section, War Production Board, will resign Jan. 19 to return to his position with Latrobe Electric Steel Co., Latrobe, Pa. **E. Franklin Hatch** will succeed Mr. Smith in the WPB posts.

—o—

Daniel C. Mills has been named manager of industrial relations, Bethlehem Steel Co., Bethlehem, Pa., succeeding the late G. W. Vary. **B. O. Bach**, former manager of contracts, fabricated steel construction, has been appointed assistant general sales manager for Bethlehem Steel.

—o—

Adolph Frankel, former staff assistant to the manager of the Lamp division, Westinghouse Electric & Mfg. Co., Bloomfield, N. J., has been appointed manager of the Lamp division's electronic tube sales department.

—o—

Louis M. Edgar has been appointed exclusive sales and engineering representative in Michigan for Kelly Reamer Co., Cleveland.

—o—

Arthur B. Rathbone, a member of the legal and operating departments, Ogle-bay Norton & Co., Cleveland, has been appointed as an alternate industry member of the War Shipping Panel of the National War Labor Board, Washington.

PINKNEY W. LOVE

Who has been named manager of the Washington office, Lukens Steel Co. and subsidiaries, Coatesville, Pa., reported in STEEL, Jan. 10, p. 66.

LEIGHTON M. LONG

Who has been appointed assistant research supervisor, Battelle Memorial Institute, Columbus, O., as announced in STEEL, Dec. 27, p. 56.

—o—

S. O. Bjornberg, consulting engineer, Illinois Tool Works, Chicago, has been appointed a member of the sectional committee on small tools and machine tool elements, American Standards Association, and **Allen N. Candee**, mechanical engineer, Gleason Works, Rochester, N. Y., has been named a member of the association's sectional committee on standardization of gears.

OBITUARIES . . .

Louis Birkenstein, 77, organizer and for many years head of S. Birkenstein & Sons Inc., Chicago, smelter and refiner of ingot metals, died Dec. 27 in that city. He was the father of George U. Birkenstein, who died Jan. 2.

—o—

George U. Birkenstein, 44, president, Anker-Holth Mfg. Co., Chicago and Port Huron, Mich., and head of George Birkenstein & Co., died Jan. 2 in Chicago, following more than a year's illness. Throughout the war Mr. Birkenstein had been active in representing the nonferrous metal trade in negotiations with WPB and OPA and in late 1942 he had conducted a special survey in Washington for the Conservation Division of WPB.

—o—

O. Roy Frankenfield, 60, vice president, Fable & Co. Inc., Philadelphia, died recently in that city.

—o—

Julien L. Eysman, 69, retired vice president and director, Pennsylvania railroad, died Dec. 31 in Philadelphia.

—o—

S. M. Foley, 55, vice president and works manager, Illinois Steel Bridge Co., Jacksonville, Ill., died recently.

—o—

H. F. Crandall, 86, general superintendent, J. I. Case Co., Racine, Wis., from 1905 until his retirement in 1920, died recently in Philadelphia.

—o—

Charles H. Hill, 74, a former designing engineer in the switch gear department of General Electric Co., Schenectady, N. Y., died Jan. 1 in Philadelphia. Mr. Hill was an honorary member of the American Society of Mechanical Engineers.

—o—

John A. McCormick, 78, chairman, Independent Pneumatic Tool Co., and Great Lakes Dredge & Dock Co., both of Chicago, died Dec. 30 in that city.

—o—

David W. Rodger, 50, vice president and secretary, Federal-Mogul Corp., Detroit, died Jan. 4. Mr. Rodger recently had been elected a director of the Automotive Council for War Produotion.

JOHN L. KEENAN

John L. Keenan, 54, former general manager of the Tata Iron & Steel Co. of Bombay and Jamshedpur, India, died Jan. 2 in the United States Army hospital at Kunming, China. He was in China on a confidential mission for the State Department. For 25 years Mr. Keenan had participated in the development of the Tata organization, largest steel plant in the British Empire.

—o—

John N. Schilling, 72, owner of John N. Schilling Sheet Metal Co., Coumbus, O., died there recently.

—o—

Frank B. Wallace, 55, a partner in the Wallace Tool & Die Co., Indianapolis, died recently in that city.

—o—

Arthur J. Beurer, 63, retired owner and operator, Broad Gauge Mfg. Co., Memphis, Tenn., died there recently.

—o—

Edward E. Staley, 72, board chairman, Baker Mfg. Co., Springfield, Ill., died there recently.

—o—

Irwin E. Lang, 41, assistant chief engineer, Pioneer Engineering & Mfg. Co., Detroit, died recently in that city.

—o—

Walter L. Hague, 71, who operated Walter E. Hague & Son Inc., Pittsburgh, until his retirement in 1934, died recently in Pittsburgh.

—o—

Walter A. Rogers, 76, founder and chairman, Bates & Rogers Construction Corp., Chicago, died Jan. 3 in Rochester, Minn.

—o—

Garnet W. McKee, 66, president and founder, Eclipse Fuel Engineering Co., Rockford, Ill., died Jan. 3 in Madison, Wis.

—o—

Samuel W. Schaul, founder and president, Spearhead Boiler Plug & Specialty Co., Cleveland, died Jan. 4.

Ingot Output in 1943 Sets New All-time Record

Production, totaling about 89 million tons, was almost three million tons greater than in preceding year

PRODUCTION of steel ingots and castings in 1943 set a new record for the fourth consecutive year, nearly 3,000,000 tons greater than 1942.

Output in 1943 was 88,872,598 net tons, compared with 86,029,921 tons in 1942, according to the American Iron and Steel Institute.

This increase was accomplished in spite of steel mill strikes in December and coal strikes earlier in the year, which caused loss of several hundred thousand tons of steel.

During December steel production fell to 7,265,777 tons, an average of 1,643,841 tons per week. In November, a shorter month, 7,374,447 tons were produced, an average of 1,718,985 tons per week. In December, 1942, production was 7,304,540 tons, a weekly average of 1,652,611 tons per week.

During December the industry operated at an average of 94.3 per cent of capacity, compared with 98.6 per cent in November and 96.6 per cent in December, 1942. The December rate was the lowest for the steel industry since July, 1941.

New Ore System Seen Increasing Iron Output

Colorado Fuel & Iron Corp., Denver, expects to increase pig iron production at its steel mill near Pueblo, Colo., as a result of the installation of a $2,500,000 ore bedding and reclaiming system recently placed in operation.

The new system prepares iron ore of standard size for blast furnaces and utilizes much material that previously was lost because of its low grade. It produces a blend for furnaces that is uniform throughout, both chemically and physically. Colorado Fuel continues to get most of its iron ore from its big mines at Sunrise, Wyo. Previously ore was obtained from an iron mountain near Cedar City, Utah. This ore continues to be received at the Pueblo steel plant.

Inland Steel Co. Sets 200 New Records During 1943

More than 200 new records in ingot production and finished steel shipments were established during 1943 by the Inland Steel Co., Chicago, including a monthly high in the shipment of plates.

Inland produced during 1943 a total of 3,597,975 net tons of ingots, an increase of 170,464 net tons over the 1942 total. In the same period it shipped 2,727,398 net tons of finished steel, 116,674 net tons more than were shipped during 1942.

In December the company set a new all-time monthly high in plate shipments of 91,693 tons. The previous high was 88,958 tons in November.

Colorado Fuel & Iron Corp. Registers Output Marks

Colorado Fuel & Iron Corp., Pueblo, Colo., smashed its production records during December as open-hearth ingots totaled 110,591 tons, compared with 107,529 tons in October, the previous high.

Pig iron production during December reached 66,221 net tons breaking the March record of 66,085 tons. Steel shipments for the corporation's plant in 1943 totaled 895,872 net tons, compared with 845,447 tons in 1942. Output of open-hearth ingots was 1,207,401 tons.

Plate Output in 1943 Established New Record

Steel plate shipments in 1943 rose to an all-time high mark of 13,382,390 net tons, John T. Whiting, director, Steel Division, WPB states. Output in December also established a new monthly record of 1,169,196 tons.

Last year's shipments compare with 11,809,938 tons in 1942, while December, 1943, production was 28,056 tons

U. S. STEEL INGOT STATISTICS

	Estimated Production—All Companies								Calculated weekly	Number
	—Open Hearth—		—Bessemer—		——Electric——		——Total——		produc-	
	Net tons	Per cent of capac.	Net tons	Per cent of capac.	Net tons	Per cent of capac.	Net tons	Per cent of capac.	tion, all companies Net tons	of weeks in mo.
Based on reports by companies which in 1942 made 98.3% of the open hearth, 100% of the bessemer and 87.6% of the electric ingot and steel for castings production										
Jan.	6,576,524	97.8	478,058	85.9	369,395	95.4	7,423,977	96.8	1,675,841	4.43
Feb.	6,031,363	99.3	447,843	89.1	344,532	98.6	6,823,738	98.5	1,705,934	4.00
March	6,787,630	100.9	503,673	90.5	381,219	98.5	7,672,522	100.0	1,731,946	4.43
1st qtr.	19,395,517	99.3	1,429,574	88.4	1,095,146	97.5	21,920,237	98.4	1,704,529	12.86
April	6,510,563	99.9	481,810	89.4	382,532	102.1	7,374,905	99.3	1,719,092	4.29
May	6,669,436	99.1	483,024	86.8	398,057	102.9	7,550,517	98.4	1,704,406	4.43
June	6,202,640	95.2	453,599	84.1	384,645	102.6	7,040,884	94.8	1,641,232	4.29
2nd qtr.	19,382,639	98.1	1,418,433	86.7	1,165,234	102.5	21,966,306	97.5	1,688,417	13.01
1st hlf.	38,778,156	98.7	2,848,007	87.6	2,260,380	100.0	43,886,543	98.0	1,696,426	25.87
July	6,556,531	96.8	466,288	90.6	393,342	94.0	7,416,161	96.3	1,677,864	4.42
Aug.	6,699,850	98.7	484,957	94.0	407,224	97.1	7,592,031	98.3	1,713,777	4.43
Sept.	6,646,702	101.4	480,635	96.4	391,241	96.6	7,518,578	100.8	1,756,677	4.28
3rd qtr.	19,903,083	99.0	1,431,880	93.6	1,191,807	95.9	22,526,770	98.4	1,715,672	13.13
9 mos.	58,681,239	98.8	4,279,887	89.5	3,452,187	98.5	66,413,313	98.1	1,702,905	39.00
Oct.	6,891,753	101.6	513,521	99.5	413,787	98.7	7,819,061	101.3	1,765,025	4.43
Nov.	6,542,942	99.6	440,941	88.2	390,564	96.2	7,374,447	98.6	1,718,985	4.29
Dec.	6,509,922	96.2	390,930	75.9	364,924	87.2	7,265,777	94.3	1,643,841	4.42
4th qtr.	19,944,618	99.1	1,345,392	87.9	1,169,275	94.0	22,459,285	98.1	1,709,230	13.14
2nd hlf.	39,847,701	99.0	2,777,272	90.8	2,361,082	94.9	44,986,055	98.3	1,712,450	26.27
Total	78,625,857	98.9	5,625,279	89.1	4,621,462	97.4	88,872,598	98.1	1,704,499	52.14
Based on reports by companies which in 1942 made 98.3% of the open hearth, 100% of the bessemer and 87.6% of the electric ingot and steel for castings production										
1942										
Jan.	6,322,215	95.3	490,874	86.0	299,017	94.2	7,112,106	94.5	1,605,442	4.43
Feb.	5,785,918	96.6	453,549	88.0	273,068	95.2	6,512,535	95.9	1,628,134	4.00
March	6,572,930	99.0	493,191	86.4	325,990	102.7	7,392,111	98.2	1,668,648	4.43
1st qtr.	18,681,063	97.0	1,437,614	86.7	898,075	97.4	21,016,752	96.2	1,634,273	12.86
April	6,345,133	98.7	454,834	82.2	321,324	104.5	7,121,291	97.7	1,659,975	4.29
May	6,595,440	99.4	453,938	79.5	333,200	104.9	7,382,578	98.1	1,666,496	4.43
June	6,239,674	97.1	452,528	81.8	323,100	105.1	7,015,302	96.3	1,635,269	4.29
2nd qtr.	19,180,247	98.4	1,361,300	81.2	977,624	104.8	21,519,171	97.4	1,654,049	13.01
1st hlf.	37,861,310	97.7	2,798,914	83.9	1,875,699	101.1	42,535,923	96.8	1,644,218	25.87
July	6,345,315	95.7	453,686	79.6	345,957	96.6	7,144,958	94.5	1,616,506	4.42
Aug.	6,414,637	96.5	467,293	81.8	345,725	96.3	7,227,655	95.4	1,631,525	4.43
Sept.	6,286,855	97.9	437,961	79.4	332,703	95.9	7,057,519	96.4	1,648,953	4.28
3rd qtr.	19,046,807	96.7	1,358,940	80.3	1,024,385	96.3	21,430,132	95.4	1,632,150	13.13
9 mos.	56,908,117	97.3	4,157,854	82.7	2,900,084	99.4	63,966,055	96.3	1,640,155	39.00
Oct.	6,750,829	101.5	461,897	80.9	366,788	102.2	7,579,514	100.0	1,710,951	4.43
Nov.	6,371,750	99.0	458,469	82.9	349,593	100.5	7,179,812	97.8	1,673,616	4.29
Dec.	6,471,261	97.6	475,204	83.4	358,075	100.0	7,304,540	96.6	1,652,611	4.42
4th qtr.	19,593,840	99.4	1,395,570	82.4	1,074,456	100.9	22,063,866	98.2	1,679,137	13.14
2nd hlf.	38,640,647	98.0	2,754,510	81.3	2,098,841	98.6	43,493,998	96.8	1,655,653	26.27
Total	76,501,957	97.9	5,553,424	82.6	3,974,540	99.8	86,029,921	96.8	1,649,979	52.14

The percentages of capacity operated in the first 6 months of 1942 are calculated on weekly capacities of 1,498,029 net tons open hearth, 128,911 net tons bessemer and 71,682 net tons electric ingots and steel for castings, total 1,698,622 net tons; based on annual capacities as of Jan. 1, 1942, as follows: Open hearth 78,107,260 net tons, bessemer 6,721,400 net tons, electric 3,737,510 net tons. Beginning July 1, 1942, the percentages of capacity operated are calculated on weekly capacities of 1,500,714 net tons open hearth, 128,911 net tons bessemer and 81,049 net tons electric ingots and steel for castings, total 1,710,674 net tons; based on annual capacities as follows: Open hearth 78,247,230 net tons, bessemer 6,721,400 net tons, electric 4,225,890 net tons.

The percentages of capacity operated in first six months of 1943 are calculated on weekly capacities of 1,518,621 net tons open hearth, 125,681 net tons bessemer and 87,360 net tons electric ingots and steel for castings, total 1,731,662 net tons; based on annual capacities as of January 1, 1943 as follows: Open hearth 79,180,880 net tons, bessemer 6,553,000 net tons, electric 4,554,980 net tons. Beginning July 1, 1943, the percentages of capacity operated are calculated on weekly capacities of 1,531,789 net tons open hearth, 116,494 net tons bessemer and 94,667 net tons electric ingots and steel for castings, total 1,742,950 net tons; based on annual capacities as follows: Open hearth 79,867,450 net tons, bessemer 6,074,000 net tons, electric 4,935,960 net tons. Data from American Iron and Steel Institute.

bove November. Prior to December, he best month for plate shipments was March, 1943, when a total of 1,167,697 ons was produced.

Continuous sheet-strip mills, adapted o rolling the heavier plates, produced 564,501 tons in December, while sheared plate mills rolled 474,122 tons and universal mills, 130,573 tons.

Wickwire Spencer To Cut Operations for Repairs

The Wickwire Spencer Steel Co.'s River Road plant in Buffalo, will shut down three open hearths and suspend blooming mill operations for at least a week starting Jan. 23, while a $200,000 building program is completed, Robert T. Dunlap, general manager of the Buffalo works, announced last week.

Included in new construction is a preheating furnace. Soaking pits will be enlarged. Drives on the blooming and billet mills will be relined, and new coils will be placed in a 2000 horsepower motor.

Steel Corp. Shipments In 1943 Below 1942

Shipments of finished steel in December by the United States Steel Corp. totaled 1,719,624 net tons, an increase of 59,030 tons over November and a decrease of 130,011 tons from December, 1942.

For the year ended Dec. 31 shipments totaled 20,244,830 tons, before year end adjustments, compared with 20,615,137 tons for 1942 after adjustments.

(Inter-company shipments not included)
Net Tons

	1943	1942	1941	1940
Jan.	1,685,992	1,738,893	1,682,454	1,145,592
Feb.	1,691,592	1,616,587	1,548,451	1,009,256
Mar.	1,772,397	1,780,938	1,720,366	931,905
Apr.	1,630,828	1,758,894	1,687,674	907,904
May	1,706,543	1,834,127	1,745,295	1,084,057
June	1,552,663	1,774,068	1,668,637	1,209,684
July	1,660,762	1,765,749	1,666,667	1,296,887
Aug.	1,704,289	1,788,650	1,753,665	1,455,604
Sept.	1,664,577	1,703,570	1,664,227	1,392,838
Oct.	1,794,968	1,787,501	1,851,279	1,572 408
Nov.	1,660,594	1,665,545	1,624,186	1,425,352
Dec.	1,719,624	1,849,635	1,846,036	1,544,623
Total	20,244,830	21,064,157	20,458,937	14,976,110
Adjustment		*449,020	*42,333	†37,639
Total	20,615,137	20,416,604	15,013,749	

†Increase. *Decrease.

Steel and Iron Made for Sale in November

AMERICAN IRON AND STEEL INSTITUTE
Capacity and Production for Sale of Iron and Steel Products

NOVEMBER - 1943

	Number of companies	Items	Annual Capacity Net tons	Production for Sale—Net Tons: Current Month: Total	Current Month: Per cent of capacity	Current Month: Shipments: Export	Current Month: Shipments: To members of the industry for conversion into further finished products	Year to Date: Total	Year to Date: Per Cent of capacity	Year to Date: Shipments: Export	Year to Date: Shipments: To members of the industry for conversion into further finished products
Ingots, blooms, billets, slabs, sheet bars, etc.	45	1	xxxxxxx	750,325	xxx		197,821	7,818,445	xxx		2,245,866
Heavy structural shapes	10	2	5,412,580	335,691	75.4		xxxxxxx	3,511,228	70.9		xxxxxxx
Steel piling	4	3	338,000	7,586	27.3		xxxxxxx	38,069	12.3		xxxxxxx
Plates—Sheared and Universal	22	4	9,489,740	1,108,460	142.0		1,949	11,805,440	135.9		34,675
Skelp	7	5	xxxxxxx	61,246	xxx		39,896	719,564	xxx		436,167
Rails—Standard (over 60 lbs.)	4	6	3,629,260	170,724	57.2		xxxxxxx	1,735,571	52.3		xxxxxxx
Light (60 lbs. and under)	6	7	309,690	8,362	32.8		xxxxxxx	150,083	53.0		xxxxxxx
All other (Incl. girder, guard, etc.)	2	8	102,000	1,084	12.9		xxxxxxx	20,145	21.6		xxxxxxx
Splice bar and tie plates	13	9	1,120,270	54,669	59.3		xxxxxxx	572,797	55.9		xxxxxxx
Bars—Merchant	40	10	xxxxxxx	627,797	xxx		81,833	6,562,460	xxx		879,173
Concrete reinforcing—New billet	15	11	xxxxxxx	34,507	xxx		xxxxxxx	384,790	xxx		xxxxxxx
Rerolling	16	12	xxxxxxx	5,976	xxx		xxxxxxx	73,482	xxx		xxxxxxx
Cold finished—Carbon	23	13	xxxxxxx	152,692	xxx		xxxxxxx	1,625,823	xxx		xxxxxxx
Alloy—Hot rolled	20	14	xxxxxxx	214,711	xxx		30,049	2,759,631	xxx		384,653
Cold finished	19	15	xxxxxxx	32,180	xxx		xxxxxxx	418,716	xxx		xxxxxxx
Hoops and baling bands	5	16	xxxxxxx	4,808	xxx		xxxxxxx	80,405	xxx		xxxxxxx
TOTAL BARS	63	17	14,719,525	1,072,671	88.6		111,882	11,905,307	88.4		1,263,826
Tool steel bars (rolled and forged)	17	18	200,840	11,918	72.1		xxxxxxx	165,452	90.0		xxxxxxx
Pipe and tube—B. W.	15	19	2,231,040	108,751	59.2		xxxxxxx	1,212,366	59.4		xxxxxxx
L. W.	8	20	845,400	43,215	62.1		xxxxxxx	512,827	66.3		xxxxxxx
Electric weld	8	21	1,149,250	83,370	88.2		xxxxxxx	949,492	90.3		xxxxxxx
Seamless	15	22	3,082,400	175,853	69.3		xxxxxxx	2,000,710	70.9		xxxxxxx
Conduit	7	23	190,000	3,804	24.3		xxxxxxx	51,274	29.5		xxxxxxx
Mechanical Tubing	11	24	597,800	61,888	125.8		xxxxxxx	684,351	125.1		xxxxxxx
Wire rods	22	25	xxxxxxx	106,693	xxx		17,303	1,108,346	xxx		206,041
Wire—Drawn	41	26	2,356,550	175,370	90.4		2,518	1,831,287	84.9		47,124
Nails and staples	19	27	1,116,640	60,511	65.9		xxxxxxx	739,772	72.4		xxxxxxx
Barbed and twisted	15	28	482,280	19,117	48.2		xxxxxxx	222,742	50.5		xxxxxxx
Woven wire fence	16	29	778,060	27,078	42.3		xxxxxxx	235,426	33.1		xxxxxxx
Bale ties	12	30	128,420	6,104	57.8		xxxxxxx	98,629	83.9		xxxxxxx
All other wire products	8	31	78,220	4,635	72.0		xxxxxxx	53,888	75.3		xxxxxxx
Fence posts	11	32	112,065	6,397	69.4		xxxxxxx	44,472	43.4		xxxxxxx
Black plate	11	33	339,700	39,794	142.4		85	318,709	102.5		85
Tin plate—Hot rolled	4	34	483,620	-			xxxxxxx	10,597	2.4		xxxxxxx
Cold reduced	10	35	3,841,340	135,655	42.9		xxxxxxx	1,960,451	55.9		xxxxxxx
Sheets—Hot rolled	25	36	xxxxxxx	539,038	xxx		16,583	5,483,207	xxx		187,579
Galvanized	14	37	xxxxxxx	69,213	xxx		xxxxxxx	747,025	xxx		xxxxxxx
Cold rolled	14	38	xxxxxxx	155,430	xxx		xxxxxxx	1,398,397	xxx		xxxxxxx
All other	16	39	xxxxxxx	27,471	xxx		xxxxxxx	326,353	xxx		xxxxxxx
TOTAL SHEETS	28	40	13,497,570	791,152	71.2		16,583	7,954,982	64.4		187,579
Strip—Hot rolled	22	41	3,201,690	131,527	49.9		14,861	1,418,984	48.4		173,299
Cold rolled	39	42	2,059,740	95,313	56.2		xxxxxxx	1,070,602	56.8		xxxxxxx
Wheels (car, rolled steel)	5	43	424,820	19,376	55.4		xxxxxxx	207,363	53.3		xxxxxxx
Axles	6	44	453,470	14,081	37.7		xxxxxxx	148,451	35.8		xxxxxxx
Track spikes	11	45	308,350	9,905	39.0		xxxxxxx	126,499	44.8		xxxxxxx
All other	5	46	xxxxxxx	16,165	xxx		xxxxxxx	183,209	xxx		xxxxxxx
TOTAL STEEL PRODUCTS	160	47	xxxxxxx	5,718,490	xxx		402,898	61,593,530	xxx		4,594,662
Pig iron, ferro manganese and spiegel	27	48	xxxxxxx	750,718	xxx		328,173	8,304,761	xxx		4,122,218
Ingot moulds	5	49	xxxxxxx	92,035	xxx		xxxxxxx	923,991	xxx		xxxxxxx
Bars	10	50	170,110	8,293	59.2		520	90,364	58.0		3,724
Pipe and tubes	2	51	106,000	6,849	78.5		xxxxxxx	79,036	81.5		xxxxxxx
All other	1	52	56,000	1,187	25.8		-	13,037	25.4		-
TOTAL IRON PRODUCTS (ITEMS 50 to 52)	11	53	xxxxxxx	16,329	xxx		520	182,437	xxx		3,724

Industry Providing Many Services

Influx of women into war plants has spurred inauguration of programs, which include recreational facilities, health treatments, beauty shops, improved in-plant feeding, music and news broadcasts and counsellor service

INDUSTRY today is doing more for employes' health, happiness and convenience than ever before. On the theory that a healthful, contented worker is an efficient producer, thousands of war plants have inaugurated plans and programs designed to boost employe morale and consequently war production.

As a result, relations between employer and employe have improved considerably—this in spite of the widespread publicity given to labor disputes and of the long hours necessitated by the pressure for war production.

One factor influencing such programs has been the great influx of women into war plants. Conditions which had been suitable when all employes were men had to be altered when women left their homes for the factories.

Also when the production tempo increased, jobs became plentiful and workers more choosy, management found the improvement of working conditions and the prevention of grievances helped to build and retain their working forces.

As employment in individual plants expanded, much of the personal touch between management and the man at the bench was lost. The boss no longer found it possible to walk through the factory and chat with the workers. In many cases, this problem was solved by having personnel counsellors, representing the management, contact employes and help them with their personal problems.

Arrange Various Programs

Another factor in improving conditions and morale was the organization of labor-management committees, now functioning in 3500 war plants.

Principal activities of the labor-management committees consist of programs designed to conserve materials, safety, transportation of workers, absenteeism, and a general consideration of production problems. A large percentage of these committees are conducting programs related to quality and control of tools and equipment, training, nutrition and health. Other activities include special production problems such as cost reduction, machine tool capacity, idle time, gas and air and electrical equipment, plant housekeeping, movies, letters to servicemen, book collections, policy radio and news, medical clinic, credit union and assistance on taxes.

Many war plants have added expert personnel counsellors to their payrolls to aid and advise workers with troublesome problems. The cost of training a new worker may range anywhere from $100 to $1500. Therefore workers represent an important company investment. Exit interview systems have been established whereby employes desiring to quit are interviewed by the personnel department. In a majority of cases the difficulties are ironed out as a result of such interviews and employes remain on the job.

Problems encountered by exit interviewers are manifold, ranging from financial difficulties to homesickness. Lack of transportation, ill health, and improper housing have figured prominently in the causes for the enormous turnover in factory personnel. Misplacement on jobs is regarded as one of the most frequent causes of quits.

A number of companies are employing

Girl employes at Douglas Aircraft Co. at Chicago, far left, learn how to unkink after day's work is done

Company-sponsored beauty shop in the plant of the Chicago factory of Republic Drill & Tool Co., left, permits women of all three shifts to receive treatments without loss of working time

...or Workers' Benefit

By J. M. KURTZ
Assistant Editor, STEEL

tax experts to aid employes with their income tax returns.

Psychologists are working hand in hand with personnel men in order to improve employe morale and at the same time increase production. The idea of in-plant music, although not new, has been widely adopted since Pearl Harbor. More than 3000 plants are broadcasting music to their workers with amplifying equipment which costs anywhere from $200 to $50,000 to install. Some of the studios are as modern and up-to-date as radio stations. Company executives believe the investment is paying for itself with reports trickling in that production in some plants has increased by as much as 20 per cent as a result of the music plan. Broadcasting of music is found to be most effective at about 11 a. m. (on the first shift) when the workers begin to watch the clock for the lunch period and again about 4 p. m., about an hour or two before quitting time.

Some companies have brief news summaries during lunch periods for all shifts and up-to-the-minute news bulletins are posted on bulletin boards to keep workers informed on any world-shaking events which might have occurred while they were at their machines producing for victory. Special vaudeville acts are sometimes presented during lunch periods.

One of the newer innovations is the in-plant library. This is generally accomplished in co-operation with the public library in the community. Magazines, business papers and trade journals which may prove helpful in their work are available.

At the Aluminum Co. of America's plant in Cleveland, a number of benefits for employes have been inaugurated which are paying the company dividends in a better absenteeism record and improved employe morale. Cigarette dispensing machines have been installed throughout the plant, thus eliminating the necessity for employes leaving their jobs to purchase cigarettes at a nearby store. Cafeterias have been enlarged and contracts let to professional caterers who are providing a variety of hot meals at prices far below those at nearby restaurants. Canteens have been set up in the plant and food wagons are hauled through the plant at intervals.

The Aluminum Company has also organized a recreational program for workers on both the night and day shifts.

Diathermy treatment is administered to Brewster Aeronautical Corp. worker as part of the health program instituted by the company at its Johnsville, Pa., plant. NEA photos

Basketball, bowling and softball are by far the most popular sports. Even movies are shown within the plant and incentive exhibits are placed on display to boost production. An engine from a German Messerschmidt was among the items placed on display. Last June a six-page tabloid was printed for the first time and distributed to employes. The paper conducted a blood donor campaign under the auspices of the labor-management committee and set a record on Pearl Harbor Day with 628 donors. Success of the company's victory garden is attested by the fact that it was awarded first prize in the Cleveland district by the National Victory Garden Institute for its achievement.

At the American Steel & Wire Co.,

Cleveland, a training program for supervisors was conceived to educate efficiently new workers and make them more adaptable for their jobs. Thus, training period has been reduced from 12 to six weeks. One of the company's most popular features is the posting of news pictures on bulletin boards throughout the plant. Twice a week a war photograph, a sports picture and one of general interest are placed on bulletin boards along with a slogan suggested by employes. Recently the company arranged for showings of its latest movie, "To Each Other," for employes and their families.

Instructions on grievance procedure are posted in the plants of Thompson Aircraft Products Co., Cleveland, and workers are asked to discuss their problems with personnel supervisors. Photographs, office hours and jurisdictions of the supervisors also are posted to aid employes in locating them

Elaborate Lounge Facilities

Some companies have set up elaborate lounge facilities for workers. For example, the N. A. Woodworth Co., Ferndale, Calif., manufacturer of aircraft parts, has a lounge which seats 160 women comfortably. It is beautifully appointed with the latest in furnishings and is provided with radios and interesting reading material. A beauty parlor has been installed in the plant where women receive beauty treatments immediately after working hours. This eliminates the necessity for women taking a day off to beautify themselves for a special occasion. Weekly cash credits are awarded to the women with good attendance records which are exchangeable for cosmetics. Powder rooms are equipped with comfortable chrome chairs, make-up mirrors, fluorescent lights and shelves for compacts, lipstick and other feminine articles.

Many companies throughout the nation have gone to great pains to make the factory a pleasant place to work. Bert I. Beverly, M. D., director of medical and personnel at the Republic Drill & Tool Co., Chicago, reports that his company's attitude is that the highest quality work is produced by those who enjoy the best possible physical and mental health.

"Women are biologically and physiologically different than men," he remarked. "If certain kinds of work are to be done by women, we believe it is essential to set up job specifications which meet the qualifications of women. We have, therefore, set up specific jobs for girls and specific jobs for men, so that men and women never do the same kind of work. This system eliminates unfair competition between the sexes. Our machines are especially designed for women, featuring ease and comfort of operation and have safety glasses and safety devices. The size and weight of pans of drills is limited to the physical capacity of the average girl."

The company has even arranged for rest periods every two hours and a well developed canteen service serves nutritious and hot meals. The company has provided its workers with free uniforms, clean washrooms, locker rooms and showers, and attractive cafeterias. Even a beauty salon has been opened in the plant.

Recently when the "no smoking" rule was changed it was expected that production would fall somewhat. Instead the company found no loss in production and discovered that despite a change in the rule few of the men smoked on the job. The company believes that leniency's end result is an improvement in general morale and a good business move.

General Motors Corp., Detroit, under the direction of Dr. Clarence D. Selby, medical consultant, is making every effort to maintain the health of employes. Methods for relieving workers of their worries, maintaining proper nutritional status, and preventing fatigue are being developed and studies of sickness absenteeism are practiced. The company is also striving for a more understanding relationship between professional and industrial medicine inasmuch as a majority of its workers are cared for by private physicians. In measuring the effectiveness of the program, General Motors found that absenteeism has been reduced considerably during the past year and continues on the decline.

Use Preventive Medicine

The American Car & Foundry Co. recently set up at its Berwick, Pa., plant a modern dispensary, fully equipped to take care of thousands of workers. The modern plant dispensary has ten nurses, a head nurse, and a doctor in attendance at all times and is prepared to handle first aid cases or serious emergency cases. Every attempt is made to keep employes in a healthy condition by using preventive medicine such as cold injections and vaccinations.

In addition to the main treatment room with its air conditioning, bactericidal-ultra-violet lamps, and its accommodations for simultaneous treatment of seven and eight patients, there is a physiotherapy room with an osteopath in charge who gives massages and ultra-violet ray treatments. A fully equipped emergency operating room with X-ray and modern fracture table are also found in the dispensary. A 24-hour service is provided for the three shifts with about 300 to 400 cases treated daily.

Industrial relations appear to be entering a new era. During the last war and shortly afterward, industrial relations emphasized such developments as employe safety, health, recreation and other welfare plans.

"The new era we are entering will be different," says C. L. Hyston, assistant to the president, Lukens Steel Co., Coatesville, Pa. "The determination of industrial relations policies and their administration will undoubtedly be influenced by two viewpoints. On the one hand, the company is interested in preserving and enhancing its economic position, while at the same time the union is anxious to insure its own security. The company will increasingly adjust its industrial relations policies and their administration according to the answers to questions such as the following: Do they satisfy a fundamental desire of the men? Do they help to increase productivity? Do they make the workers say: 'This is a good place to work.'"

Although many of the benefits established for workers since Pearl Harbor cannot be measured in terms of dollars and cents on a company's financial records, they nevertheless are proving of inestimable value, some directly and others indirectly. Industry's industrial relations are keeping pace with the times.

Cutting Tool Manufacturers Association Incorporated

Cutting Tool Manufacturers Association, a nonprofit corporation, has filed articles of incorporation in Wilmington, Del., according to W. G. Robbins, recently elected chairman of the board. By-laws were also completed at the same meeting.

Membership in the group is available to any individual, partnership, firm or corporation engaged in the manufacture of tools designed for cutting materials through use with power driven machinery. Manufacturers of hand operated cutting tools are specifically excluded.

There is no initiation fee but dues are on a sliding scale. Each manufacturing organization, regardless of size, is entitled to only one vote in association affairs. Voting is by companies rather than individuals. Plans are nearing completion for holding organization meetings in other industrial sections of the country.

BRIEFS . . .

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., reports that the 300,000 volt X-ray machines produced by it make possible studies of the action of bullets in motion within gun barrels and when they hit targets.

—o—

Claud S. Gordon Co., Chicago, celebrates its thirtieth anniversary with the publication of a catalog which outlines the company's history and describes equipment manufactured by it.

—o—

Rohm & Haas Co., Philadelphia, is underwriting a pension plan for workers with more than five years service which will provide a monthly retirement income approximately equal to 40 per cent of an employe's pay, plus increased life insurance.

—o—

Precision Paper Tube Co., Chicago, has quadrupled its factory space to meet war production demands.

—o—

Krembs & Co., Chicago, has available a chart which is a handy key to finding the best flux to use in connection with a host of metal joining jobs.

—o—

Edward Valve & Mfg. Co. Inc., East Chicago, Ind., has appointed Eshelman & Potter, Birmingham, Ala., and Charlotte, N. C., its southeastern representative.

—o—

Oceco division, Johnston & Jennings Co., Cleveland, announces appointment of General Meters & Controls Co., Chicago, as representative in the Chicago territory.

—o—

Young Radiator Co., Racine, Wis., announces appointment of W. P. Nevins Co., Chicago, as representative in the Chicago area.

—o—

Oliver Iron & Steel Corp., Pittsburgh, on Jan. 1 formed an Industrial Fasteners division to handle sale of products in industrial, transportation and jobbing fields.

—o—

C. Frederick Wolfe Inc., Richmond, Va., has been granted a certificate of authority to deal in steel and special machinery by the Virginia State Corporation Commission.

—o—

Robert H. Clark Co., Los Angeles, has completed its new plant in Beverly Hills, greatly expanding the company's production facilities of adjustable cutting tools and automatic tapping machine conversion unit.

Death of John E. Jones, Pioneer Silvery Iron Producer, Breaks Link with Past

WITH the death, Jan. 5, of John E. Jones, chairman of the board, Globe Iron Co., Jackson, O., and for many years a prominent Ohio industrialist, (STEEL, page 47, Jan. 10) another link with the early days of the iron and steel business in this country was broken.

Mr. Jones' death resulted from a heart ailment with which he had been afflicted for more than five years. Funeral services were held Saturday, Jan. 8, at Jackson.

Though only 79, Mr. Jones at the time of his death was one of the oldest living persons still actively interested in business whose activities spanned the years from the charcoal furnace to the modern blast furnace. When he died he not only was chairman of Globe Iron Co. but he had many other business interests and was active in community and cultural affairs.

The Jones family has been active in the iron business in Jackson county since 1837. In that year Mr. Jones' grandfather, Thomas T. Jones, organized the Jefferson furnace. In 1872 his father, Eben Jones, and his grandfather helped to organize the Globe Iron Co. at Jackson. In 1882, Mr. Jones left high school and entered the service of the Globe Iron Co., beginning as storekeeper and working up through positions of increasing importance to become general manager in 1898. In 1921 he succeeded his father, Eben Jones, as president. In 1939 he resigned the presidency of the company in favor of his own son, Edwin A. Jones, assuming the position of chairman of the board.

JOHN E. JONES

During the period of his active connection with the company, and largely through his effort, the Globe company grew from a small local furnace with a capitalization of $120,000 to its present position with a capitalization of $1,200,000 and a plant of modern construction producing a distinctive silvery iron.

How the Globe company came to specialize in silvery and other specialty irons is said to have resulted almost by accident. It is recorded that after starting to work in the company store in 1882 Mr. Jones gradually advanced to the position of secretary of the company. All through the nineties, and against his father's wishes, he kept buying stock in the company.

Back in the nineties while John E. was rising to prominence in company affairs, the Globe furnace would occasionally turn out what was called an "off-cast," that is a cast high in silicon. Mr. Jones, about this time, learned that high-silicon iron could be used advantageously in small quantities by foundrymen in the production of castings. He decided to see what he could do in disposing of these "off-casts" which the Globe furnace occasionally turned out. He found a market for the iron and from that point on built up a specialty business in high silicon iron which is unique in the iron industry.

Speaking at a meeting of sales representatives in Jackson in 1934, Mr. Jones said: "We were the originators of high silicon iron production in this country and the first to advertise and call the melters' attention to the wonderful benefits to be derived from the use thereof. J. Blodgett Britton of Warrentown, Va., an Englishman, did some of our early work in metallurgical analysis."

In addition to his business activities Mr. Jones took an active interest in community life. In 1930 he was president of the National Eisteddfods, and in recognition of his services, for several years was honorary president of the International Eisteddfods held in Wales.

Terminations Settlement Clarified by New Clause

IMMEDIATE inclusion of the Baruch standard termination clause in all fixed-price government war contracts is expected to do much to dispel industry's confusion and fears on order cancellation. Application of similarly positive and consistent policies to the muddled labor situation would constitute another long step toward heightened industrial unity.

In spite of numerous uncertainties still to be clarified, industry has again recorded lofty production figures. Bituminous coal output recovered much of the ground lost the preceding week; production of automobiles and trucks likewise was substantially higher than for the next earlier period. Bank clearings rose to a figure 13 per cent above that for the preceding week and 11 per cent beyond that of the comparable week of 1943.

Some authorities estimate that December employment figures will show 98.5 per cent of the nation's nonagricultural labor force working. Such a figure, which would be the highest ever recorded, would probably represent the maximum employment possible to attain. Industry still has a huge task ahead to fill the armed forces' needs till Germany is defeated.

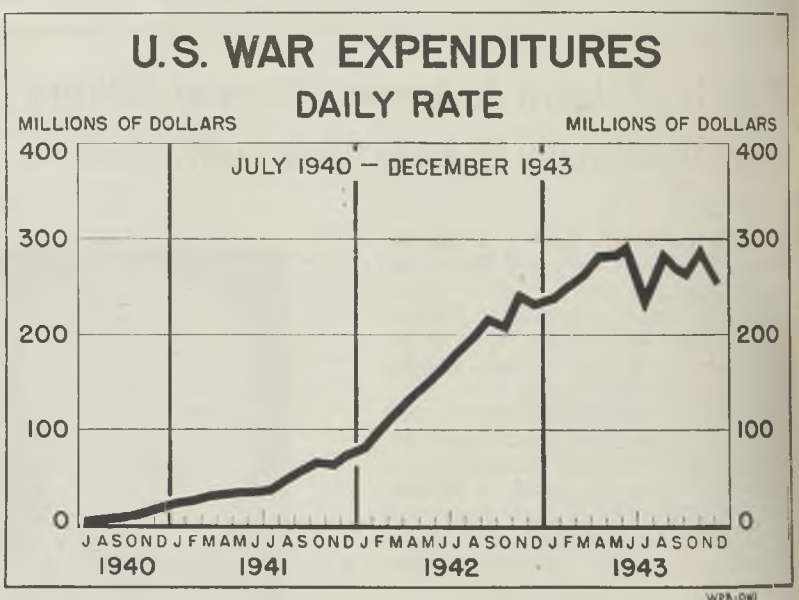
TRUCK PRODUCTION — Anticipated bottleneck of axles, transmissions, and power plants for the huge 1944 military and civilian truck program is being eliminated by widespread subcontracting of components. Shortage of anti-friction bearings (those for large units are produced by only one manufacturer) is being corrected by locating surplus stocks through a national survey, and by subcontracting plans. Present production of hose, packing, and other articles in synthetic rather than natural crude rubber is expected to release more natural rubber for tires than had been expected.

CONSTRUCTION VOLUME—Continental U. S. civil engineering construction totaled 23 per cent less in dollar value last week than for the preceding period and comprised only one-third of the volume reported a year ago.

Private construction was 40 per cent higher than for the corresponding 1943 week, but 1 per cent lower than a week ago. Public construction dropped to one-fourth of the figure for the comparable period of last year, and was 31 per cent under the volume shown for the week preceding the current period. State and municipal construction, although 70 per cent above the total for the preceding week, was 69 per cent below the volume for the comparable 1943 week. New capital for construction purposes amounted to $133,113,000, compared with $524,000 for the corresponding period a year ago.

TOTAL EMPLOYMENT—During November total employment, including service in armed forces, declined for the second successive month, with number of persons employed or in service dropping to 63,100,000, against 64,300,000 for October and 64,400,000 in September. Construction project employment declined below 1,500,000, compared with 2,600,000 workers in the same period of the preceding year and 2,800,000 for the comparable month of 1941.

WAR EXPENDITURES—December government expenditures for war purposes declined to $6,717,000,000, a reduction of $1,077,000,000 from the November total. For the final half of 1943 war expenditures totaled $43,103,000,000, against $33,289,000,000 for the comparable period of 1942.



FIGURES THIS WEEK

INDUSTRY	Latest Period*	Prior Week	Month Ago	Year Ago
Steel Ingot Output (per cent of capacity)	96.5	91.5	98.0	97.5
Electric Power Distributed (million kilowatt hours)	4,568	4,337	4,567	3,953
Bituminous Coal Production (daily av.—1000 tons)	1,725	1,554	2,100	1,550
Petroleum Production (daily av.—1000 bbls.)	4,366	4,358	4,377	3,871
Construction Volume (ENR—unit $1,000,000)	$21.6	$28.2	$34.7	$63.9
Automobile and Truck Output (Ward's—number units)	18,090	15,220	18,720	17,155

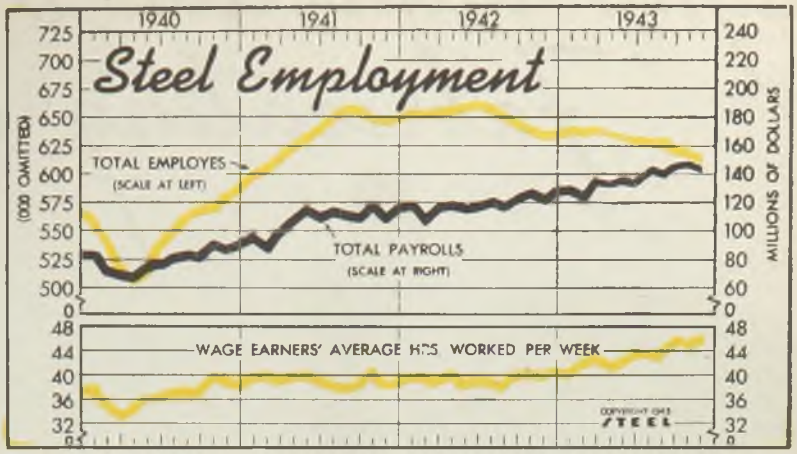
*Dates on request.

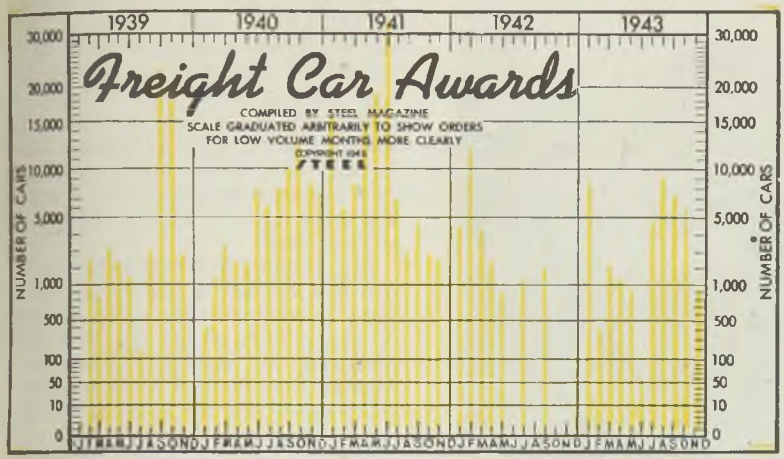
TRADE				
Freight Carloadings (unit—1000 cars)	723†	644	848	621
Business Failures (Dun & Bradstreet, number)	31	25	40	95
Money in Circulation (in millions of dollars)‡	$20,436	$20,428	$20,135	$15,393
Department Store Sales (change from like week a year ago)‡	+22%	−4%	+13%	+15%

†Preliminary. ‡Federal Reserve Board.

Steel Employment

	Employees—Number (000 omitted)		Total Payrolls (Unit—$1,000,000)	
	1943	1942	1943	1942
Jan.	637	651	129.7	118.8
Feb.	635	651	122.8	108.5
Mar.	637	653	136.8	117.0
Apr.	634	654	136.3	118.5
May	632	656	137.4	117.4
June	631	659	136.2	118.0
July	627	655	142.8	120.7
Aug.	625	647	139.9	118.7
Sept.	620	641	143.8	124.8
Oct.	615	635	144.9	126.6
Nov.	611	632	141.5	122.8
Dec.		633		129.8



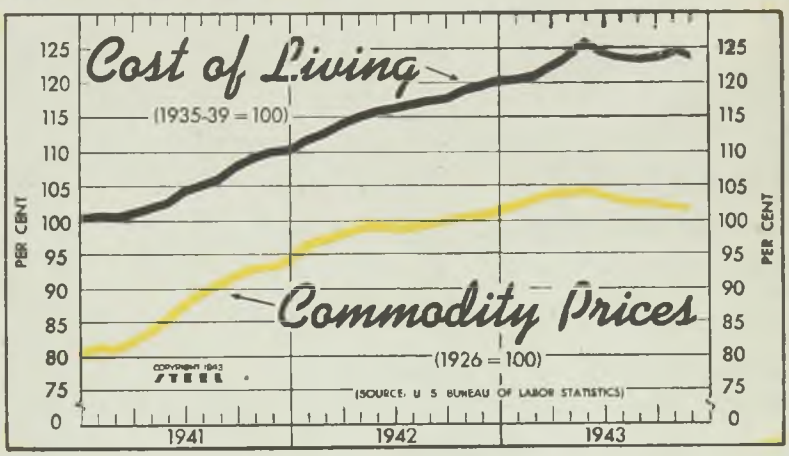


Freight Car Awards

	1943	1942	1941	1940
Jan.	8,365	4,253	15,189	360
Feb.	350	11,725	5,508	1,147
March	1,935	4,080	8,074	3,104
April	1,000	2,125	14,645	2,077
May	870	822	18,680	2,010
June	50	0	32,749	7,475
July	4,190	1,025	6,459	5,846
Aug.	8,747	0	2,668	7,525
Sept.	6,820	1,863	4,470	9,735
Oct.	5,258	0	2,499	12,195
Nov.	870	0	2,222	8,234
11 mos.	38,455	25,893	113,093	58,708
Dec.	.....	135	8,406	7,181
Total	....	26,028	121,499	65,889

Wholesale Commodity Price—Cost of Living Indexes

	—Commodities— (1926=100)			—Living Cost— (1935-39=100)		
	1943	1942	1941	1943	1942	1941
Jan.	101.9	96.0	80.8	120.6	112.0	100.8
Feb.	102.5	96.7	80.6	120.9	112.9	100.8
Mar.	103.4	97.6	81.5	122.8	114.8	101.2
Apr.	103.7	98.7	83.2	124.1	115.1	102.2
May	104.1	98.8	84.9	125.1	116.0	102.9
June	103.8	98.6	87.1	124.8	116.4	104.6
July	103.2	98.7	88.8	123.8	117.0	105.3
Aug.	103.1	99.2	90.3	123.2	117.5	106.2
Sept.	103.1	99.6	91.8	123.9	117.8	108.1
Oct.	103.0	100.0	92.4	124.4	119.0	109.3
Nov.	102.9	100.3	92.5	124.1	119.8	110.2
Dec.	....	101.0	93.6	....	120.4	110.5
Ave.	.....	98.8	87.8	.....	116.5	105.2



FINANCE

	Latest Period*	Prior Week	Month Ago	Year Ago
Bank Clearings (Dun & Bradstreet—millions)	$9,742	$8,619	$8,886	$8,196
Federal Gross Debt (billions)	$170.3	$169.8	$166.2	$112.7
Bond Volume, NYSE (millions)	$72.4	$47.4	$53.8	$71.4
Stocks Sales, NYSE (thousands)	4,429	4,703	5,174	3,798
Loans and Investments (millions)†	$49,734	$49,950	$51,166	$41,467
United States Government Obligations Held (millions)†	$36,109	$36,169	$37,341	$27,832

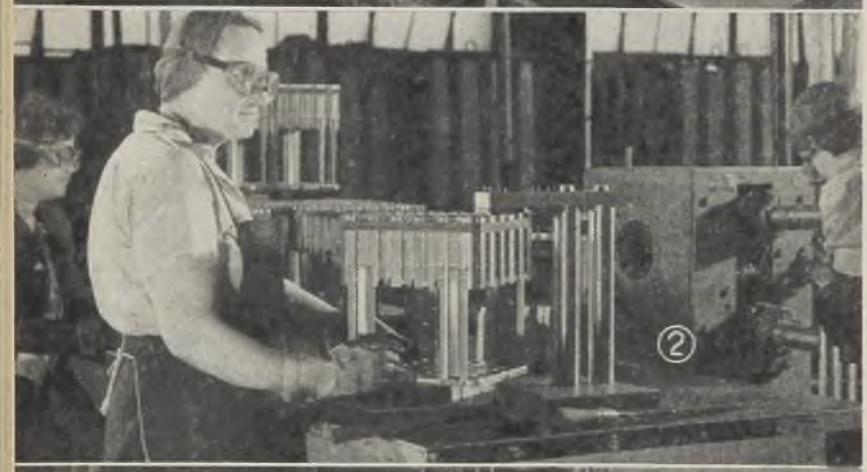
†Member banks, Federal Reserve System.

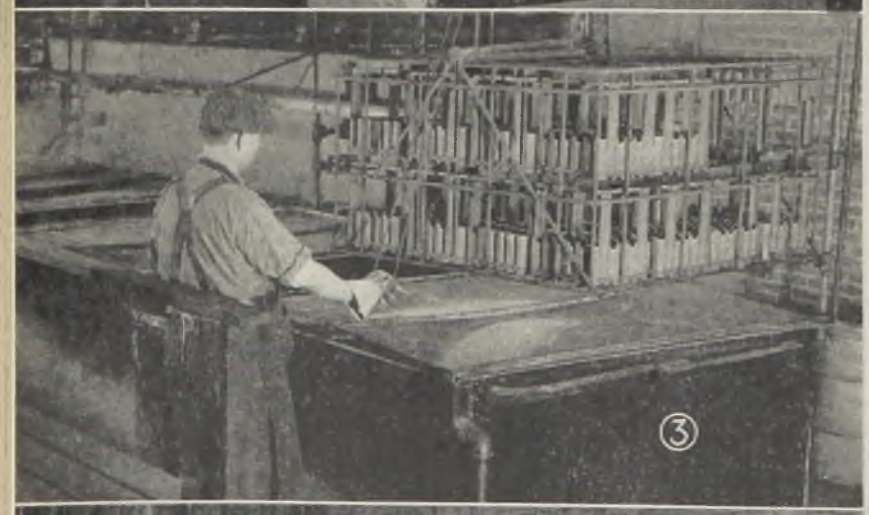
PRICES

STEEL's composite finished steel price average	$56.73	$56.73	$56.73	$56.73
Spot Commodity Index (Moody's, 15 items)†	247.6	247.6	246.5	242.3
Industrial Raw Materials (Bureau of Labor index)†	112.3	112.2	111.7	106.7
Manufactured Products (Bureau of Labor index)†	100.3	100.4	100.4	100.1

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

High-Production Sheet-Steel Fabricating Line





A TYPICAL high-production sheet-steel fabricating line employing latest improvements is found at Milcor Steel Co., Milwaukee. The line pictured here includes slitters, blanking and forming machines, various types of presses, resistance welding equipment, chemical cleaning facilities, galvanizing, and pickling department and various special assembly and checking facilities. All of this equipment is tied together effectively by a highly efficient arrangement of mechanical handling facilities. Too, the production equipment itself is arranged for most efficient floor production through the various operations.

In addition to the production line shown which makes ammunition boxes for the Navy, Milcor Steel is producing steel landing mats, tail pieces for bombs, and other products for war and essential civilian needs.

Fig. 1 shows first step in the production line devoted to the manufacture of Navy ammunition boxes. Fig. 1 is part of that portion of the line devoted to producing the separators. Steel sheet received from the mill is slit into proper width for making the girths of the tubes for the separators.

Next the steel strips are put through blanking and forming machines to make individual tubes. Following the blanking presses are four identical lines which form the tubes in a succession of operations. Inclinable presses are used with chutes leading from one machine to the next so the tubes in process can roll from one station to the next, eliminating handling and stock piling of parts between operations. One of the final operations is to seam the lock-joint in the tube on a horn press.

After individual hexagonal shaped tubes are formed, they are spot welded together in rows of six in a special welding fixture. Following this, six rows are welded together to make a honeycomb of 36 tubes which subsequently is placed in the sheet metal box.

Fig. 2 shows special height and alignment plug gages which check alignment through the tube to the holes in the diaphragm unit. One of the spot welding operations can be seen at the extreme right.

Fig. 3 pictures some of the Parkerizing equipment. Here an overhead hoist is being used to "dunk" baskets containing the completed separator units. First tank contains an alkali cleaner and is followed by two separate rinse tanks. Fourth tank contains the Parkerizing solution from which the work also must be rinsed twice.

Debris is removed from all tanks by intricate overflow arrangements. After Parkerizing, the units are placed on a conveyor which carries them through

a paint tank and a drying oven and finally to the assembly department for insertion into the outer box.

Fig. 4 is first step after forming the outer box in a series of deep-drawing press operations. Here the box is cleaned carefully in a sequence of specially designed tanks equipped with continuous conveyor for speedy operation.

Fig. 5 reveals two of the specially built circular seam welders which are employed to weld the entire top rims to the boxes, which then roll down the conveyor to the next operation.

In Fig. 6, the top rims having been securely welded, the box is passed through a series of additional welding operations in which handles and clips are attached. Mechanical handling facilities are nearby; in fact, a portion of the overhead chain conveyor on which the boxes are hung can be seen at the left in the illustration. This carries the completed boxes to the galvanizing department shown in Fig. 7.

Fig. 7 shows one of the zinc pots being used for galvanizing the covers for the boxes after they have been stamped on a large press, cleaned and pickled.

At the left background in Fig. 7 can be seen one of the conveyor lines carrying the galvanized boxes on to the assembly department. A similar conveyor also carries the covers for the boxes on to assembly.

After the completed boxes have been placed on the chain conveyor in Fig. 6, they are carried through openings in the walls and on into the pickling room where they are cleaned, returned to the conveyor and passed into the galvanizing department.

After galvanizing the boxes are placed back on the chain conveyor, carrying them to the assembly department.

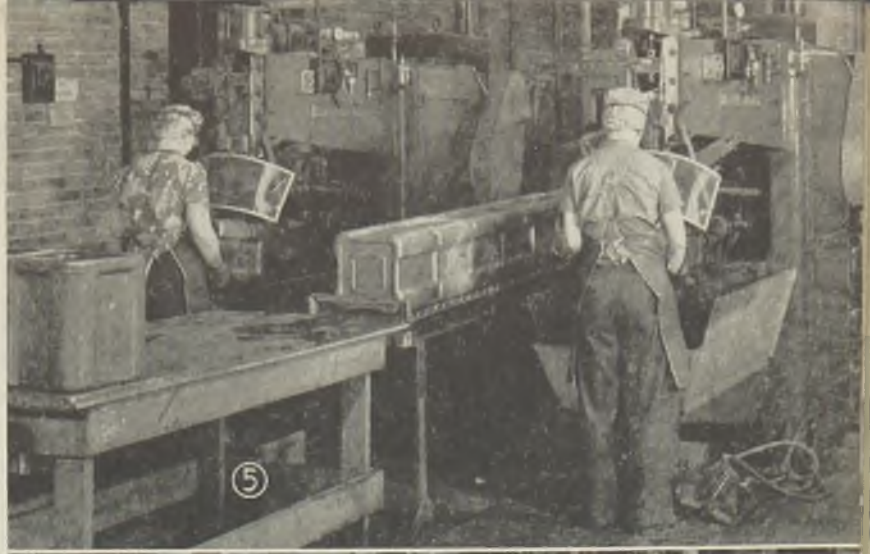
One of the first operations in the assembly department on the brightly galvanized outer boxes after they have been removed from the conveyor, is to insert a pin in the latch. This is followed by reaming and riveting operations.

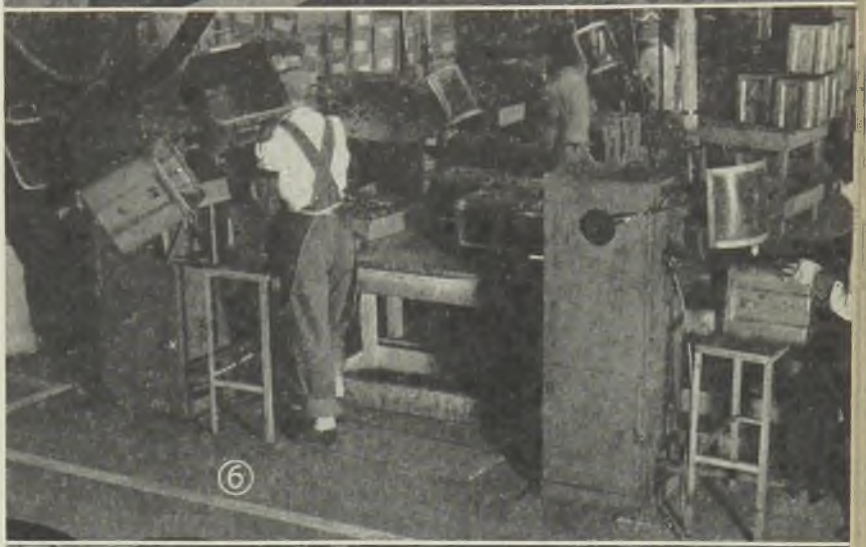
In a subsequent step, the cork gasket is attached to the inner cover of the box by one operator on a specially built hand press. Then this cover is clinched to the outer cover.

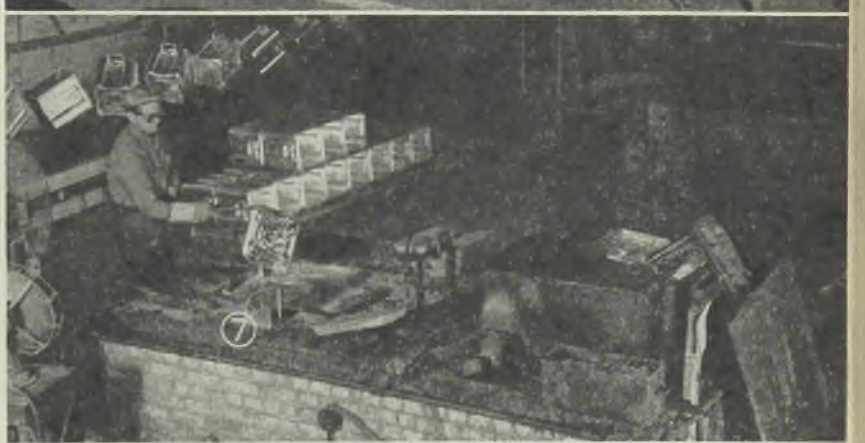
Fig. 8 is a view in the assembly room showing covers and boxes being tested before separators are inserted. The Navy inspector at the right foreground stands next to the testing machine, extreme right.

The loading platform is just outside of the assembly room. This makes it handy, for after the covers are placed on the boxes and tests are made, the completed boxes go directly into the waiting railroad cars.

If it were possible to reveal the output of this line, it would convey a better idea of the extremely high efficiency with which all these operations are carried out and interlocked one with another so a continuous flow of work through processing is assured. These illustrations, however, will serve to indicate some of the efficient setups employed.

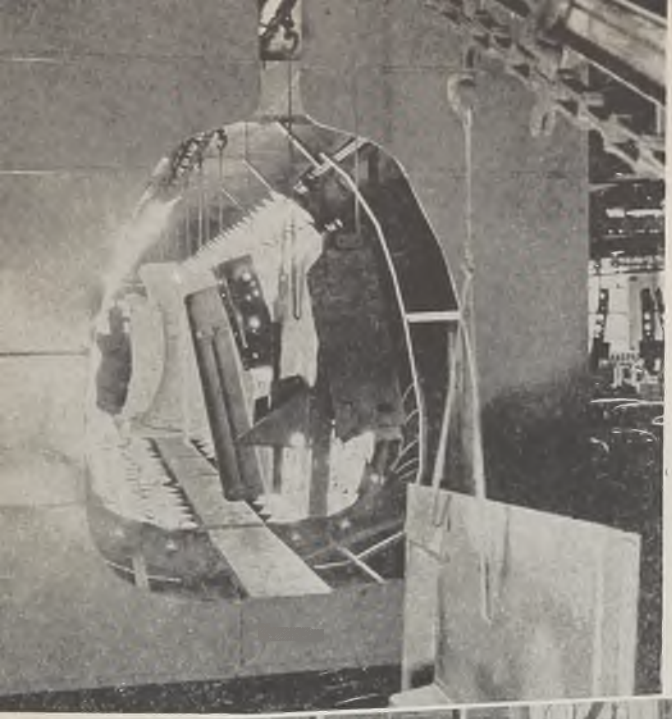






INFRA-RED

Scope of process now enlarged to include, in addition to usual baking and drying work, such comparatively new applications as preheating and maintaining heat during welding, heating for expansion fits, dehydrating metal products for rust prevention, dehydrating foundry molds and cores



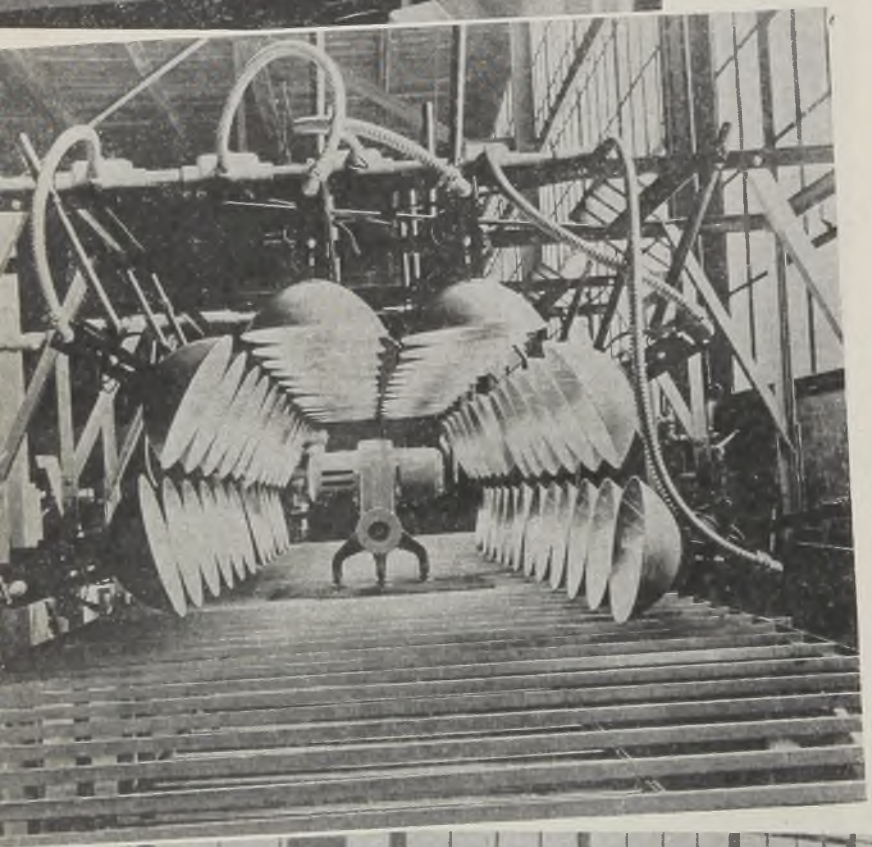
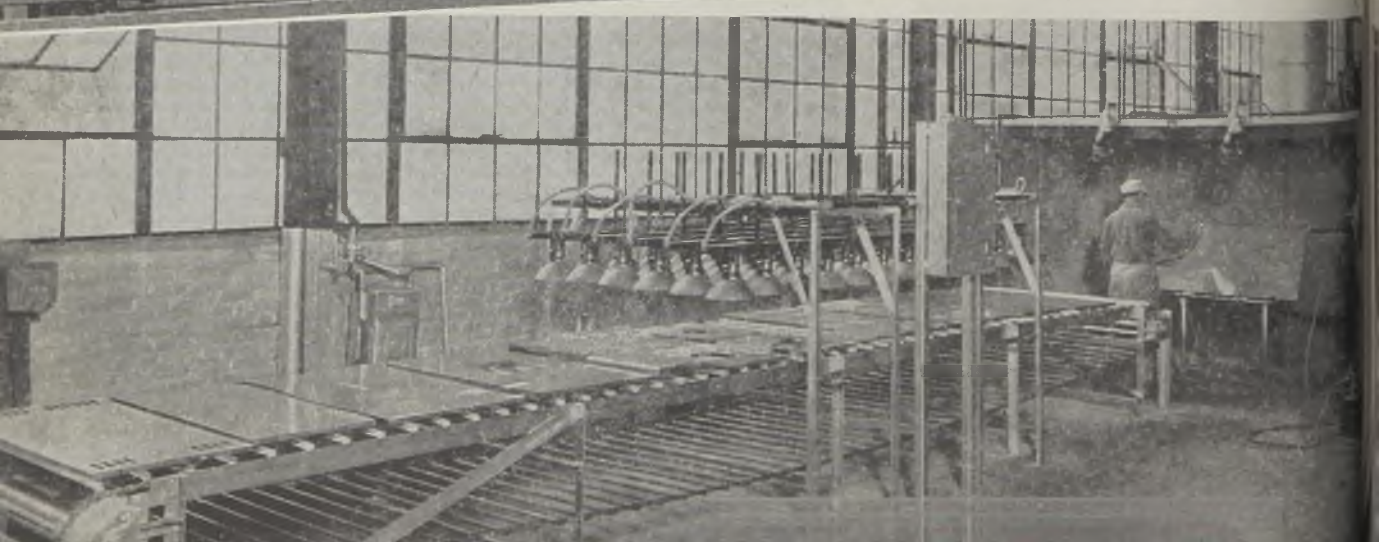


Fig. 1 (*Top left*)—*Infra-red tunnel for finish baking automotive parts at White Motor Co. is suspended from ceiling, allowing floor space to be utilized for storage and so saving*

Fig. 2 (*Left*)—*Anchor Post Fence Co. uses this infra-red installation to finish bake the completely fabricated oil burner and oil furnace units, also to work flat sheets by rearranging the reflector units*

Fig. 3 (*Below*)—*Here same infra-red installation as pictured in Fig.* 2 *is being used to finish bake flat panels by rearranging the reflector units*

Fig. 4 (*Opposite page*)—*This infra-red tunnel is here processing a variety of parts for heating equipment. Now it is being used to finish bake* 100-*pound bombs by adjusting the contour of the tunnel to fit that of the bombs*



RHEATING

By I. J. BARBER
Infra-red Engineer
Fostoria Pressed Steel Corp.
Fostoria, O.

MANY reasons account for increased use of the near infra-red process for industrial baking, drying, preheating, expansion heating and similar operations. Early in 1939, when it was first applied industrially, the increased speeds which it afforded over the conventional methods of long standing were so great that it seemed almost miraculous. Hours were reduced to minutes. Immediately the process was called "a new industrial tool," and rightly so.

As equipment manufacturers designed proper frame work, reflectors, and the like to utilize the radiant energy supplied by the near infra-red lamps, they too discovered many advantages of the process over conventional methods. It was soon apparent that varied sizes of tunnels could be constructed to specifically accommodate the contour and size of almost any object to be processed. Under normal conditions and properly engineered, this meant that the energy input would do in a certain time exactly what it was supposed to do. It eliminated the necessity of supplying over-doses of energy that otherwise would be wasted.

Since the near infra-red process operates by radiation, the rays which are directed on the material are at once converted into usable heat and are not required to heat convection air currents in or surrounding the tunnels. Since the surrounding air is not heated directly by the radiant energy, it avoids uncomfortable working conditions due to excessive heat surrounding the installation.

Also, it was soon apparent that because of the relative lightness in weight, near infra-red installations could be suspended from the ceiling to save valuable floor space. After this country became actively engaged in the war, this feature became of prime importance. In fact, it has eliminated the necessity of constructing additional buildings in numerous cases.

The several installations now in operation at the White Motor Co. are excellent examples of conserving floor space by suspending the tunnels from the ceiling. In fact, this feature was important in selection of finish-baking equipment to be installed in their new operations' building. As can be seen by Fig. 1, the tunnels so mounted allow extra space on the floor immediately below for stacking materials prior to finishing. The tunnels shown here are used to bake prime and finish coats on fenders, shields, running boards, dash boards, instrument panels, and the like. Eight minutes is required for the prime bake and 12 minutes for the finish bake. Previously both coats were baked in a gas oven and required 55 minutes for each.

Because near infra-red starts to work immediately, this process has resulted in large savings of energy. It is not necessary to preheat ovens to certain temperatures prior to placing the materials therein. As soon as the current is turned on, and the radiant energy strikes the material, processing is underway. In cases of delay in fabrication on production lines, at lunch periods, between shifts, or at quitting time—it is only necessary to turn off the current to stop processing. Then the processing can be resumed at a moment's notice.

To solve production bottlenecks quickly large installations, ranging from 300 kilowatts upward, have been designed, installed and ready for operation in approximately a month.

As an example of the extreme flexibility of near infra-red equipment, the installation at Anchor Post Fence Co., Baltimore, Md., is cited. Manufacturers of oil burning furnaces and oil burning units, they desired a finish-baking process which would handle flat steel sheets prior to fabrication, as well as the complete oil burning units. Fig. 3 shows the installation being utilized for baking finish on the flat sheets. Red, aluminum, light blue, light grey and dark grey are baked equally well in 8 minutes. Fig. 2 shows the same installation after the tunnel arms were re-adjusted to form a contour advantageous for baking a wrinkle finish on the oil burning units. By reducing the conveyor speed the latter is baked in 16 minutes.

The installation at Thermador Electric, Los Angeles, is another example of flexibility. Before Pearl Harbor, the instal-

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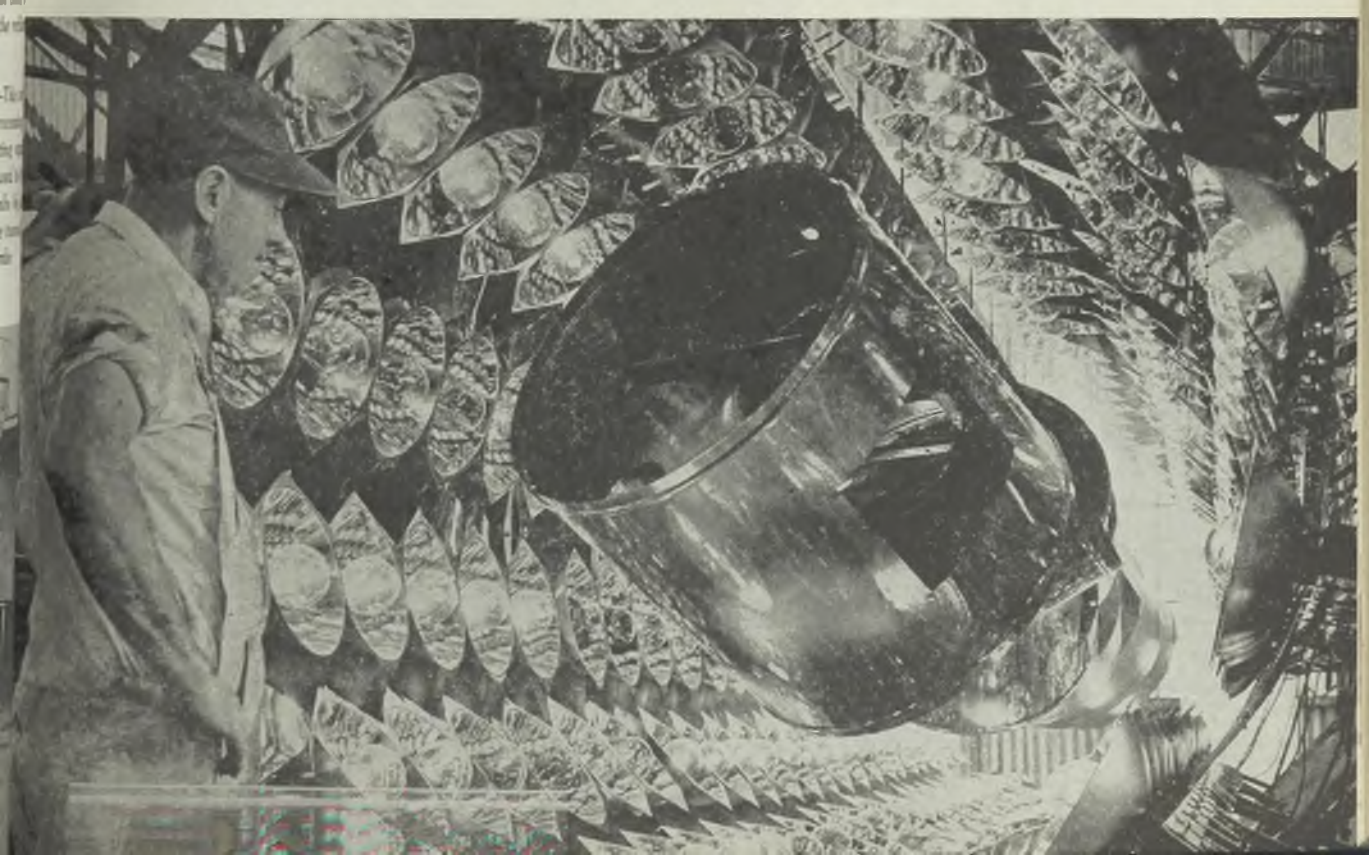


FORGED

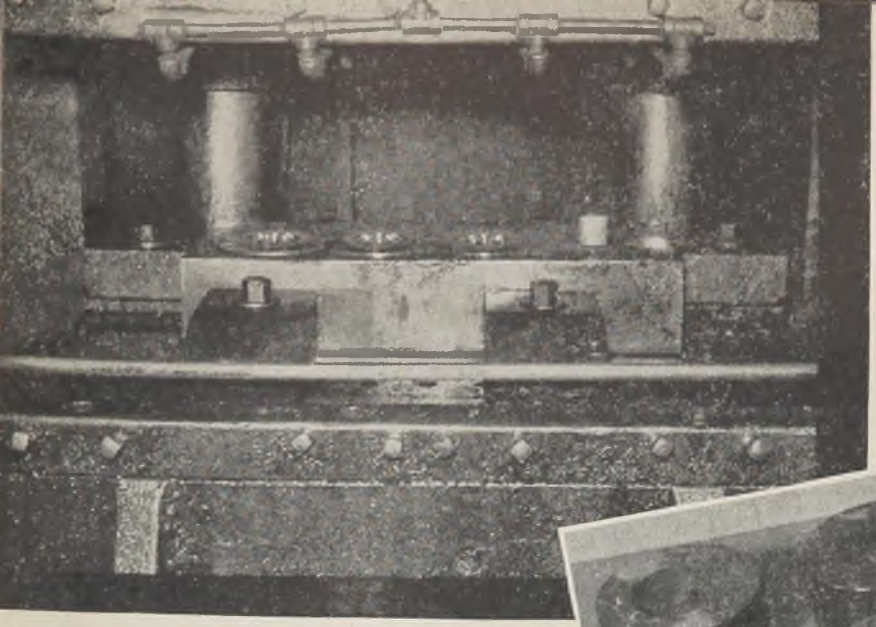
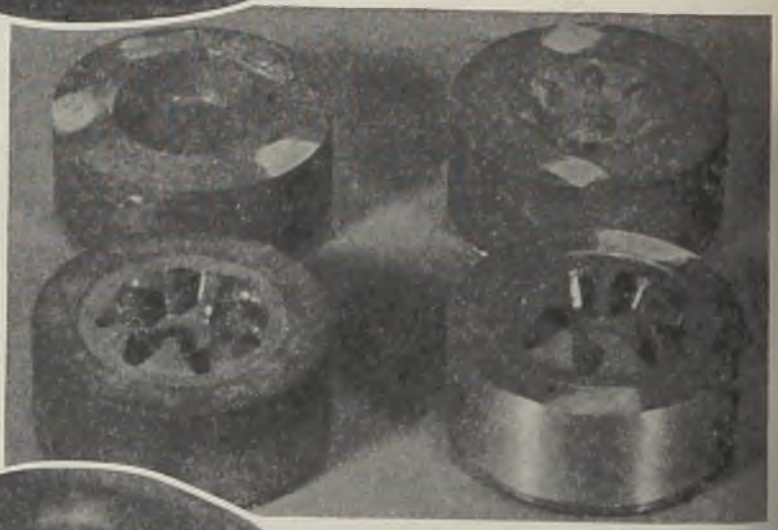


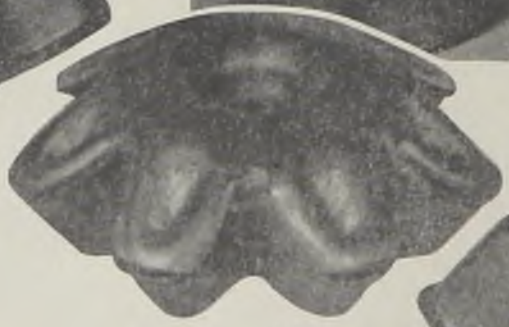
Fig. 1 (Above)—Upper and lower bolsters in place in forging press ready to begin run of pinions. Slug in die at extreme right will be upset, next semi-forged in die No. 2 and finished forged in die No. 3 or 4. Latter two are used alternately to prevent overheating

Fig. 2 (Above)—Complete set of dies used in forging gears. Dies at extreme right upset bar stock slug. Second pair performs semi-forging operation and third and fourth pair the final forging operation

Fig. 3 (Above)—Semi-forged slug is shown at left with completely forged pinion at right. The flash will be trimmed off next and the pinion will be ready for coining

Fig. 4 (Right)—Dies at the right semi-coin the forged pinion, forming a depression in back of each tooth which takes excess metal displaced in coining with dies at left





g. 5 (Above) — Both sides of a mi-coined gear are shown here. ote the depressions in back of each oth which will take up excess metal in the final coining operation

Fig. 6 (Right)—After three forging and two coining operations, the pinion is ready for final finishing. Note the smooth tooth surfaces which require no further machining

Hind COINED GEARS

. . . . save more than 50 per cent of stock; cut cost from 10.2 to 18.5 per cent; eliminate need for special gear cutting equipment

MARKED SAVINGS of critical materials and machinery as well as time and costs have been effected by the Timken-Detroit Axle Co., Detroit, through its forging and coining process for making differential pinion gears.

The company has been well-known for many years as a leading manufacturer of automotive parts but a few months ago it faced the problem of stepping up production of driving axles for military equipment. The fact that most military vehicles, unlike civilian automobiles, are all-wheel drive only served to accentuate the problem from a quantity standpoint. Each vehicle has at least two drives—and often three—with each driving axle requiring four differential pinions.

High-traction differential pinions with variable leverage teeth previously made principally for tractors were specified for the military vehicles. These pinions were made on special gear cutting machines incorporating a cam arrangement actuating the cutting tools and it was impossible to get additional equipment in time to meet the vastly increased schedules set up by the armed forces. Fortunately, early in 1941, R. J. Goldie, vice president, had conceived the idea of forming pinions by forging and coining; subsequently the necessary experimental work was done under the direction of C. L. Wilbur, forge division manager.

Two sizes of pinions now are being turned out in quantity by the new method, the smaller of which is designated as No. 1 and the larger and heavier one as No. 2. In applying the process, it was decided to concentrate on pinions because of the large number required and because volume was necessary to justify development expense. Further, it was found that forged pinions held up better in the field than ones machined from bar stock. Also, there was the matter of smaller die cost for pinions as compared with side gears.

Adoption of the process already has been fully justified since savings of steel alone to date have amounted to around 2,000,000 pounds. On top of this, further savings of critical alloying elements have been effected by switching from alloy steels to national emergency grades.

The cost of producing the No. 1 pinion has been reduced 10.2 per cent as compared with semi-forged and cut pinions. In the case of No. 2 pinion, the reduction has been 18.5 per cent. Scrap loss now is less than 1 per cent and rejections are at the almost infinitesimal rate of less than one-fifth of 1 per cent.

From 12,000 to 16,000 No. 1 pinions are being produced from one set of forging dies and 18,000 to 20,000 from the coining dies. Forging die life is from 8000 to 10,000 pinions in producing the larger size and coining die life from 15,000 to 16,000.

The savings on material can be more adequately visualized when it is explained that the smaller pinion required bar stock weighing 1.65 pounds when the machining operation was employed as compared with a 0.92-pound slug for the forging process, representing a saving of 0.73 pound. Weight of the finished pinion is 0.50 pound. Saving in the case of the larger pinion is even greater, being 2.65 pounds. Weight of bar stock required was 4.77 pounds; forge slug weighs only 2.12 pounds.

Fig. 7 (Left)—Timken-Detroit engineers find reinforcements provide the answer to long die life. Dies are inserted into the reinforcements such as the one shown here by a light press fit

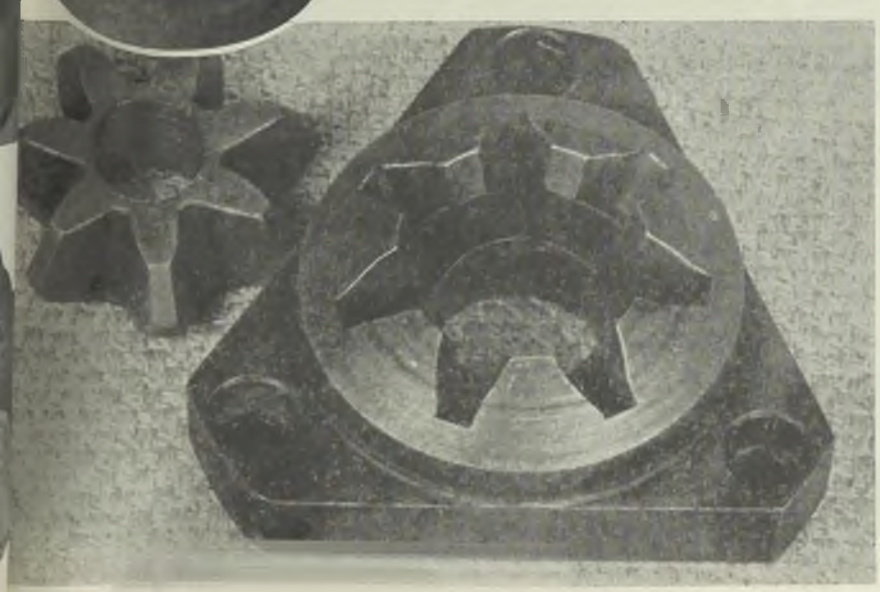


Fig. 8 (Below)—In the machining operations which follow forging and coining, the pinion is held and centered in this fixture which duplicates the coining die form

NE Steels Meet Full Requirements

In perfecting the forging and coining process, Timken engineers found that SAE-4620 worked out advantageously for the smaller pinion and SAE-4120 for the larger. The advent of the critical situation in all materials made it necessary to change over to leaner steels and at present the company is using some 2000 tons monthly coming under the national emergency ranges. NE-8720 has been substituted for SAE-4620 and NE-9420 for SAE-4120.

"We have found that the NE-8700 series steels meet our full requirements." reports Vice President Goldie, "and as far as we know their performance in service has been satisfactory. We have had to make some slight modifications in our handling and heat treating practice, but this has worked out satisfactorily.

"We have found that NE-8720 is a little more susceptible to surface scaling, during heating than SAE-4620. The forced use of alternate chemicals in pickling inhibitors has added to the cleaning problem. The NE-8720 steel must be handled more rapidly in quenching to get the required hardness.

"As for machining, our records show that NE-8720 is not quite as good as SAE-4620. However, this is not a problem in making these forged pinions.

"Since the 9400 series has been introduced we have been obliged to use it for some parts. To date we have found

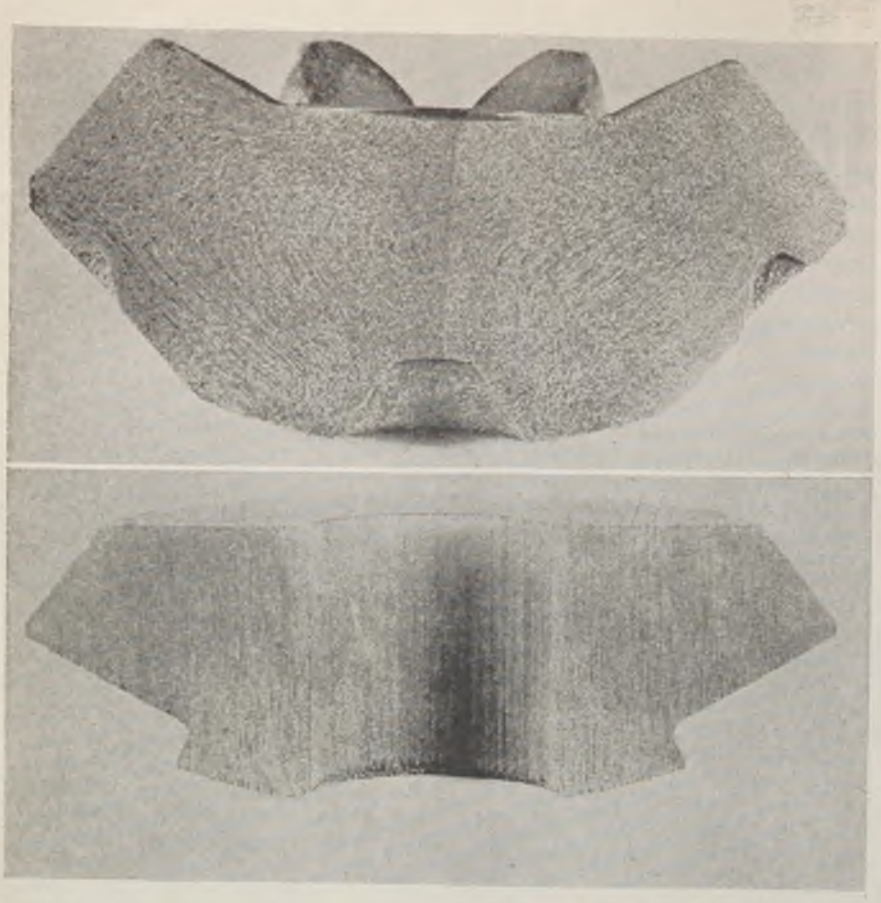


Fig. 9—Pinion machined from bar stock, at bottom, is compared with stronger forged and coined pinion at top. Note that stresses are exerted parallel with metal flow lines in the former, and at right angles in the latter

that it is about 85 per cent as good as SAE-4620 from the standpoint of gear life.

"One of these forged pinions was originally made of a 5 per cent nickel steel because it was a highly stressed part in a heavy duty axle and the design could not be changed to a heavier section. The alternate chosen for this steel was NE-8817 and it was the only steel available. Now that NE-8817 has been eliminated, the NE-8720 is the only steel left unless it becomes possible to get the original nickel steel on high priority."

In commenting on postwar prospects, Mr. Goldie expresses the opinion that large amounts of NE steels will be used. "They are based upon the sound principle that a small quantity of a number of alloys in steel is better than a large quantity of one. This principle has been known for a long time, but was not always applied until it was necessary to set it up in the form of the NE steels," he adds.

The original experimental work on coined gears was conducted with a 2000-ton crankpress built by the National Machinery Co., Tiffin, O., which was larger than needed but it did supply adequate rigidity for the work.

At the outset, it was desired to save as much material as possible and therefore it was decided to pierce the pinion hole in the forging process with just enough stock left for the subsequent cleaning-up operation. It was necessary to abandon this approach as coining would distort the pierce bore without properly filling out the pinion teeth. In other words, the metal was forced back into the pierced hole rather than into the pinion tooth cavities of the coining die.

Experiments then were conducted with a solid pinion and, while it was possible to force metal into the tooth cavities, either the flash at the contour of the large end or heel of the tooth was so heavy as to distort the tooth in removing it or the coining die would burst if the flash were reduced to reasonable thickness. Attempts to cold-work the metal were unsuccessful and the pinions now are formed at temperatures of 1200 to 1500 degrees Fahr.

Next, a cup-shaped depression was placed in the center of the spherical radius at the back of the pinion but this did not prove to be a solution as the metal apparently failed to flow fast enough to prevent die breakage. *It finally was decided to leave a depression in the large end of each tooth of sufficient area to absorb the metal displaced in the coining of the tooth and, after some experimentation, this device worked out well.*

A number of other problems also required solution before sustained production could be achieved. Coining dies were found to vary and this objection was overcome by making a theoretically perfect master pattern cut on a gear-cutting machine to which the coining dies were accurately fitted.

It was believed that gear teeth were distorting on hardening after the coining operation so master patterns and coining dies were made to allow for this distortion. However, it was found that the assumed distortion was a fine scale which, on removal in a light pickling operation, accounted for a different reading on a checking fixture.

Surface appearance was excellent after the coining operation but subsequent pickling and carburizing left too rough a surface when the scale was removed by pickling. However, it was found that a satisfactory surface could be developed by removing all scale by sand-blasting between the forging and coining operations and by following coining with a light sand-blasting.

In regular production work, the solid slug is upset in the first four pairs of dies shown in the forging press in Fig. 1. Teeth are semi-forged in the second pair of dies. The third and fourth pairs are identical and finish forge the teeth. These dies are used alternately to keep them from overheating.

In other words, the forging operation takes three strokes of the press, using first dies Nos. 1, 2 and 3 and then dies Nos. 1, 2 and 4. It was found that fewer than three stages in the forging process required an impossibly fast flow of metal and that more than three stages were unnecessary. A complete set of forging dies is shown in Fig. 2.

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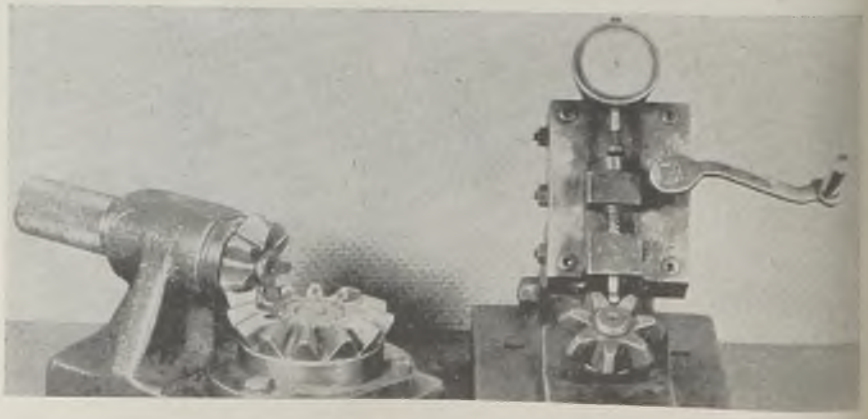
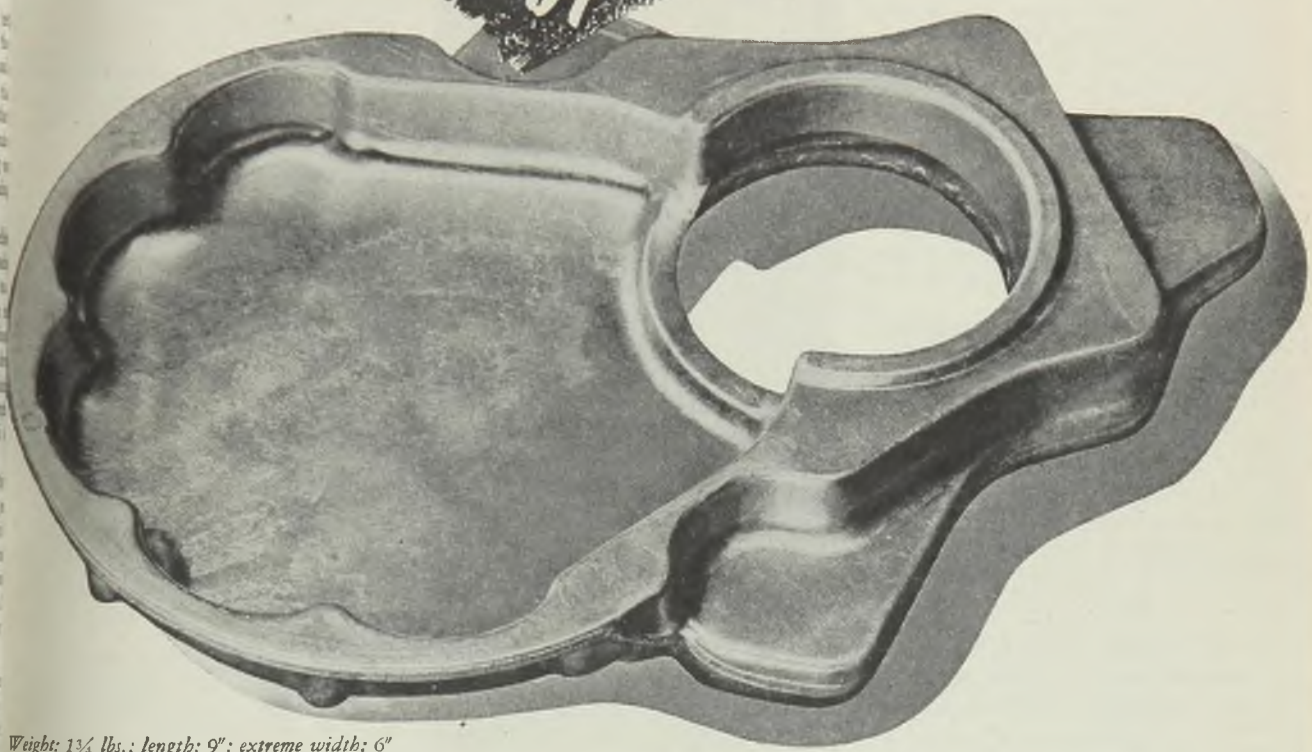


Fig. 10—*Pinions are checked for size and accuracy in balling and rolling fixtures shown here. Tooth depth is held within* 0.004-*inch*

AN INTRICATE DIE-PRESSED ALUMINUM FORGING

by REVERE



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BARGE CONSTRUCTION

INHERENT characteristics of greater fabricating speed, increased strength and rigidity, and marked reductions in weight effected through use of electric arc welding is graphically evidenced in today's use of the process in making a wide variety of light and heavy equipment.

Repeated verification of this fact is contained in many reports received by the Lincoln Electric Co., Cleveland, revealing how metalworking industries are setting new production records through the use of recommended welding techniques and methods.

One typical example which further indicates the practicability of welded design in watercraft construction was submitted to Lincoln Electric through the Brown Steel Tank Co., Minneapolis—a plant doing an outstanding job in building large pontoon sections for the U. S. Navy Bureau of Yards and Docks. Although lacking in complete details due to Navy restrictions, the information given reveals some of the reasons why welding has enabled industry to produce various types of watercraft at a rate which would be impossible by former construction methods.

A large battery of welding machines of 300 and 400-ampere capacity are used to weld-fabricate hundreds of these water-tight structures designated by the Navy as "T-7" sections. Several of these units are bolted together at the scene of action to other structures known as "T-6" sections, thus making up a complete invasion equipment barge.

In assembling the center sections, which are of square type construction, the flame and machine-cut pieces comprising the bottom, sides and flooring of these units are generally welded downhand in a flat position. Reinforcements inside the structure, fillet welded in the shape of T-members as shown in Fig. 1, give added strength and rigidity.

Single-pass butt, corner and fillet welds are used in the overall welding procedure with American Welding Society specifications E-6010 and E-6020 shielded-arc electrodes for mild steel the weld metal of which has a tensile strength (as welded) of from 65,000 to 74,000 pounds per square inch. Electrode sizes of ¼-inch diameter predominate.

The larger size has in most instances replaced the 3/16-inch size formerly used, thus providing maximum welding speed and efficiency.

An interesting sidelight on this pontoon construction job is the use of unique, portable positioning fixtures (see Fig. 3) which are used in welding the end sections. Built of odds and ends of scrap angles and I-beams, these shop-made positioners are joined together by welding and provide a convenient means of moving the work from place to place to facilitate production.

The positioners are designed so that the sections can be rotated, thus permitting corner joints to be welded in flat position despite the unusual angle of the pre-shaped bottom plate. Fig. 2 shows a welder completing a bead on a corner weld of this section.

Extremely rigid and nonbuckling construction is effected by the framework of reinforcing members, welded to the interior of the sections (see Fig. 4). These supporting braces are made up of mild

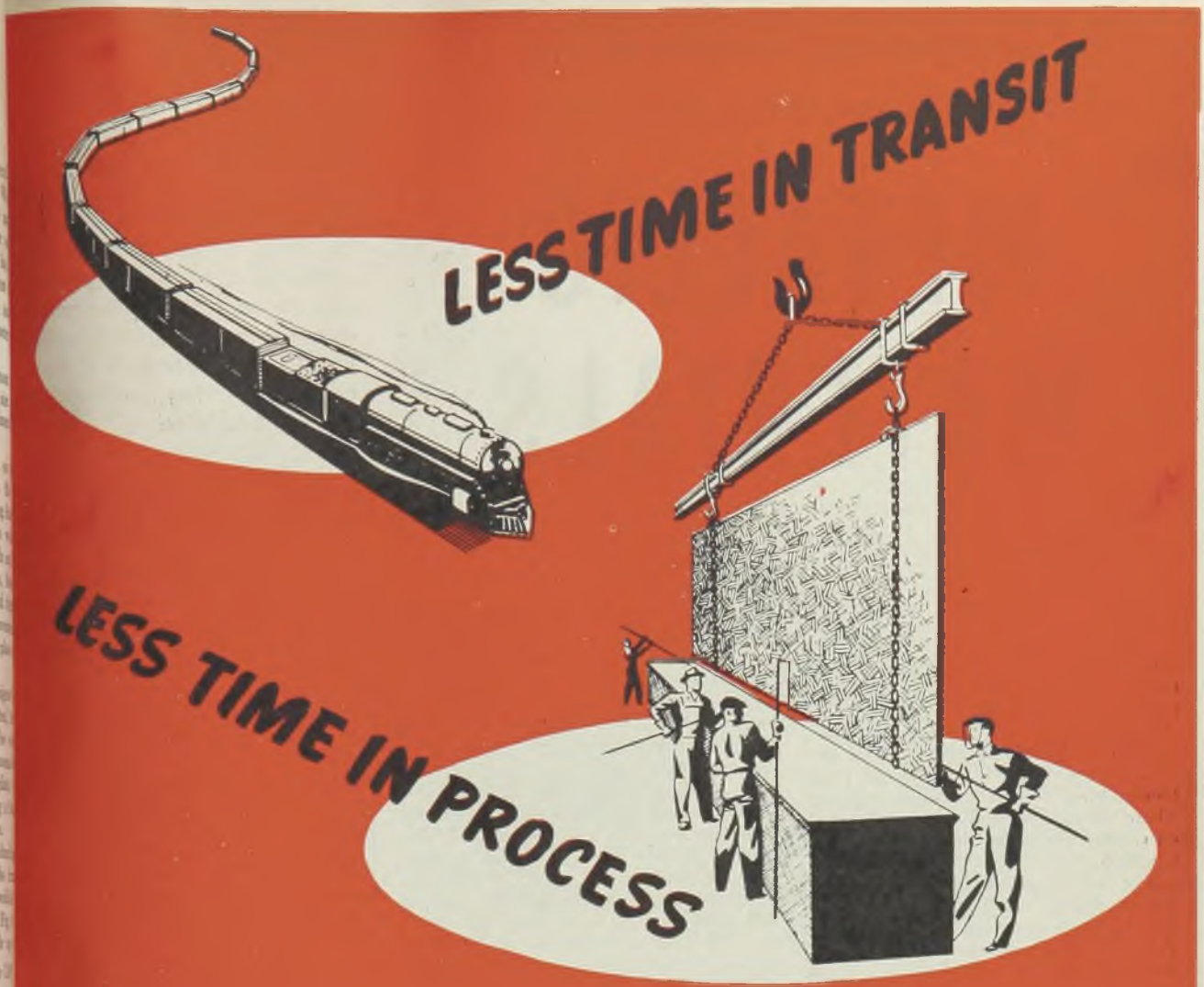
(*Please turn to Page* 119)

Fig. 1 (*Upper right*) — *Welding two center sections of pontoon unit*

Fig. 2 (*Right*)—*View of welding positioner in use*

Fig. 3 (*Left below*) — *Portable, weld-built fixture used for positioning end sections for maximum welding efficiency*

Fig. 4 (*Below*)—*Interior construction detail of end section showing method of welding reinforcement members*



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AN ENGINEERING APPROACH TO THE

SELECTION, EVALUATION AND SPECIFICATION OF

METALLIC MATERIALS

Dr. Gillett continues his discussion of special tests in the eighth installment of his report for the War Metallurgy Committee presented here, declaring that standard procedure aimed to appraise the properties of metals wholly fails in determining properties which count in bearings. Various types of bearing materials are frankly analyzed

By H. W. GILLETT

Bearings

BEARINGS are an outstanding case where "standard" tests, aimed to appraise the properties of *metals*, wholly fail to appraise those properties that really count in actual *bearings*. Nevertheless, bearing bronzes are still specified on the basis of the tensile properties at room temperature, determined on a test bar whose dimensions and rate of freezing on casting are unlike those of the bearing itself.

The compressive yield strength, or almost equally well, the hardness, at the bearing operating temperature is about the only property determinable by "standard" testing methods that has direct meaning. Even this falls down in the case of a lined bearing where the thin lining is supported by the stronger back, for compression tests of massive metal of the same composition as this thin lining do not reveal the resistance of the backed-up lining.

Tests need to be made on bearings themselves, and for bearing properties, for example, with special equipment, such as that of Fig. 41. Though this is obvious, laboratory tests on bearings have not developed to the point where they can be termed either standardized or accepted by engineers.

Because bearing failures are disastrous and little understood, engineers are inclined to regard bearings with awe and to be reluctant to make any changes in a workable design. Tradition largely governs design, to such an extent that substitution in the field of bearings is very difficult. Any tests, regardless of their soundness, are viewed with suspicion and alternate bearing materials find it hard to obtain trial on the basis of test results.

Bearing tests, like those for corrosion and wear, must simulate the important features of service, and the type of failures produced in test must be the same type which are encountered in service.

A bearing consists of the bearing itself, the oil or other lubricant, and the shaft or other coacting part. As long as there is oil between the parts, nothing happens. After a stop the oil film becomes more or less squeezed out, allowing metal-to-metal contact between minute high spots on shaft and bearing, except for any film of metal oxide adsorbed oil, or other material of that nature that may remain on these spots.

On starting, the relative motion tends to rub the spots clean and put them in condition to weld, i.e., to gall. If the bearing is too heavily loaded at this time or the bearing metal unsuitable, the starting torque will be high, galling will start between high spots and damage will be done before the oil-pumping action of the bearing pulls in a complete film of oil. In very heavily loaded bearings it is necessary to lift the shaft off the bearing by oil pressure before starting.

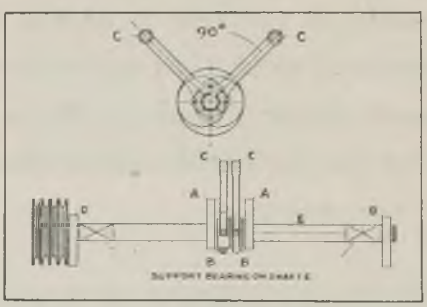

Fig. 41—Principle of a bearing tester developed by the General Motors Research Laboratories, used for determining the overall behavior, as to fatigue resistance and seizure, of full size automotive connecting rod bearings. The shaft, which is eccentrically loaded, applies a force alternately to the two bearings as it rotates. The eccentric mass is calculated to produce loads approximately the same in amount and variation with time as in actual rod bearings, at operating speeds. (Courtesy General Motors Research Laboratories)

Once the full liquid film of oil is established, the bearing should run without trouble unless something happens to puncture the oil film, such as deflection of shaft or bearing under load due to lack of stiffness, excessive loads, or to the entrance of a chunk of grit that cuts through the oil and oxide films and plows up a furrough in the bearing, clean and in condition to weld onto the shaft. The quicker the grit is embedded clear below the surface of the bearing, the less danger from this source, but if it sticks in without being covered, it acts as a lap.

The bearing heats up in running, due to friction within the oil and due to any incipient seizure phenomena that may have occurred, deformation due to thermal expansion sets in, and, if the bearing is temperature-sensitive, it gets softer.

On stopping, the oil film thins out as the bearing slows down and local contact and seizure phenomena are again favored. Plastic flow under pressure transmitted through the oil, or directly when the oil film is imperfect, may squeeze the bearing metal and allow it to become bell-mouthed to accommodate shaft deflection. Excessive play in too large a clearance may exert a pounding action.

For material under such conditions of service, the ordinary mechanical tests are of no value, for none of them measure the elusive properties which make bearing metals different from most. Such properties can be measured only by running the material as a bearing and finding its behavior under load. Tests of bearing materials in this way show that excessive loads cause failure by seizure, which results from high friction leading to excessive heating. "Bearing metals" differ markedly from those that are not bearing metals, by carrying much higher loads before seizure occurs. The reason for the high seizure resistance of good bearing materials may be due to a high capacity to adsorb an oil film, or to acquire an oxide or other nonwelding film (beneficial dirt) or to some other property not apparent. At any rate,

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the only way to evaluate this property, which is perhaps the only one which might properly be called a "bearing" property, is to test it as a bearing.

Certain mechanical properties are needed in a bearing for fairly well understood reasons. Some of the features needed are, an adequate compressive yield strength at operating temperature to resist squeezing out under the bearing load[96], yet a yield strength low enough, if possible, to embed a grit particle. A low modulus of elasticity, so as to allow considerable elastic deflection back of a piece of grit, or to accommodate shaft deflection, may be an asset. Many bearing metals do have low elastic moduli. Fatigue resistance is needed for intermittently loaded bearings which often fail in fatigue. Cracking occurring on a lined bearing may be due to lack of fatigue resistance of the lining, or of imperfect bond between shell and lining. Notched-bar impact resistance might possibly be a feature in a very loose bearing with improper oil grooves, but the service does not allow deformation of the order produced in an impact test to fracture.

Thin Lining Superior

Modern babbitt lined bearings have very thin linings for reasons analogous to those that demand thinness in soldered joints, the support given by the backing makes the thin linings very much stronger than a massive specimen of the lining material. With precision machining so that a bearing will finish up without cutting through to the backing, and with rigidity in shaft and bearing, it is possible to make the lining thin enough so that this added strength is utilized. By such means, the automobile engine is adequately served by lead-base babbitts that, in massive form or in thick linings, would not have a high enough compressive yield strength to resist squashing out, but which, in the thickness used, are at least as satisfactory as were the thicker, tin-base babbitts previously used, even though the lead-base babbitts get so soft at bearing operating temperature that they were not suitable when thick linings were in vogue.

A committee of the Society of Automotive Engineers says[97], "Lead-base babbitt bearing can be expected to show mileage superior to that of tin-base *providing* the babbitt thickness does not exceed 0.035-inch. Between 0.035 and 0.060-inch the performance can be expected to be on a par. If the lead-base babbitt is over 0.060-inch thick, its performance will probably be inferior unless the severity of operation is reduced."

A candidate alloy, aspiring to be a "bearing metal", can be given a preliminary examination as to hardness at room and at bearing operating temperature. In the case of lead-base alloys where rate of application of load influences strength and where precipitation and aging tendencies might be present, slow loading in the hardness test, after proper aging, is necessary. The compressive yield strength on massive specimens can be directly determined, or similar information be obtained, and more conveniently than by regular compression testing at elevated temperatures, by the repeated pounding test developed at the Bureau of Standards[98]. The specimen for this, though small, is still massive as compared with a thickness of modern bearing lining. Some idea of resistance to squashing and of embedability can be had from such tests.

A propensity toward seizure has to be measured by some test in which the material of the shaft, with the finish to be used on the shaft, is rubbed against the material of the bearing, with the finish it is to have, in the presence of the lubricant to be used, and, to complete the story, in the presence of representative grit. Since bearings operate at an elevated temperature, provision must be made for control of temperature.

A convenient seizure test can be made on the Amsler machine shown in Figs. 42a and 42b[99]. The method of operation is described in the captions. Another device is shown in Fig. 43.

The regulation endurance test, on massive specimens, does not appear to give information of much value. A type of repeated flexure test that can be run on bushings or on lined bearings is illustrated in Figs. 44 and 45.

The engineer has a general background as to the hardness, seizure resistance, etc., of the alloys that have served for linings or for bushings under various conditions of load and speed, for bushings of given dimensions and clearance. If tests such as those outlined above, indicate that the new alloy is not too obviously lacking in some important feature of behavior, it can then be examined in simulated service, in actual thickness, finish, shaft clearance, etc. The General Motors machine, though specially designed for testing connecting rod bearings, can give information, especially on fatigue resistance, useful on other bearings. Or, an actual bearing can be made and tested for behavior, particularly as to seizure, as in Fig. 46.

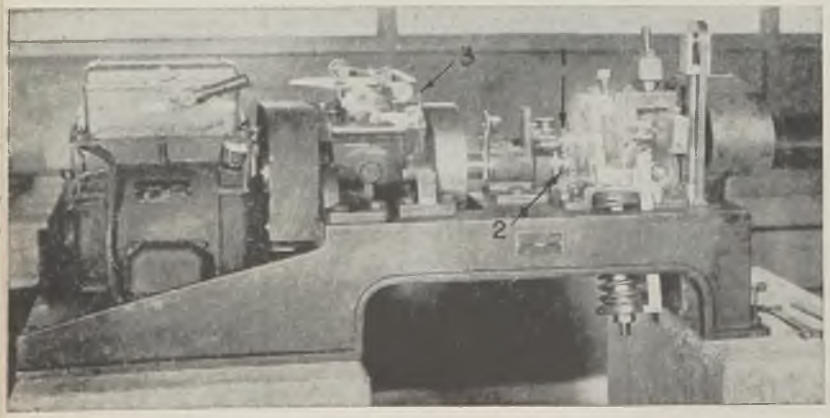
Some idea of the behavior of the alloy as to corrosion by active oil can be had from special tests, such as the Underwood test, but such tests are notorious for failing to place materials in the proper order if any deviation is made from the exact type of oil and the exact temperature of service.

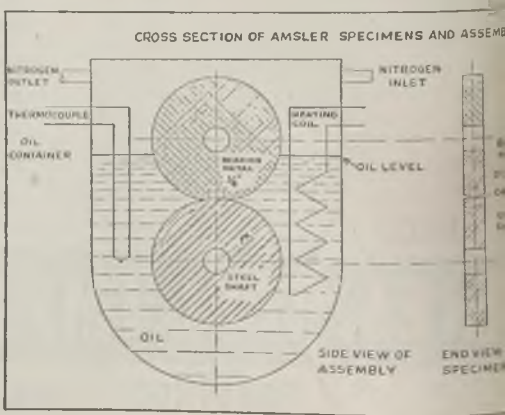
Even all these tests put together do

Fig. 42a (Left below)—The Amsler wear testing machine, on which seizure tests of bearing metal can be made. The results obtained have been found to be related to seizure in full-size bearings. 1. Specimen. 2. Shaft. 3. Torque recorder. The specimen and shaft may be enclosed so that temperature and atmosphere may be controlled as shown by Fig. 40b

Fig. 42b (Below)—Schematic diagram of bearing and shaft assembled for test and detail of the specimens used in the Amsler machine. The bearing specimen can be smaller than shown, set into the upper disc. The bearing specimen does not rotate in the seizure test. Before the test proper is begun, the bearing is worn in to the shaft to eliminate variations of fit and finish. In the test, the load is increased in gradual stages until the coefficient of friction rises sharply—the region of incipient seizure. The load at which the increase occurs is called the seizure load, for in an actual bearing such an increase of friction would cause so much heat generation that actual seizure would occur.

All good bearing materials have high seizure loads





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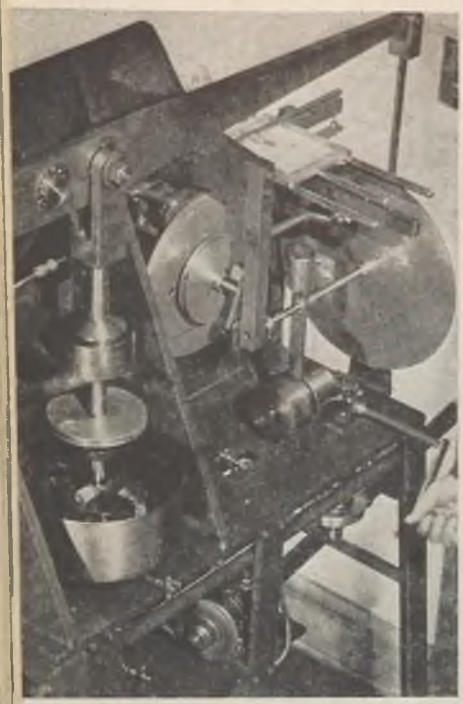


Fig. 43—A seizure tester in which pivoted pad thrust bearings are used. The principle of operation is much like that of the Amsler machine

not guarantee that the alloy is entirely suitable for a given installation, especially if the exact features of stiffness of shaft and bearing in the actual design have not been duplicated, distortions that may occur through the particular temperature distribution in the actual design, are unlikely to be duplicated in a test setup. Cruel and unusual punishment may be present in actual service. But, as far as a bearing material can be evaluated prior to actual service, such tests can at least indicate whether the material is unsuitable or has a chance. In the case of substitutes, where it is known that certain materials have worked in the past, there is considerable assurance that the new material will work if it behaves in the test about like previous materials showing favorable reactions.

By such tests, and by actual service, a variety of bushing alloys and bearing linings have been developed for different types of service. In attempting to generalize on the metallurgical requirements of a bearing from the particular cases of alloys found useful in service, the superstition grew up that a bearing has to have hard particles in a soft matrix or soft particles in a hard matrix, and that a uniform, homogeneous metal or alloy could not act as a bearing.

This is a backhanded way of saying that depressions, such as are produced by wearing in when the bearing has hard particles in a soft matrix, are good oil reservoirs, but neglects the obvious fact that the depressions could be mechanically produced. There are strong advocates of intentionally pockmarked bearings. It also neglects the fact that, within their limited load carrying ability, massive bearings of pure lead have excellent behavior, and that pure silver bearings coated with pure lead are among those best suited for severe duty, the load carrying ability of the lead film being vastly raised by its stronger backing.

Another thing that is disregarded when the usual generalizations are expressed as to soft pools in a hard matrix, is that these soft pools are generally lead, and provide a smear of lead over the surface. Outside of the tin-base babbitt (which contain a smearable matrix) and some extremely hard high-tin, nonleaded bronze bushings used with ample lubrication and only in very special service when exceptional compressive yield strength is needed, nearly all our good sleeve bearing metals contain lead or cadmium, or some very soft metal that smears as lead does.

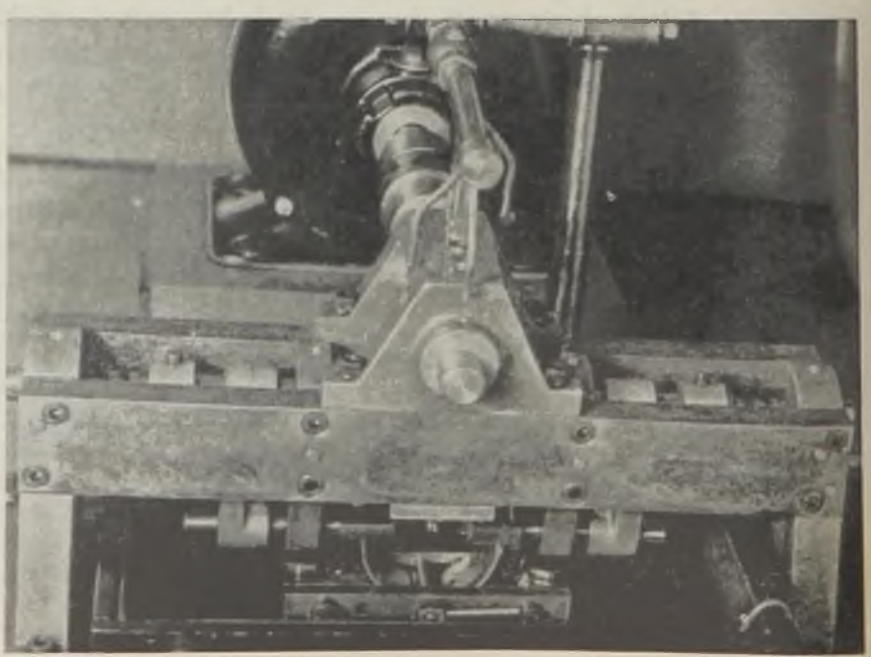
The common bearing alloys are the tin, lead, or cadmium-base babbitts, and the leaded bronzes. Tin-base babbitts, tin hardened with antimony and copper, were the standard of excellence when thick babbitt linings were in vogue, though lead-antimony and lead-antimony with a little tin were always used in larger tonnage than the tin-base alloys and were generally adequate for those cases where the operating temperature was not too high. The lead alloys lose compressive yield strength and hardness as the temperature rises, while the tin-base alloys do not soften to such a degree.

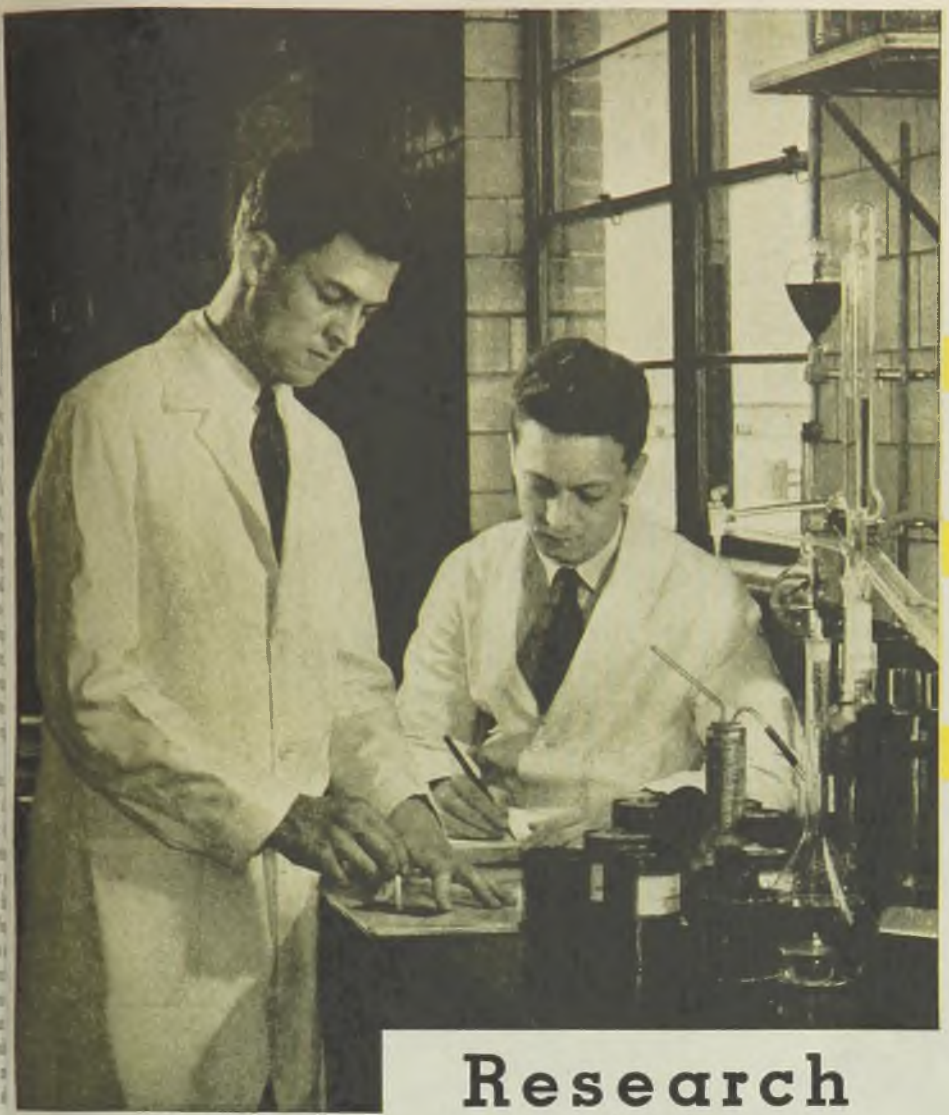
In very thin linings, the regular, old-time, lead-base babbitts act as well as did the tin-base babbitts in thick linings. Cadmium-base babbitts then came to the fore, which were able to stand somewhat more severe duty than even the tin-base babbitts, and whose hardness temperature curve only fell off slowly with temperature, much as the tin-base babbitts do. The corrosion resistance of cadmium-base alloys to active oil at high temperature is much poorer than that of the usual lead-base alloys, so, while the cadmium alloys surpass tin-base in load-carrying ability, they are inferior in those cases where neither excessive temperature nor active oil can be avoided. The cadmium-base babbitts would serve widely in place of tin base, were there enough cadmium to meet the demand, but there is not.

Modification of the usual lead-base babbitts has taken two routes, the older one employs calcium as a hardener, plus a small amount of tin, and other elements for further hardening, or to improve resistance to active oil. The corrosion resistance is not, however, sufficiently improved. The necessary control of the calcium content brings in a production problem such that skill and experience are needed, the alloy does not have as favorable "soldering" or "tinning" behavior as some others, and the relatively poor corrosion resistance limits it to rather low temperature use, but it does serve as a limited replacement for tin-base babbitt.

The other modifications retain antimony as the main hardener, use a little tin and introduce either arsenic or silver to bestow better hardness at elevated temperatures. Although former specifications for lead-base babbitts limited arsenic to 0.25 per cent or less because of alleged brittleness and injury to bonding properties, one alloy uses about 82½ lead, 15 antimony, 1 tin, 1 arsenic and ½ per cent copper, to duplicate the behavior of average tin-base babbitts, and may even have still higher arsenic content. Another combines the solder-

Fig. 44—Test for fatigue of a lined bearing half-shell. The shell is held in place by the pin at its middle. The two ends are flexed by the reciprocating device through 0.003-inch. The specimen is submerged in an oil bath kept at the desired temperature. Courtesy Bohn Aluminum & Brass Corp.





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ing properties of the lead-silver alloys with the bearing properties of the lead-antimony alloys and balances the antimony and tin contents so as to produce satisfactory resistance to corrosion by active oil. This contains 10 to 15 antimony, 2 to 3 tin, 2 to 5 silver, and up to around 0.25 per cent copper, depending on the grade of tin-base babbitt, hard, medium, or soft, it is desired to duplicate. This has good bonding properties and a hardness-temperature curve coinciding closely with that of the grade of tin-base babbitt being duplicated.

These alloys use much less tin than does the common lead-base babbitt of 75 lead, 15 antimony and 10 per cent tin, in which the tin is kept high primarily for bonding purposes.

The lower-tin, common lead-base babbitts, the calcium hardened or arsenic hardened types, may need "tinning" of the bearing shell before applying the lining metal. For such "tinning" the 96 lead, 4 per cent silver solder is useful.

There is little need for tin-base, cadmium-base or specially alloyed lead-base babbitts when extremely thin linings are used, for lead containing 10 to 15 antimony, 2 to 5 tin, and up to 0.25 per cent copper, applied with good practice as to fluxing and "tinning", will do about all that any babbitt will. It is in the cases where thick linings have to be employed, as because of machining tolerances, or for relining old bearings, that the special babbitts fill a need. Practically all the needs formerly served by tin-base babbitts can be served by babbitts with not over 5 per cent tin.

"Copper Leads" for Hard Service

For service too severe for babbitts, recourse is commonly made to "copper leads", a group of alloys with a matrix of copper or copper with a small amount of tin, sometimes with a little silver, or nickel instead of, or together with the tin, carrying 20-35 per cent lead distributed through the matrix in pools. The lead smears over the running surface and the pools from which it comes, wear down or corrode down to provide little oil-holding depressions. The matrix itself has none too good resistance to galling, the alloys will not stand starved lubrication as well as the babbitts, they do not wear in rapidly, they require hard shafts, increased clearance, and uninterrupted lubrication, as compared with babbitt, and securing uniform distribution of lead in tiny pools instead of in large gobs, is a headache to the producer. The cost of a good copper-lead bearing is all out of proportion to the cost of the raw materials because of the fussy control that has to be exercised, in respect to lead distribution and to bonding.

In spite of these drawbacks, and of the danger that the lead will be corroded out of the surface by active oil, the higher compressive strength and especially the load-carrying ability at elevated temperature of the copper-leads over babbitt have led to their wide use. One saving grace is that when a bearing

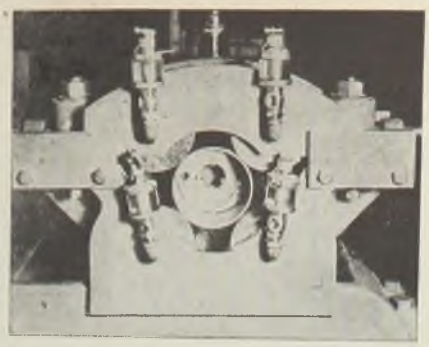

Fig. 45—Fatigue and bonding test of full lined bearing. The four rollers deflect the bearing shell, which is rotated at 2500 r.p.m. If no cracking of the lining or bond failure occurs in 15 hours, the specimen is considered satisfactory. Courtesy Bohn Aluminum & Brass Corp.

does fail, there is some chance that enough lead will melt out, with the matrix staying put, to prevent quite as much damage as when matrix and all melt out, as with babbitt.

For very severe service, as in aircraft bearings, silver is coming into important use. It has a fairly low elastic modulus, about 10 million, is very fatigue resistant, its hardness, about 25 brinell, is not too high to afford some embedability, indeed it is within the range of that of the stronger babbitts at room temperature, it maintains this hardness at bearing operating temperatures, and it is fairly seizure resistant. A little lead greatly improves its seizure resistance, but injures its bonding properties when cast on a steel back. Using pure silver to secure bonding, and electroplating a film of lead over the bearing face provides insurance against seizure, as long as the lead is not removed by oil corrosion. To avert corrosion, a still thinner film of metallic indium is sometimes plated over the lead. Another promising scheme is to make the bearing face, at least, by electrolytically codepositing silver plus a few per cent of lead. In fact, for linings of the thinness favored at present, making the whole lining by electrodeposition offers some advantages.

"Sandwich" bearing linings are in use in which a porous layer of bronze, copper-nickel, or the like, is adhered to the steel back by powder metallurgy methods, then the voids filled and the bearing surface provided with a lead-base babbitt. This scheme builds up a "copper-lead" type of structure, avoiding some of the bonding difficulties of the fused copper lead, and the babbitt pools are much more resistant to corrosion by active oil than is the lead of the copper-lead type.

Thus, for lined bearings, the engineer has a number of choices among excellent materials that have working properties previously afforded by the tin-base babbitts.

In unlined bearings, i.e., bushings, a copper-alloy matrix carrying lead pools, amounting to some 5 to 15 per cent lead, is the regulation material. These have high compressive strength as compared with the copper-lead linings of higher lead content, and can easily be cast with uniform distribution of the lead. The composition most used is 80 copper, 10 tin, 10 lead, though 85 copper, 5 tin, 5 zinc, 5 lead, is often found to serve. On the whole, however, too much zinc is considered to be detrimental to seizure properties, and a higher lead content than 5 per cent is preferred, so the tendency has been to cling to the 80:10:10 composition. When that composition is demanded, and the "impurity" limits are low, only scrap of 80:10:10 composition can be used, available scrap of other types cannot be worked in, so the requirement for new tin is high. It would also be helpful if the requirement for new copper could be kept low.

The extent of real engineering need for the high compressive strength of 80:10:10 has been questioned by Etchells and Underwood[100] who point out that if a plain bearing has to start under load, the permissible load is limited by the permissible starting torque, so that, unless some means is employed for lifting the journal from the bearing before starting, the unit load is held down to

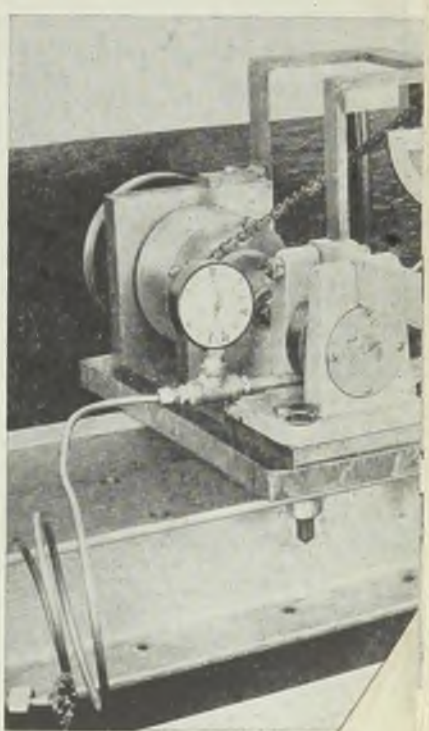

Fig. 46—A sleeve bearing testing machine used for studies of seizure. The load-carrying ability of the bearing is measured by finding the maximum load which can be supported without excessively high friction. Torque is measured on the driven shaft by the torque dynamometer. The apparatus can be driven at a wide variety of speeds

the order of 250-300 p.s.i. projected area. The straight copper-lead alloys will stand some ten times this load when operating at 300 degrees Fahr., so the use of alloys of very high compressive strength may not be as necessary as it often is considered to be.

Carrying this thought over to the less highly leaded alloys for bushings, it may not be necessary to strengthen the matrix, i.e., 90 copper and 10 per cent lead, with no use of tin, might serve in some instances where 80:10:10 has previously been used, since it withstands seizure better than 80:10:10. Another alloy of as good seizure resistance as 80:10:10 and much the same order of compressive strength is 85 copper, 10 lead, 3 tin and 2 per cent antimony, in which antimony replaces several times its weight of tin. Reasonable amounts of zinc appear compatible with this, so scrap, from which some of the zinc has been removed, as by melting in a Barrett cupola, common practice among manufacturers of leaded bushings, could be used to supply both the tin and the copper.

Still another alloy similar in general properties to 80:10:10 is 80 copper, 2½ tin, 2½ zinc, 10 lead, 5 per cent manganese, made for example, from scrap 85:5:5:5, and scrap copper, with the addition of the manganese and of such additional lead beyond that in the scrap, as is needed to bring it up to the 10 per cent level.

In fact, the most important feature of a bushing alloy seems to be the 10 per cent lead, and whatever level of strength and hardness the service demands the matrix have, between that of straight copper in 90 copper, 10 lead, and that of a bronze with copper and tin in the 80:10 ratio of the 80:10:10 alloy, can be provided from scrap and from other hardening elements than tin.

The designer can well make an examination of the needs imposed by the type of service the bushing will operate in, and select an adequate, available alloy that can be made from scrap without use of tin, rather than to call for a particular chemical composition that imposes a drain on strategic materials.

Finally, it should be recalled that for some types of service, cast iron, with its smearable graphite flakes for initial protection, and the places from which graphite has been removed, to serve as tiny oil reservoirs for later stages, and for others, porous bushings, of common bearing alloy composition, or even of iron, made by powder metallurgy methods and soaked with oil, have their places.

It takes only cursory consideration of the bearing problem to appreciate that the properties of metals that are usually measured and specified in the hope of securing quality do not appraise those methods for this use, and that, in order to meet the service requirements an assembly, varying from a bearing support plus a solid sleeve bearing, to one plus a bearing made up of several layers, has to be engineered out of different materials.

From this example, one may well advance to an equal degree of skepticism about the assumption that the usually measured properties really evaluate the qualities actually involved, in other structures and other applications. Measuring unused attributes and overlooking those that are used is obviously poor engineering in selection of bearing metals. Other cases are less obvious, but often are not much more defensible when the actual demands of service are listed.

BIBLIOGRAPHY

[96] Failure from lack of compressive strength is very rare among usual bearing alloys under proper operating conditions. Such failures usually reflect such a lack of proper lubrication as no bearing could withstand.

[97] Report to Office of Defense Transportation on Engine Bearings, by Society of Automotive Engineers, 1943, p. 3.

[98] French, H. J., S. J. Rosenberg, W. LeC. Harbaugh, and H. C. Cross. "Wear and Mechanical Properties of Railroad Bronzes at Different Temperatures". Bureau of Standards Journal of Research, Vol. 1, (1928) pp. 343-421.

[99] Figs. 42-46 are included here as a few out of many such outfits specially designed to give direct information on some of the variables that count in bearings. Similar collections could be shown for corrosion testing, high temperature testing, and so on, but these samples will serve to indicate that thought is being given, in laboratories everywhere, to searching out the conditions of service and rigging equipment to impose those conditions on metals and parts made from metals, instead of relying on conventional mechanical tests that do not directly appraise the attributes that the engineer is really going to use.

[100] Etchells, E. B., and A. F. Underwood. Practical Aspects of Bearing Design. 1. Lubrication, *Machine Design*, Vol. 4, Sept., 1942, pp. 84-87, 148.

(*Continued next week*)

Feeder Voltage Regulator Standards Issued by NEMA

The story of feeder voltage regulator stadardization is told in 28 pages in the new Feeder Voltage Regulator Standards, Publication No. 43-86, October 1943. This publication marks the first time that all of the standards of a national character having to do with feeder voltage regulators and step type voltage regulators have been published in one complete and self-contained volume.

Some of the subjects treated are: Temperature rise, effect of altitude, ratings, insulation, temperature, tests, performance specifications, bushing characteristics, guides for loading, efficiencies and losses, accessories, terminal markings, and a complete section on definitions of terms.

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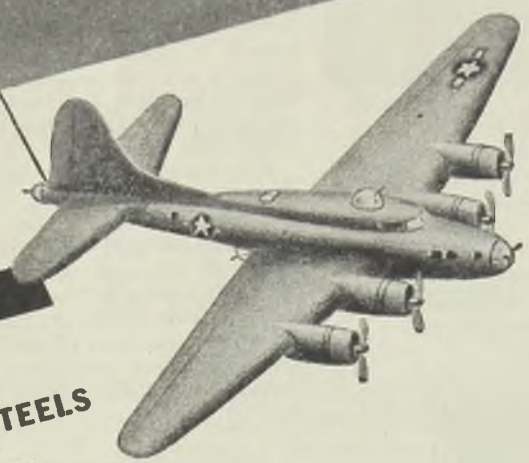

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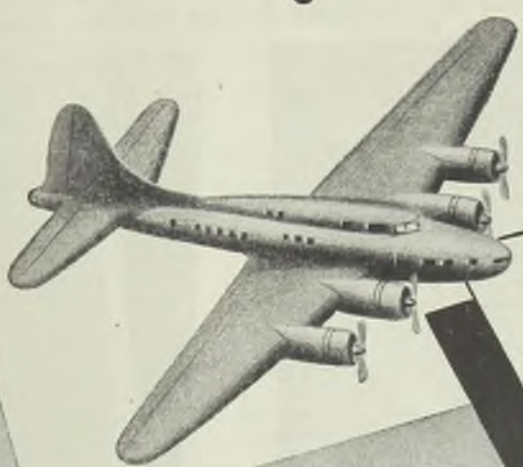

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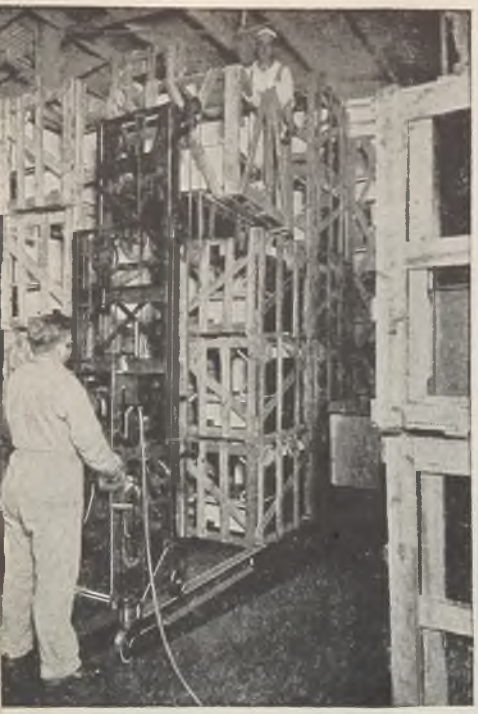
STACK to the CEILING

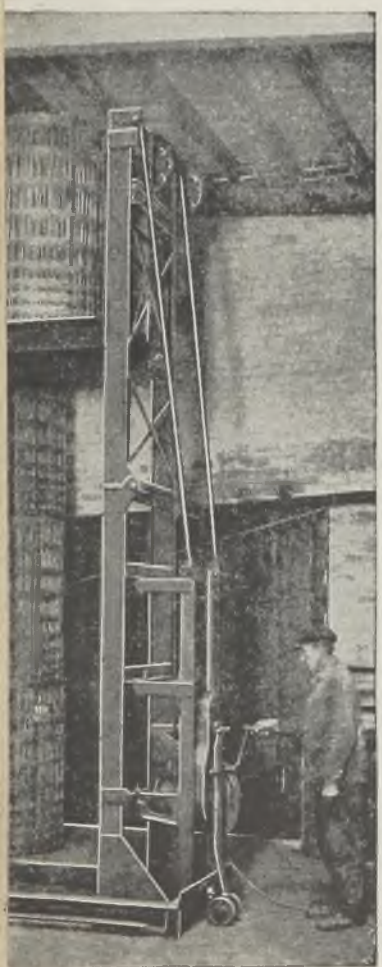
One plant enlarges its storage space 400 per cent (same floor area) by use of special stacking machine; indicates possibilities of using "overhead" space for the storage facilities you need

By W. J. KENNEDY
Barrett-Cravens Co.
Chicago



(Above)—Storing stoves four high with an electric telescoping portable elevator increased effective storage space 300 per cent in this plant

(Below)—Here a wire fence manufacturer obtains the additional space he needed by piling rolls of fencing four high



A CERTAIN manufacturer of enamelware lost out on a big government contract, because he learned about storage the hard way. This company is a leading manufacturer in its field. Consequently it encountered no difficulty in obtaining a sizable government contract early in this war because its costs of production were lower than those of its competition.

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The company wound up its contract one month late with a rejection of 15 per cent for damages and was barred from further bids for six months.

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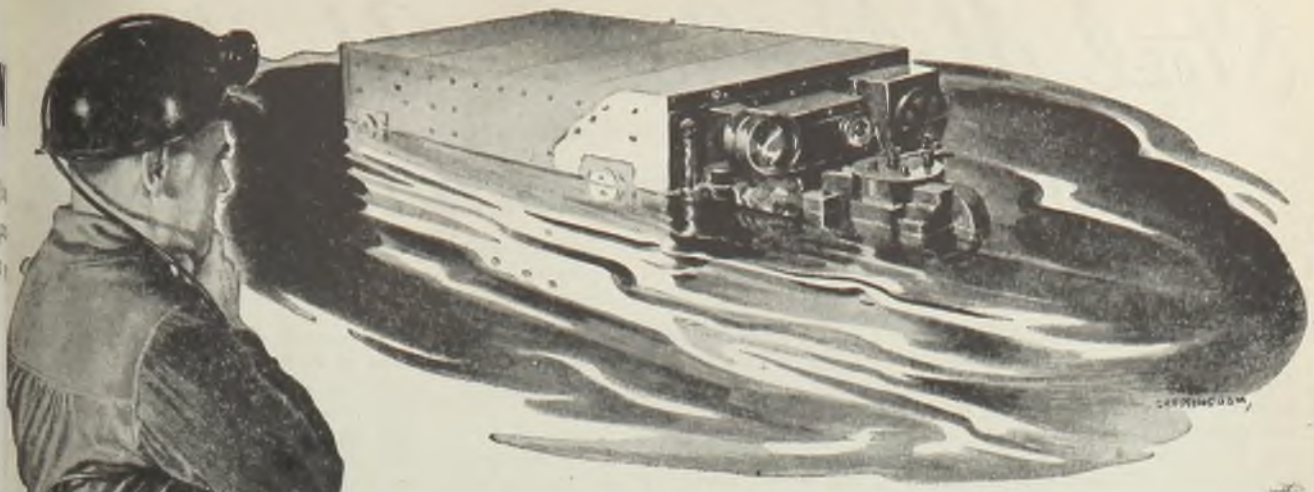
(Please turn to Page 122)

(Below center)—Storing radiators has always been a serious problem for radiator makers. Not in this plant, however, for here a portable elevator, operated from either side, makes the job simple and safe

(Right below)—This foundry and machine shop stores castings in a minimum of space by use of racks and skid boxes shown in background. Parts boxes on floor casters are stacked three and four high in the same manner



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★ It is simple to maintain. Merely charge adequately, add pure water, keep clean and dry.

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Some of the unique characteristics which account for the long life and dependability of the Edison Alkaline Battery are cited in the column at the left.

EDISON STORAGE BATTERY DIVISION, THOMAS A. EDISON, INCORPORATED, WEST ORANGE, NEW JERSEY

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ALKALINE BATTERIES

Steel Mill Boiler Units Use Supplementary Fuels

By M. H. KUHNER
Chief Mechanical Engineer
Riley Stoker Corp.
Worcester, Mass.

BLAST FURNACE PLANTS benefited probably more than most other industrial plants from the progress made in power boiler design during the past few years. Not so long ago the generation of steam in steel mills was done in long rows of small capacity boilers. Steam pressures were low. Good efficiencies seemed unimportant. A number of the boilers were equipped to burn blast furnace gas only, the rest coal or other common fuels. If the gas burning boilers could not take all the blast furnace gas available, the excess was simply exhausted to the atmosphere while at the same time other boilers were running along on costly purchased fuel.

In a group of mills all within a few miles of each other, owned by the same company, each had its own boiler house with its own crew of engineers, firemen and maintenance men. Large boilers with water-cooled furnaces were frowned on because safe and efficient combustion of blast furnace gas supposedly required heat re-radiation from refractory furnace walls. There was justification for this opinion because (1) ignition temperatures of blast furnace gas are high compared with other gases, (2) theoretical flame temperature is much lower than that of coal or oil and (3)

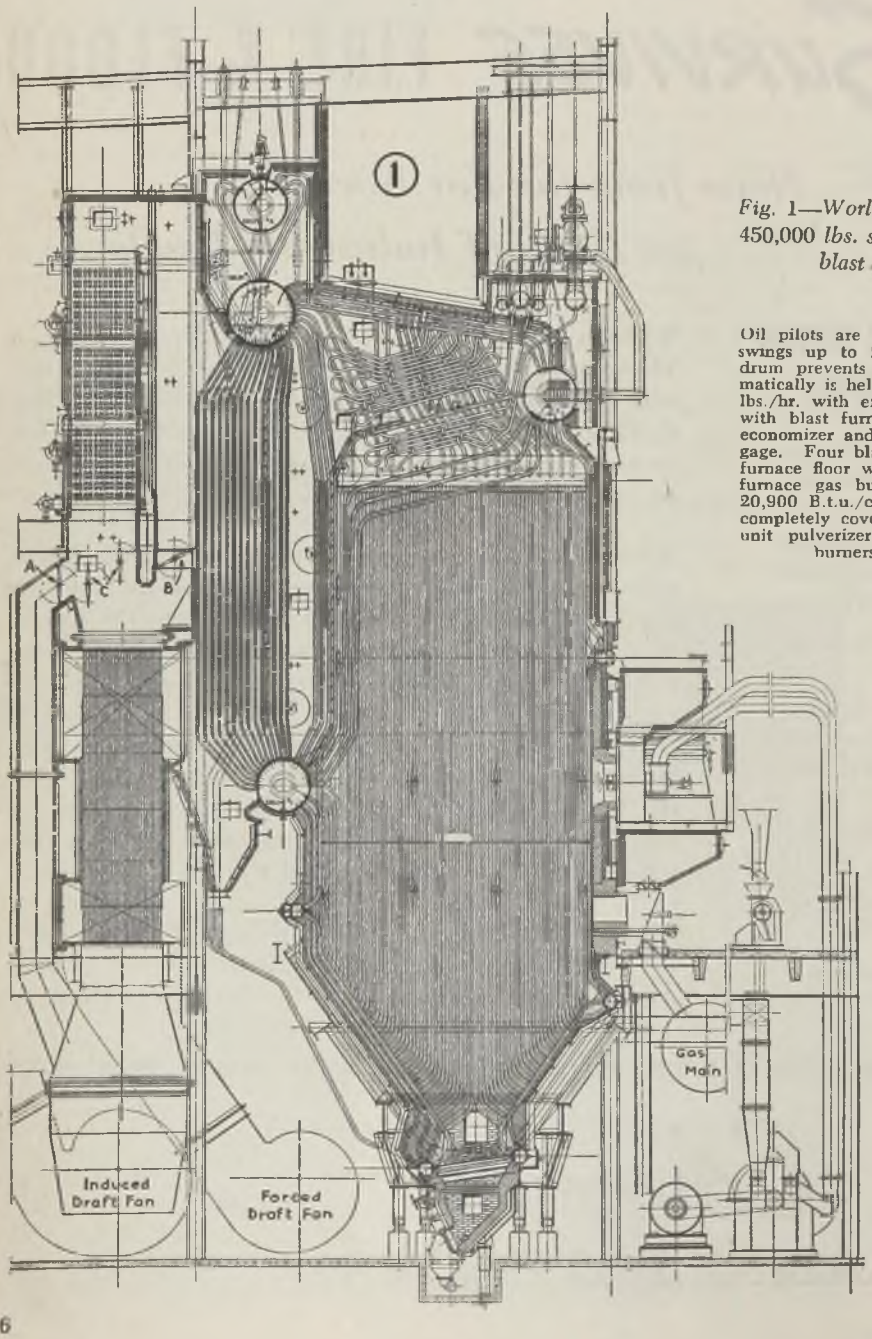
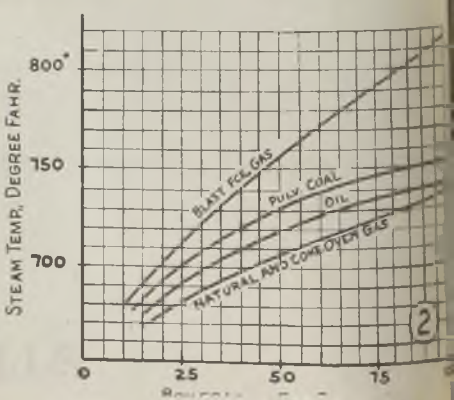


Fig. 1—World's largest steel mill boiler which generates 450,000 lbs. steam per hour at 500 p.s.i. at 750° F. with blast furnace gas and/or pulverized coal

Oil pilots are used for blast furnace gas burners. Steam load swings up to 250,000 lbs./hr. occur suddenly; steam receiver drum prevents possible carryover and steam temperature automatically is held constant at 750° F. for any load above 200,000 lbs./hr. with either fuel combination. At highest steam output with blast furnace gas only, part of combustion gas by-passes economizer and air heater to keep fan suction below 10" water gage. Four blast furnace gas burners are directly above hopper furnace floor with four pulverized coal burners 10' above blast furnace gas burners. Maximum heat release rate with gas is 20,900 B.t.u./cu. ft./hr. All walls of the 52' high furnace are completely covered by bare water wall tubes. Each of the two unit pulverizers is capable of supplying two pulverized coal burners with 14 tons of pulverized coal hourly

Fig. 2 (Below) — Characteristic steam temperature curves for five types of fuels. Fig. 3 (Opposite Fig. 2)—Steam temperature curves with a desuperheating type of control over high load range



High-capacity steam generating plants firing blast furnace gas in combination with pulverized coal are designed with low rate of heat release. Superheater performance affected by mass gas flow. Correct fuel-air ratio and combustion control require careful study when fuels are burned in combination

three-quarters or more of blast furnace gas weight entering the furnace is inert with the remaining combustible portion being mainly carbon monoxide.

Burners for blast furnace gas were not fully developed. Usually the gas entered the furnace through large pipes in heavy solid streams, combustion air penetrated the streams with difficulty, the flame was long and not too stable. Steam load swings were hard to handle and were preferably taken by coal or oil-fired boilers. The solid refractory furnace walls and constant firing rates made furnace conditions tolerably safe.

Later improvements in burner design permitted the use of completely water-cooled furnaces. Basically the improvements involved dividing gas and air streams into thin layers, allowing air and gas to mix thoroughly in or near the burner nozzles. Thus correct fuel-air ratio could be maintained, ignition and flame conditions became stable and heat reflecting brick walls were found unnecessary.

It was then realized that centralized steam and power generation would bring attractive returns by more economical use of the available fuels, lower maintenance expense, greatly reduced operating cost and above all, the insurance that steam and power are always available when and where needed. One or two large stations strategically placed near the blast furnaces to serve the entire mill or group of mills certainly represents much lower initial investment than a number of plants each with many small boilers and generators. Some of the central stations in steel mills are tied in with similar stations and public utilities for exchange of electric power.

Uninterrupted availability and reliability of power supply are of prime importance under this system. The central station must deliver power even though one of the blast furnaces supplying gas for the boiler house is out of service. Supplementary fuel becomes a necessity because only gas in excess of that used by hot blast stoves and gas engines is available. The economics do not permit standby boilers solely for supplementary fuel. Instead, the large steam generating units normally fired by blast furnace gas must be equipped to handle supplementary fuels. Because the cost of the supplementary fuel per unit of heat value is generally many times greater than that of blast furnace gas, high efficiency of steam generation is necessary.

Almost all modern high-capacity steam generating units now under construction or installed in steel mills within the last five or six years use supplementary fuels with blast furnace gas. Table I shows analyses of five typical fuels based on percentage by weight to permit direct comparison, and Table II lists these fuels as used in a number of recent steel mill steam generating units. The plants, whose names and exact locations are withheld by war censorship, are in Pennsylvania, Illinois, Michigan and Texas.

The steam conditions listed in Table

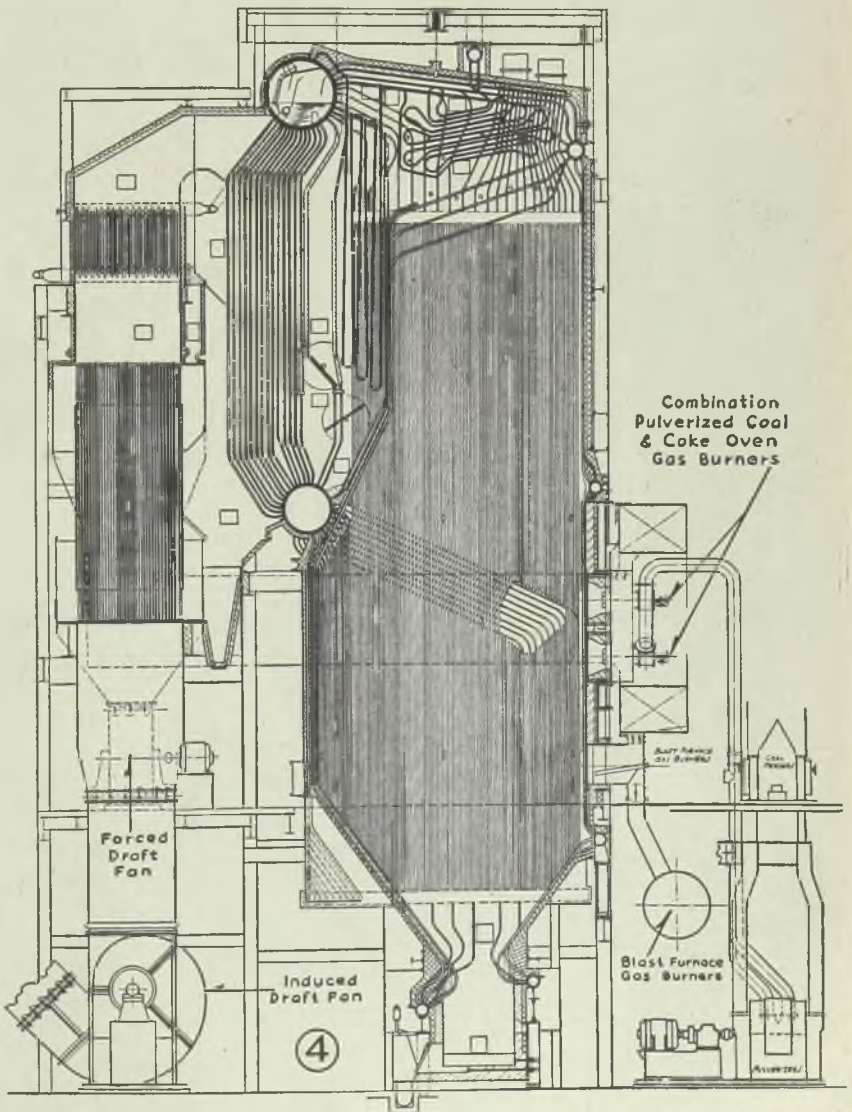


Fig. 4—Two units of this type now under construction each will generate 440,000 lbs. of steam per hour at 480 p.s.i. at 790° F., burning over 7,000,000 cu. ft. blast furnace gas or over 35 tons bituminous coal per hour

Any combination of these two fuels may be used. The water-cooled furnace is 32' wide and 65' high. One row of blast furnace gas burners is just above furnace floor hopper and eight flare-type burners for coal and coke oven gas are located above. Gas by-pass dampers control the steam temperature. Four pulverizers, each connected to two burners, are placed in the basement with coal feeders on operating floor. Two sets of motor-driven fans are provided; only one induced draft fan is used when coal and coke oven gas carry the load. Combustion air for blast furnace gas is heated to 530° F. by air heater

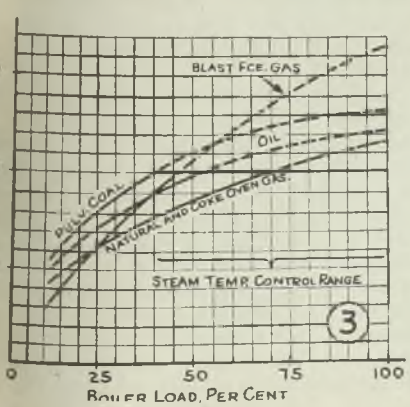


Table I—Comparison of Different Ty

Fuel	Analyses by Weight, Per Cent: Carbon C	Hydrogen H_2	Sulphur S_2	Carbon monoxide CO	Methane CH_4	Ethylene C_2H_4	Ethane C_2H_6	Benzene C_6H_6	Carbon dioxide CO_2	Nitrogen N_2	Oxygen O_2	Ash	Moist.	Heat value, B.t.u./lb.	Comparative overall efficiency o same boiler unit, %	Excess air for combustion, %	Lbs. fuel consumed/million B.t.u recovered in steam generated	Lbs. comb. gases/million B.t.u. recovered in steam generated	Wt. of comb. gases compared with coal, %	CO_2 in combustion gases, %
Blast furnace gas		0.16		23.49	Trace				21.51	54.84		Trace	Trace	1,140	82.0	18	1071.0	1873	162.0	24.5
Natural gas					84.30		4.80		2.40	8.50				21,270	82.5	10	57.0	1015	87.7	10.5
Coke oven gas		9.40		15.80	45.00	6.70		7.00	7.00	8.40	0.70			19,915	82.0	15	61.3	1000	86.4	9.4
Fuel oil	87.63	9.61	1.30							0.78	0.58	0.10		18,140	86.0	15	64.1	1055	91.1	14.3
Penna. bitum. coal	79.03	4.13	1.58							1.65	1.61	10.00	2.00	13,800	86.0	22	84.3	1158	100.0	15.3

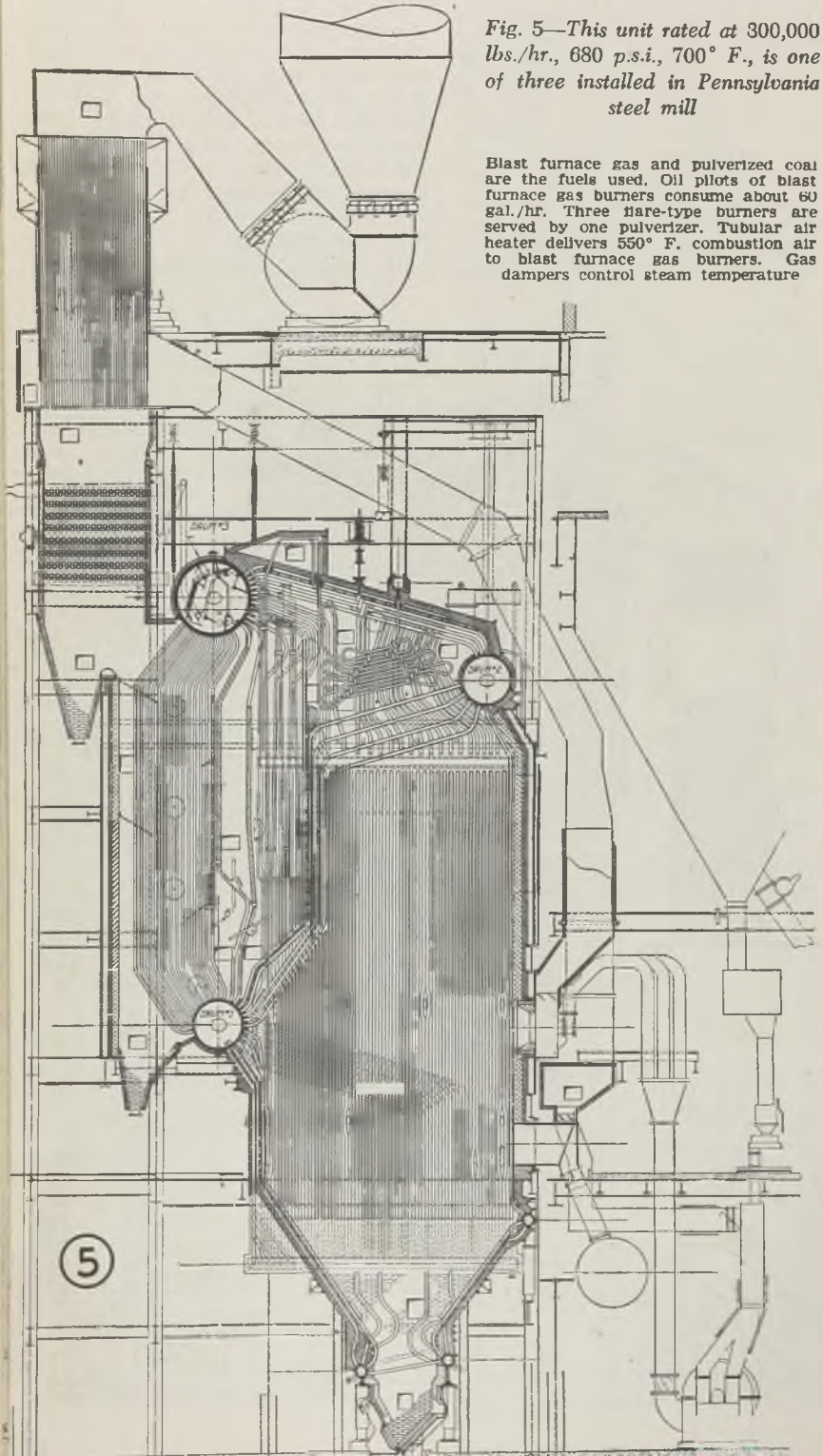


Fig. 5—This unit rated at 300,000 lbs./hr., 680 p.s.i., 700° F., is one of three installed in Pennsylvania steel mill

Blast furnace gas and pulverized coal are the fuels used. Oil pilots of blast furnace gas burners consume about 60 gal./hr. Three flare-type burners are served by one pulverizer. Tubular air heater delivers 550° F. combustion air to blast furnace gas burners. Gas dampers control steam temperature

II shows that pressure and temperatures in general run lower than for central stations, but all boilers supply steam to turbines for power generation.

As is usual in steel mills where steam and power requirements swing between wide limits, sudden load surges come on boilers without warning. This fact plus the great dissimilarity of blast furnace gas from other types of common fuels present a number of unusual problems to the designer of steam generating units for steel mill service. These factors require special attention: (1) Boiler design, (2) furnace design, (3) superheater design, (4) control of combustion air, (5) supplementary fuel arrangement, (6) induced draft fan power, (7) combustion air temperataure, (8) burner design.

Boiler Design: Sudden steam load surges produce disturbances within the boiler pressure system. The circulatory system of boiler and water wall tubes must be more liberally designed than for the usual central station boiler and it is wise to provide greater than "standard" steam release space in the drums.

The larger weight of combustion gas from blast furnace gas and the fact that heat absorption is principally by convection require more liberally proportioned boiler heating surface than is necessary with other common fuels.

Furnace Design: Blast furnace gas delivered to boilers may contain 0.1 to 2.4 grains of dust per cubic foot gas, depending on the extent of gas cleaning. Over 40 per cent of the dust is iron. Slagging can develop in furnaces burning pulverized coal in combination with blast furnace gas, even if furnace temperatures are kept below coal ash fusion temperature. It appears that blast furnace gas dust acts as a flux on coal ash. This may be due to the iron in the dust.

Boiler furnaces burning blast furnace gas with pulverized coal must be designed for low heat release rates; a rate of 22,000 B.t.u.'s per cubic foot per hour is none too low for a completely water-cooled furnace. The shape of the furnace is of still greater importance. The distance from blast furnace gas burner to combustion gas exit must be sufficient for the time required to complete combustion. This is many times greater for the lean blast furnace gas than for a richer natural gas or coke oven gas. The

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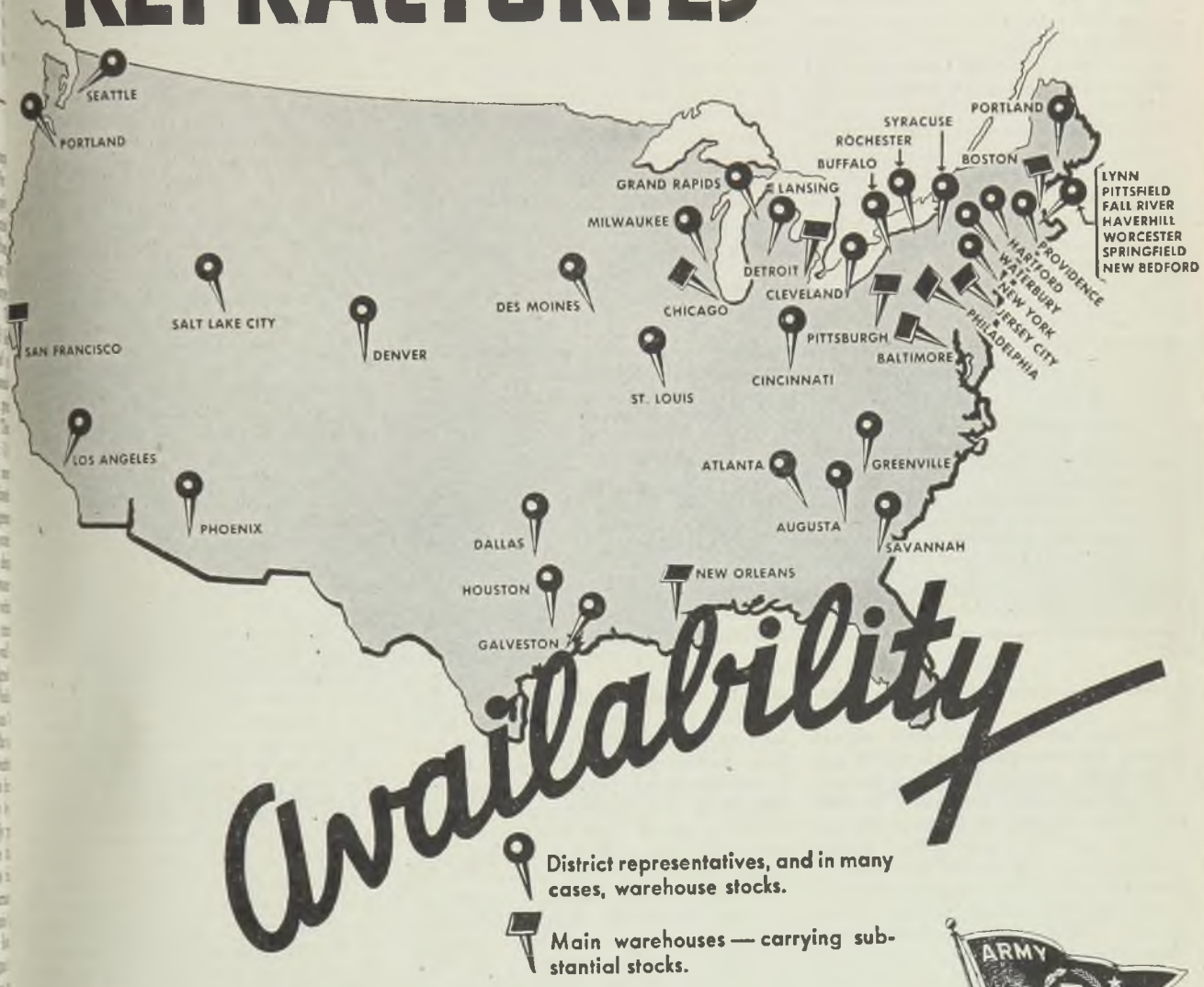

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furnace must be so proportioned that combustion gas approaches the exit at a velocity no higher and preferably lower than in a pulverized coal furnace and it must be kept in mind that for every pound of steam generated with blast furnace gas almost 2 pounds of combustion gas moves through the furnace.

Experience with pulverized coal installations proves that it is basically sound to provide for low velocity of combustion gas entering the boiler and superheater passes. Low momentum of dust particles carried in the gas generally prevents slag and dust from adhering to tubes. Fused and semiliquid dust particles leaving the furnace in the combustion gas gradually become chilled while slowly driving over tube surfaces. Low gas velocity is even more important for combustion firing of blast furnace gas and pulverized coal because not only are large quantities of dust carried in combustion gas, but the dust tends to liquefy part of the coal ash particles. Thus danger of slag and ash deposits on boiler and superheater tubes is greater.

Furnace bottom construction should provide for continuous discharge of ash in dry form. So-called wet furnace bottoms are inadvisable because it is difficult, if not impossible, to melt the ash collected on the furnace floor during operation with high rates of blast furnace gas and low rates of pulverized coal. In any event, the large quantity of inert gas introduced into the furnace with blast furnace gas lowers furnace temperature. It is doubtful that the ash can be sufficiently liquefied to make it flow even during the highest steam load in spite of possible fluxing action of blast furnace gas dust.

Superheater Design: Combustion products leaving the boiler furnace when burning blast furnace gas are from 60 to 90 per cent greater with oil or coal (see Table I). Among many factors affecting superheater performance, mass gas flow over the surface is one of the most important. If combustion gas temperature passing over the surface were the same resulting steam temperature would be much higher with blast furnace gas than with coal or other fuels. With gas by-pass dampers to control steam temperature, up to 50 per cent of the combustion gas from blast furnace gas would have to by-pass around the superheater to have the steam temperature about equal to that obtained when all combustion gas of coal or oil passes over the superheater surface. The required large by-pass dampers and blank gas passages make this arrangement costly and inconvenient.

In the characteristic curves of steam temperatures for various fuels, Fig. 2, blast furnace gas produces a steeply rising curve because heat is absorbed by convection only, but curves of other fuels show some of the combination convection-radiant heat absorbing characteristics. Temperatures shown in Fig. 2 would be obtained if all fuels were burned through one combination burner or if all burners were equally distant from the superheater surface. Placing supplementary fuel burners close to the superheater and blast furnace gas burners at a greater distance keeps steam temperature more uniform with fuels fired individually or in combination. A gas by-pass (Fig. 4) or desuperheating type (Fig. 1) steam temperature control system is then employed only to level out the natural steam temperature rise obtained with each fuel over the higher load range, resulting in steam temperature characteristics as shown in Fig. 3.

An important point in design and placement of the superheater for combination firing of blast furnace gas and pulverized coal, as well as for dirty blast furnace gas alone, is the stickiness of the dust carried in the combustion gases. It is a well known fact that the adherence of fly ash to heating surface is affected by surface temperature; the higher the temperature of the tube surface the easier it is for the dust to stick. Troublesome fouling of the superheater surface may result, especially with high temperature superheaters which must, of necessity be placed in the higher gas temperature zone. Wide vertical and horizontal spacing of the superheater tubes and provision for access to the superheater surface for hand lancing are important requirements. The superheater must not be nested among boiler tubes and above all dust and slag must not be given the opportunity to bridge across tubes.

Control of Combustion Air: Combustion control and maintenance of correct fuel-air ratio are more involved when burning one or more supplementary fuels in combination with blast furnace gas than for a single fuel or a combination of similar fuels. Table I shows, for example, that products of efficient combustion of blast furnace gas contain 24.5 per cent CO_2, those of an eastern bituminous coal 15.3 per cent CO_2. Obviously a CO_2 indicator or recorder would be a poor guide for combustion air regulation if the two fuels were simultaneously burned in varying proportions.

Blast furnace gas requires about 80 pounds of air to develop 1,000,000 Btu in steam; coal requires about 10[illegible] pounds. Because air flow control from steam flow would be incorrect, it becomes necessary that the combustion air supplied to the burners be controlled by the fuel to be burned. Thus, air delivered to the blast furnace gas burners is in correct proportion to the weight of gas burned and the air supplied to burners for pulverized coal or other auxiliary fuels is in correct ratio to the burning rates of these fuels. This requires independent air supply systems to the individual burners.

If blast furnace gas burners are separate from supplementary fuel burners the problem is more readily solved by simply dividing the air from one common duct among the individual burners. Air flow dampers controlled from fuel feed proportion air quantities delivered to the burners. Automatic controls maintain the correct fuel-air ratios in the larger installations. Gas pressure drop over an orifice in the main supply blast furnace gas duct positions the dampers supplying air to the gas burners, while a master controller controls gas flow from steam pressure. In some cases, an interlock is provided between supplies of blast furnace gas and supplementary fuels. If pressure in the blast furnace gas duct drops so low that stable burner operation is endangered, air and gas flow to blast furnace gas burners automatically stops while supplementary fuel burners take over steam load.

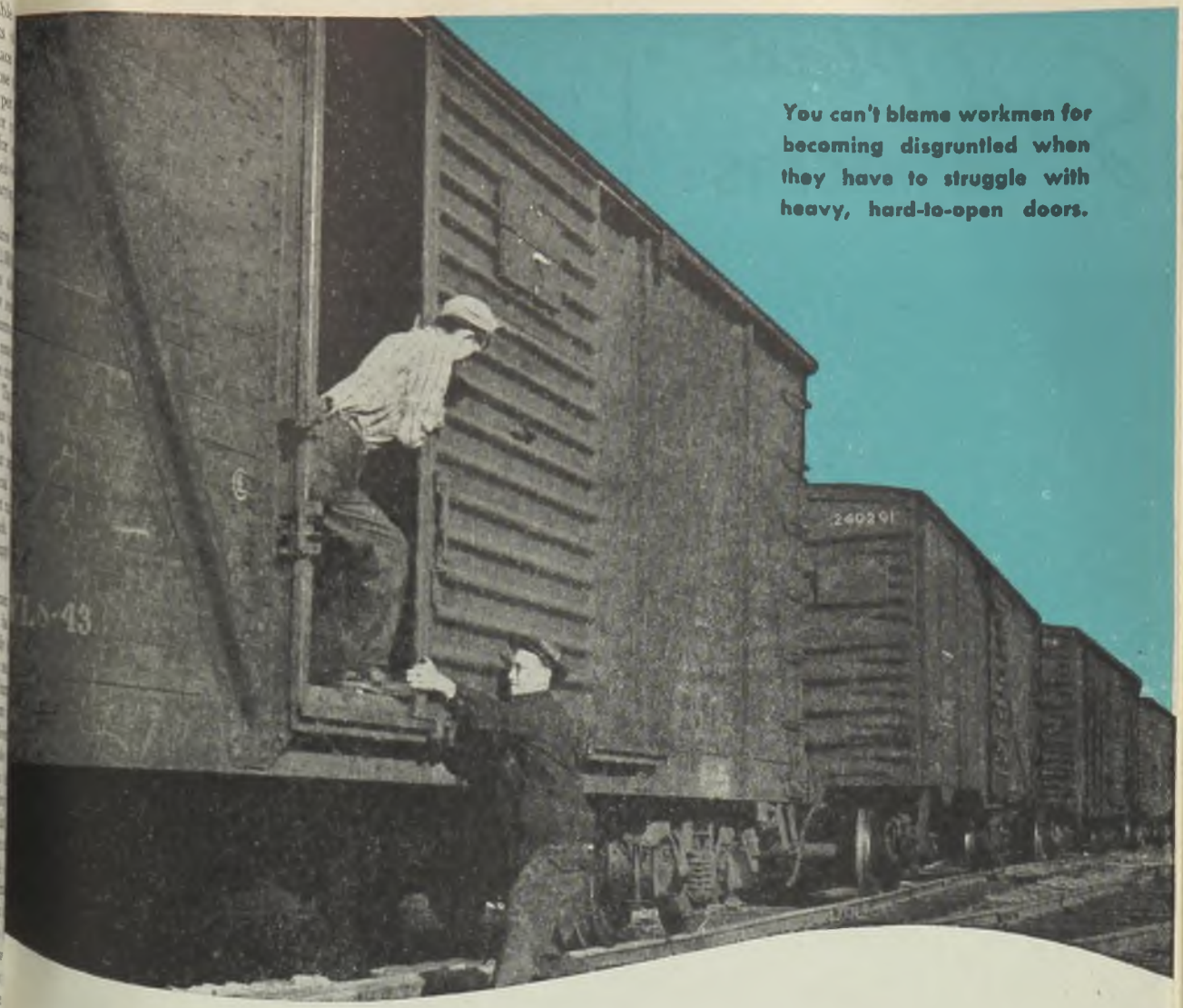
Supplementary Fuels: Blast furnace gas supply for the boiler house is often unpredictable. It may be suddenly interrupted before boiler house operators are warned. An interruption of steam and power supply can of course not be tolerated, especially if the power plant serves a number of outlying mills. If the supplementary fuel is coke oven gas, natural gas or oil, the steam load can be quickly taken over by this fuel, but a pulverized coal installation must be designed to permit instantaneous change from gas to coal without reduction in steam output rate.

With the so-called bin system, pulverized coal is available near the burners for instant use; but a bin system is cumbersome and expensive. Most modern steam generating units for blast furnace gas combined with pulverized coal are equipped with unit mills for direct firing. (Figs. 1, 4 and 5). Where sudden and unannounced interruptions of blast furnace gas supply are anticipated, pulverizers are kept running at full speed and with coal feeders closed. At the moment gas supply drops below

(*Please turn to Page* 123)

Table II—Fuels Used in Recent Steel Mill Boiler Installations

Fuels Employed	No. of units	Steam: Unit capacity, lbs/hr	Steam: Press. psi	Steam: Temp. F°
Blast furnace and coke oven gas; coke breeze	2	100,000	425	700
Blast furnace gas; pulverized Eastern bituminous coal (oil for pilots)	1	450,000	500	750
Blast furnace gas and oil; future, pulverized coal	1	150,000	400	700
Blast furnace and coke oven gas; pulverized coal	2	175,000	300	700
Blast furnace gas; pulverized coal (oil for pilots)	3	300,000	680	760
Blast furnace and coke oven gas; pulverized high-volatile coal	2	440,000	480	790
Blast furnace gas; lignite coal on traveling grate stoker	1	36,000	285	715
Blast furnace, coke oven and natural gas	1	125,000	420	750



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In these days of shortages of many materials, it's quite possible that Aluminum can be obtained for doors for the new boxcars scheduled to be built. No extra man-hours will be needed to fabricate aluminum doors, and think of the man power and dispositions saved when these cars get into service.

Imagineers who are seeking ways of improving rolling stock to be built for wartime service, and for postwar use, may well examine the advantages gained by employing Alcoa Aluminum Alloys. Weight-saving usually means labor-saving. And, because aluminum is highly resistant to corrosive attack, equipment is less likely to be injured by unavoidable neglect.

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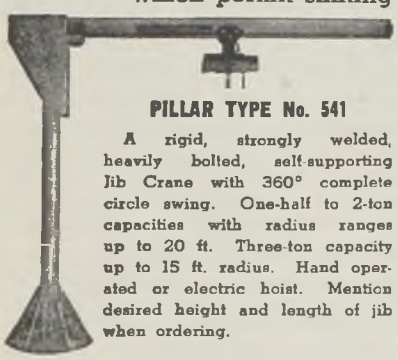
Photo Courtesy Weidenmiller Foundry Corp., Chicago, Ill.

★ Above illustration of overhead transfer cranes is typical of the manner in which loads may be transferred from one or more points to *any* point-of-operation in the foundry . . . from furnaces to pouring. Note how the runways extend the full length of the building with various transfer points which permit shifting of hoists from one crane to another. Likewise, Chicago Tramrail Overhead Cranes may serve any number of building bays in steel plants, in steel storage rooms, resulting in a speedy lift in production with a sharp let-down in handling costs. Such an installation is your best answer to more efficient crew operations, reduced worker fatigue, more production in the face of labor shortages.



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CHROMIUM PLATING

By WM. WHALEN
Vice President
Canadian Hanson & VanWinkle Co. Ltd.
Toronto, Canada

USE OF hard chromium for prolonging tool life is not new; but because there was the bother of setting up the system; and because there were more than enough tools for everyone's use, the general attitude was: "Why not buy a new tool?"

Today, the picture has changed. It is no longer a matter of "why bother" but one of making sure that the manpower of the country is utilized in the best possible manner. "Presalvage" by hard chromium is the answer. No one can afford to overlook this practical answer to a serious problem.

By "presalvage" I mean that hard chromium is applied before the tool is ever used. Then after a much longer useful life, it may be returned to service "as good as new" by the simple process of stripping off the remaining chromium and replating to required dimensions.

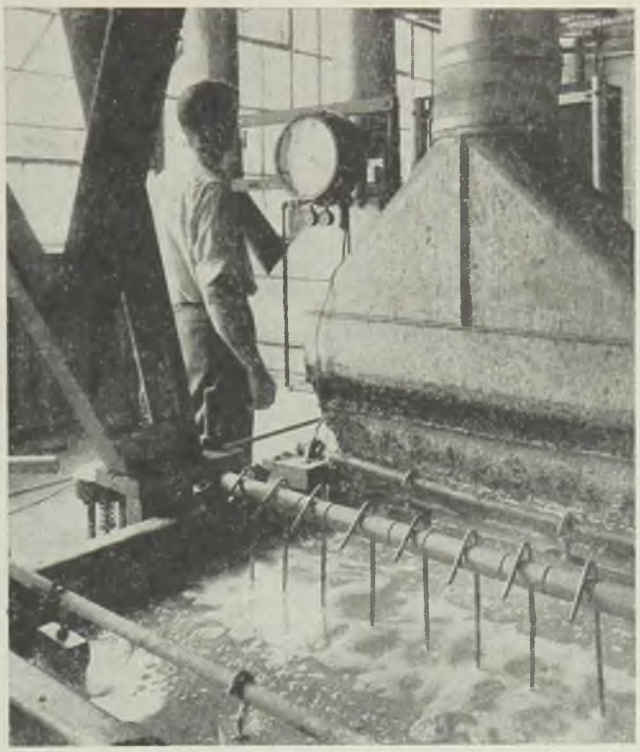
It is not necessary to grind cutting tools undersize before plating, except to meet unusually exacting specifications. The plate thickness of hard chromium on the tool may be held to one-half of one ten-thousandth of an inch if necessary, whereas drilled or reamed holes seldom require a closer tolerance than a distributed error of one ten-thousandth would allow.

Thus not only does modern "presalvage" chromium plating conserve the steel that goes into the tool but it conserves the manpower and equipment necessary to duplicate it or to finish-grind the plated tool to size as in the cold hard chromium methods.

Let it be clearly understood that no miracles are claimed for this method. For example, no one should assume that a drill which has been run until the lands are "shot" can be reclaimed as good as new by *any* hard chromium process, and no reamer or tap that has been run to death can be remade "better than new."

Also, chromium plating will not make a poor tool into a good one. The tool must be made from good steel, properly heat treated and correctly ground. Probably most of the benefit from the plate is due to the lower coefficient of friction between steel and chromium which permits the chips to clear easier and minimizes the built-up edge.

The plate used is very thin and the surface of the tool must be in excellent condition, free from decarburization, grinding borings, worn or rough edges. A very smooth finish is necessary on the clearance and face of the tooth to give a smooth, sharp edge. In most cases it will be found necessary to stone these faces to ensure best results.



This acid cleaning tank also deposits a tin coating electrolytically. Foxboro pneumatic-operated single-action temperature recording controller, used with this bath also is shown. Foxboro Co. photo

So-called "perishable tools" properly treated by chromium plating *before any use*, then run until wear is evident (not to the point of exposing or damaging the underlying steel) *then* they may be removed from service, stripped of the remaining chromium and replated to "as good as new" condition, *not once but several times.*

"Presalvaging" by the hard chromium method is neither difficult nor complex. It involves the usual steps of cleaning, stripping, plating, rinsing, and simple heat treating to remove the gases which produce embrittlement. Anyone of average ability can handle it. (Editor's Note: One such process was described in STEEL, June 14, 1943, p. 100, and June 28, p. 84).

A few reports on results obtained with chromium plated tools are of interest. In one plant, die maintenance was a large item in the cost of molding porcelain and plastics and was greatly reduced by chromium plating these molding dies. Not only did the chromium plated dies wear much longer but also when worn, they were usually reclaimed at low cost. The resulting economies are considerable as shown by the report that a plated die produced 400 per cent more porcelain parts.

Better molding too was obtained with the plated dies. They held their dimensions longer, and because of the low cost of salvage, the die parts were kept at closer limits. Plated dies produced molded products with an exceptionally high finish and thinner fins which were removed more easily.

Chromium plated taps have been found to give exceptional service. One concern states that four chromium plated taps threaded 58,000 more holes than unplated taps and another reports that taps did from 100 to 350 per cent more work when chromium plated in tapping bakelite and other insulation materials which caused rapid wear of tools fabricated from unplated steel.

An automobile manufacturer has replated worn and undersize reamers as many as nine times. Many of these reamers had been discarded. They were worn and rusty and unfit for service. After chromium plating and regrinding, they worked better than new steel reamers. Still another concern reports that through chromium plating reamer life is increased 2500 per cent when working in aluminum and numerous cases of four, six and eight times more work for ream-

(*Please turn to Page* 120)

From a paper presented at joint meeting of the electroplating and metal finishing, and the welding, brazing and hard surfacing advisory committees to the Metals Controller, Department of Munitions & Supply, Ottawa, Canada. Mr. Whalen is a member of the electroplating and metal finishing committee.

Testing Instrument

Wherever it is necessary to measure tension or applied stress, the dynamometer, manufactured by W. C. Dillon & Co., 5410 West Harrison street, Chicago, will handle the job speedily and accurately. It may be used in field tests, on the production line, or in laboratory setups. Small in size, light in weight, the dynamometer displays its value when called upon to indicate tension in wire, cable, rope; or when hooked in series with mechanical testing apparatus to measure flexure or fatigue limit.

Etched silver numerals on black dial are large and easy to read. The main indicator hand is white and maximum indicator hand is red. The dial is covered with a ¼-inch shatterproof safety glass crystal. Rubber gaskets seal dial from dust and dirt. The mechanism can-

not be injured by overload and will withstand full shock recoil. It is calibrated to an accuracy of 2 per cent plus or minus. It is compact, measuring 8¼ x 6¼ x 3 inches, and weighs 8 pounds 4 ounces.

Other features are: Constructed of special high duty tool steel; drain holes in case of accidental immersion; galvanized shackles tested to 25,000 pounds. It is finished in machinery gray and is serially numbered for shop disposition. A steel carrying case is supplied.

Electronic Flaw Detector

Special Products Division of General Electric Co., Schenectady, N. Y., announces a new high-frequency electronic flaw detector for production line detection of longitudinal cracks and seams in nonmagnetic metallic tubing. The new instrument is capable of detecting and locating imperfections ½-inch long, 10 mils wide and 1/3 of the wall thickness in depth, even though they are on the inside of the tubing and do not appear on either surface. It is especially desirable for testing tubing for coolers and heat exchangers before installation, thus preventing flaw failures in the field.

In operation, the tubing to be tested is fed through a box with coils sur-

rounding the tubing. After the circuit constants for the particular size of tubing being tested are set by means of selector switches located on the panel of a control unit, power is applied to the coils which in turn induce eddy currents in the tubing. A flaw in the tubing causes changes in these eddy currents. An electronic circuit in the control unit detects these changes and energizes a signal relay, thus disclosing to the operator the existence and location of the flaw.

The detector consists of a control unit, which is standard for testing various sizes of nonmagnetic tubing, and a coil box which accommodates any one specific size of rounds, straight tubing of uniform outside diameter from ¼ to 2 inches, inclusive. Additional coil boxes, which are fully interchangeable as to mounting, dimensions and cable terminals, are available to accommodate any size tubing within the range specified.

The complete instrument is small, light and easily installed. Power supply required is 100-125 volts, 60 cycles.

Bin Level Indicator

A dry materials bin level indicator that operates entirely on the electronic principle is now available through Mosher Electronic Control Systems, 130 West 42nd street, New York 18. The device has

no moving parts; thus danger of clogging, arching and mechanical breakdown is eliminated. It is effective in measuring all types of material, whether fine or coarse.

Use of the bin level indicator gives a positive check on shipping and storage operations and prevents possible loss of valuable material through spillovers, underfills, mistakes or other miscalculations. The system is easy and inexpensive to install.

The device consists of two parts. The first is a detector box, which is attached to a probe extending into the bin. In the box are a series of vacuum tubes. Although highly sensitive and accurate, the system is rugged and fully protected. A second box is the signal control which is attached to a series of colored lights that show when the bin is full, empty, etc. Hook-up with valve cut-offs, sound makers or remote signal devices can readily be arranged through a series of appropriate relays.

Thermometer Bulb Insert

Of particular interest to power plant engineers in airplane factories, a new Rosan thermometer bulb insert used in tank and plumbing installations has been announced by Bardwell & McAlister, Hollywood, Calif. It is adaptable to both old and new type thermometer bulbs.

Considerable difficulty is encountered by airplane manufacturers when installing thermometer bulbs in soft metals

due to stripped threads. The Rosan thermometer bulb insert is made of steel and inserted in soft metals. This prevents the usual crossing of the threads in the soft material of the thermometer bulb receptacle. If the insert is damaged, it can be replaced easily in such installations without removing the plumbing or the tank and without using oversize replacements which in turn involve redrilling and retapping operations.

The serrated collar at the head of the insert engages its teeth with the inner teeth of the locking ring which is serrated both inside and out. The outer teeth or splines of the locking ring broach their way into the parent material at the wall of a counterbore when struck with a hammer or a drive tool.

This makes the insert or stud an integral part of the parent material and a completely solid unit. When it is neces-

(All claims are those of the manufacturer of the equipment being described.)