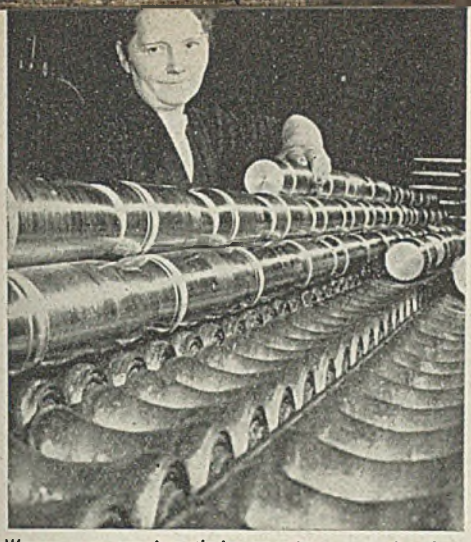

Women are proving their capacity as steelworkers in the nation's mills. Page 66


# STEEL

*The Magazine of Metalworking and Metalproducing*

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## NEWS



## TECHNICAL



## FEATURES



## MARKETS

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

STEEL
November 22, 1943

# We Cannot Coast to Victory

A grass-roots survey of industrial opinion, taken at this particular moment, would show a disconcerting confusion as to the exact status of our war effort.

This confusion arises chiefly from a lack of trustworthy information as to just where we stand. On one hand we hear that the war is far from won. On the other hand, we are told that anything can happen in Europe anytime. Some authorities tell us that production is woefully inadequate. Against this, we have daily evidence of cancellations, cutbacks and drastic revisions in war contracts. WMC informs us that grave manpower shortages are in the offing; other agencies say that revisions in war production will release needed workers in comfortable abundance.

What is one to believe from this deluge of conflicting opinion? Are we on top of the war production problem or are we not? Is the end in Europe near at hand or is it far in the distant future? Is the manpower situation critical, or are we being kidded?

A fair, dispassionate answer is difficult. Probably the truth is more encouraging than is generally realized. After Pearl Harbor, the Army, Navy, Marine Corps and all other agencies planned on a high, wide and handsome basis. Every conscientious official went to great lengths to play safe. He asked for more than he thought might be needed.

Today, with war production at a high peak, we are finding that in some instances we overshot the mark. In others we are behind schedule. But in the overall effort, we are on the safe side. As a result there are abandonments of expansion projects, cancellations of contracts, cutbacks in quantities ordered and shifts in specifications. These are the natural concomitants of a play-safe policy.

So what? Assume that the foregoing explanation is reasonably sound. If so, is there anything in the situation that suggests we can relax? Can we safely coast in to victory?

Here our answer can be positive. We cannot, we dare not coast. Instead, we should be restudying our problem. We have licked some details; others still challenge us. Our job is to reappraise the challenge in the light of present and future conditions and to shift our efforts to the spots of greatest need.

We have much work to do before victory is ours.

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**AN IMPORTANT REPORT:** The editors of STEEL are proud to be privileged to present in this and subsequent issues an important report entitled, "An Engineering Approach to the Selection, Evaluation and Specification of Metallic Materials", prepared for the War Metallurgy Committee of the National Academy of Sciences and the National Research Council and Advisor to the War Production Board and other war agencies.

Almost every reader of STEEL will appreciate the significance of this report when he realizes that it is an attempt to help the user of metallic materials to select from the large number available the ones which will best serve his purpose.

For instance, a manufacturer desiring to know what NE steel can be substituted satisfactorily for the SAE steel he has been accustomed to use could be expected to consult his design engineer, his testing engineer and his metallurgist. Each of these three specialists looks at the problem from a different

(OVER)

angle. The report strives to help each to appreciate the others' viewpoints—to bring the trio together on a basis of common understanding.

We believe this report will be hailed as an outstanding contribution to the literature of the specification and selection of engineering materials which will prove useful for many years to come.

—p. 72

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**LESSONS IN PACKING:** A month or more ago when we were commenting upon the remarkable advance in the protection and packaging of metal products brought about by the exigencies of this war, we had not realized the extent to which the invasion technique of our armed forces has influenced the method of packing and shipping.

Now we find that some manufacturers, shipping industrial equipment under Army, Navy or Lend-Lease specifications, actually pack this equipment so that it can be thrown overboard from a vessel, swept into shore by the tide and recovered days later—with no injury from salt water, shock, or exposure. It is not enough that the package be air, water, moisture, and shock proof; it also must be compact so as to be economical of shipping space.

It will be recalled that American manufacturers once were considered the world's worst packers of export shipments. There will be no excuse for carelessness on this score after the present experience.

—p. 97

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**OVERDUE HOUSECLEANING:** Is there a note of incongruity in this situation? High officials of WPB are deploring the exodus of able industrial executives from its roster. Chester Bowles, price administrator, is boasting of his success in inducing 50 top-ranking business executives to take important posts in OPA.

The explanation is found in the previous record of the two agencies. The organization problem of WPB has been solved. On the other hand, OPA, hotbed of theorists and dreamers, has been pushing people around to the point where the public is in open revolt. There was a definite need for sound judgment in the personnel of OPA.

But do not let anybody tell you that you can draw a fine line of distinction between business men and other agency incumbents. The thing that counts is the policy handed down from above. WPB has had policies leaning toward the sound side. OPA has had policies leaning toward the "mother knows best" philosophy.

The house-cleaning in OPA is overdue.

—p. 53

**CURBING PATENT ABUSES:** Everybody has such a big stake in the American patent system that any changes in its functioning should be considered with the utmost care. Since five days after Pearl Harbor, a commission appointed by President Roosevelt has been studying the patent system from two angles—first, to determine whether any features of it interfere with the war effort and, second, to ascertain if it can be improved.

The commission, headed by Charles F. Kettering and consisting of other top-notch, well qualified members, has made a partial report which now is being considered by the House Patents Committee. The report states that no serious interference with the war effort has been discovered and that the patent system—already the best in the world—can be improved.

The commission concludes that patents "may be and have been abused." The abuses arise not from the patent itself but by virtue of "secret, improper and even illegal agreement." The committee recommends legislation compelling patent owners to record in the patent office all existing agreements pertaining to the patents. It also recommends changes in the court procedure affecting patents. It does not recommend a compulsory licensing system.

Industrialists should follow closely every step in the congressional handling of the commission's recommendations. This is important business.

—p. 49

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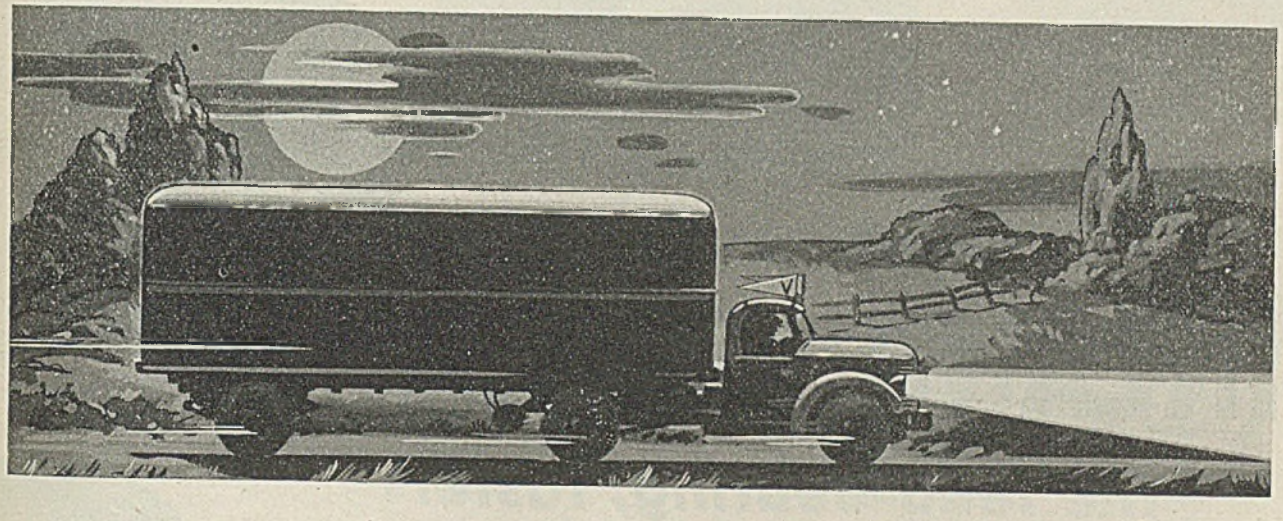
**HEADED FOR OBLIVION?** A few months ago there was a great hue and cry over the alarming rate of absenteeism in war plants. Today criticism on this score has died down considerably. In some plants absenteeism is reported to have been reduced as much as 60 per cent.

This does not mean that the problem has been solved. Too much time still is being lost unnecessarily. But it does mean that some employers and employes have been realistic enough to search out the causes of absenteeism and practical enough to apply correctives. If all employer-employe organizations were to do what the more enterprising ones have done, the word "absenteeism" would soon sink back into its normal status of obscurity. —p. 60.

E. L. Shaner

EDITOR-IN-CHIEF

# RYERSON STEEL RACES ACROSS COUNTRY



## 10 Tons of Sheets Delivered 700 Miles in 30 Hours 20 Minutes

It is 4:10 P.M.—a truck with ten tons of sheet steel pulls away from the Ryerson Chicago plant. In a Western war factory 700 miles away, important production for Army invasion equipment is waiting.

Flying the ODT "Emergency Flags" with special permission to travel at 60 miles an hour, the shipment arrives the next day at 11:30 P.M.—just 30 hours and 20 minutes after the order was dispatched.

Two significant facts: The sheets so urgently needed were in Ryerson stock for immediate shipment. And Ryerson facilities and service measured up to the emergency.

Unusual? No! This order is only one of many Ryerson emergency shipments that are preventing production shut-downs in these critical times. Every day, Ryerson skill and experience are expediting deliveries of vital steel.

Next time you need steel in a hurry, whether it is sheets, plates, bars or beams—we urge you to call the nearest of the ten Ryerson Steel-Service plants. Whatever you require, you'll get prompt, effective cooperation.

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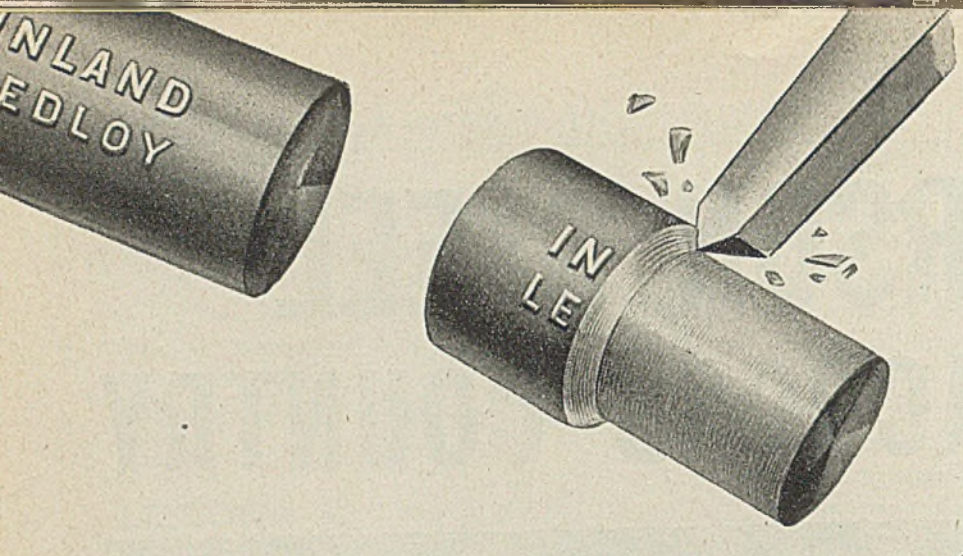
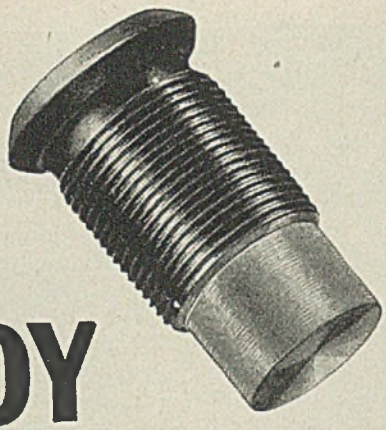
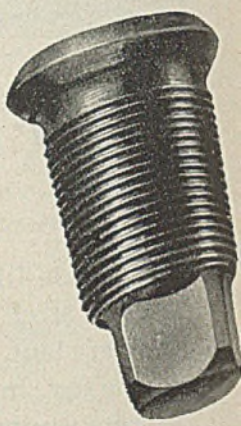


## Higher War Output Results from

# INLAND LEDLOY

## —the lead-bearing, faster-machining, low unit-cost steel



Increased production up to 110%—tool life lengthened up to 300%—these are the principal results obtained in America and in England, where Inland Ledloy is used for wartime parts production.

Inland Ledloy is open hearth steel containing a small percentage of lead, which is uniformly dispersed and alloyed with the steel by a special Inland process. This addition of lead *greatly improves machineability*. Except for its slightly finer grain structure, all physical properties of Ledloy—yield strength, ultimate strength, elongation, reduction of area, resistance to impact, etc.—are the same as for open hearth steel of similar analysis.

Welding qualities are comparable with those of ordinary carbon steel. Ledloy is easily forged, giving sharp, clean, die impressions. Methods used and results obtained when heat treating and carburizing are the same as for steel of similar analysis, except for the effects of the slightly smaller grain structure.

Today, all the Ledloy that Inland can make is being used to speed up war production. But when peace comes, Ledloy will again be available for general manufacturing use—to speed up output, and to cut unit cost.

Write for further information on Inland Ledloy.

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# Reconversion Problems to Fore with War Mobilization Job Past Peak

*Signs multiplying of increasing emphasis by government on postwar problems. . . Threatened exodus from Washington of top-flight production personnel serves to substantiate view that major task of organizing industry for war is completed*

MOBILIZATION of industry for war appears definitely past the peak. Except for pulling together a few loose ends here and there, the major task of all-out organization seems completed.

War goods are rolling out of mills and factories in prodigious quantities. Channeling of raw materials into consumption has been effected on an orderly basis. From now on, the evidence indicates, the major war production job will be to maintain the high level of output attained in recent months—maintain it until the military victory is won.

When will the war end? No one can answer that question. The military leaders say it will take months of hard, bitter fighting to defeat Germany. After that, we face months of the toughest kind of combat with Japan. If we take the military men at their word it is obvious we are a long way from victory.

Evidence is accumulating, however, to indicate that thought in official quarters more and more is being directed toward the day when reconversion of industry from war to peacetime activity will present the major problem.

Rumors that top government war production officials are getting ready to quit their Washington posts and return to private industry as soon as possible have added fuel to the fire of speculation concerning government future policy. All last week Donald Nelson, chairman of the War Production Board, was kept busy denying reports he was considering a job in private industry. Late in the week, however, he is understood to have assured WPB officials that he plans to stay on indefinitely as long as the War Production Board continues a first-ranking agency.

In informed circles it was said Nelson had intimated he would consider WPB to have lost top-rank status if it did not have authority over the demobilization of industry and postwar reconversion, and that he would resign if that control were lodged elsewhere.

### Report Nelson Plans To Stay

From this it is taken that Mr. Nelson has had some assurance from President Roosevelt that the War Production Board will play an important role in the reconversion job, and the quiet passing of the word around that Mr. Nelson plans to stay is seen as an effort to influence other high production officials to remain in their government posts.

Charles E. Wilson, executive vice chairman of WPB, however, last week confirmed a rumor that he plans to return to private industry as soon as possible. He told reporters his resignation from WPB has been before President Roosevelt "for some time" and that he likely will return to his former post as president of General Electric Co. He added, however, that the President has not accepted his resignation, and that even if it should be accepted there is no likelihood that he would leave Washington at once.

"There may be a considerable job sketched out for me to complete," he said.

Another high War Production Board official planning to return to private industry as soon as he can obtain his release from the government is Hiland G. Batcheller, operations vice chairman.

Mr. Batcheller, who came to Washington from his post as president of Allegheny Ludlum Steel Corp., Pittsburgh, it was learned last week, has handed in his resignation but it has not been accepted and no date for his leaving has been set.

Planned withdrawal of such men as Wilson and Batcheller from their government posts is considered highly significant. For one thing, it is seen as confirming the view that the whole war production effort has been gotten under such effective control the services of fewer of the country's industrial organizing geniuses are required to implement it. Also it is felt the threatened exodus of such top executives from Washington means that with the United Nations launching offensives on all fronts and with the tide of war turning rapidly in our favor, the companies which in the past have

been managed by these men want them back in their regular jobs to prepare for the postwar economy.

Extent of this "back-home" movement apparently under way is reflected by the fact that the November issue of the National War Agencies telephone book contains 54 pages compared with 58 in September.

In recent weeks official thinking has been increasingly in the direction of the demobilization job which looms ahead. Early this month, for example, Donald Nelson told the Senate Military Affairs Subcommittee, which has been studying the problem of winding up war contracts, that the time is approaching when individual war plants will be allowed to go back to civilian production as the need for their war products is filled. He said that Arthur D. Whiteside, WPB vice chairman for civilian requirements, has a "very complete program for civilian production" worked out.

According to Mr. Nelson, as more materials come in, the civilian program can be expanded in any direction. As war contracts are cut back, supplies of critical materials will again be available, and factories freed of war production will be able to resume their normal production of civilian goods. First conversions, Mr. Nelson told the committee, will be to production of civilian transportation equipment, farm machinery and tools, truck parts, and repair parts for such household equipment as refrigerators.

Many war contracts already have been terminated and the prospects are that cutbacks will increase rather than diminish from now on. Currently, for example, a rumor is circulating that the manufacture of steel shell cases will be discontinued and a shift made to brass in the very near future, reflecting the improvement which has been effected in brass supply.

Up to the present time factories with discontinued war contracts have been placed promptly on new war work, but indications are that as cutbacks and contract terminations multiply closed shops are inevitable unless those factories with terminated contracts are permitted to divert their facilities to the production of civilian goods.

### Evaluating Surplus Raw Materials

According to Mr. Nelson's testimony, cases will arise when factories affected by contract cancellations will not be needed for war work. When this occurs, he said, the Redistribution Division of the War Production Board will take over any uncut raw materials that can be used elsewhere in the war effort. This division and the procurement agencies are working out machinery for evaluating the surplus raw materials, goods in process, and finished goods that such factories may be left with, in order to settle their accounts with the government as quicky as possible.

Recent appointment of Bernard M. Baruch as chief of a new War and Postwar Adjustment Unit in the Office of War Mobilization is seen as a straw which points the way the wind is blowing. Mr. Baruch's new job encompasses problems arising during the remainder of the war and postwar period but it is significant that his first move concerned the development of procedure for orderly and fair termination of war contracts, which certainly would be considered more nearly postwar than war in its implications.

Further indicative of the emphasis being placed increasingly on demobilization is the report that within recent weeks the War Production Board has been giving consideration to measures aimed at facilitating resumption of the manufacture of some 700 civilian items by small plants.

The Office of Civilian Requirements is understood to have compiled a list of essential items which it wants scheduled for increased production in the first quarter of 1944. This list has not been made public, but it is understood that the items scheduled for production increases include such articles as garden tools, lunch boxes, vacuum bottles, ice refrigerators, spring-wound clocks, phonograph records and repair parts for many types of electrical household appliances. This program of increased civilian goods production is to be implemented through use of small plants. WPB Executive Vice Chairman Wilson is understood to have issued a policy memorandum ordering WPB industry divisions to adopt the "broad objective" of providing qualified small plants with sufficient material "to bring their production up to the average for the industry as a whole."

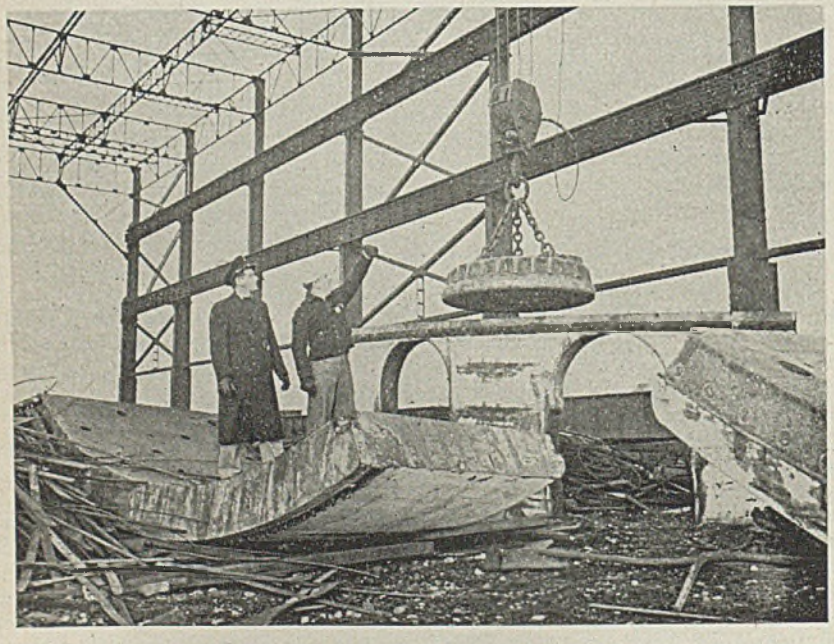
The memorandum also is said to order the relaxing of raw materials quota restrictions whenever such a move is required to permit qualified small plants to operate.

### Manpower Shortage Interferes

Standing in the way of an early increase in civilian goods production, even though larger raw material supplies are available, is the manpower shortage. However, even here Mr. Nelson states the problem is on the way to solution.

With war contracts being canceled piecemeal and replaced by others to meet the changing needs of war, the question of which factory is to gain or lose a contract is based chiefly on the manpower resources of the various communities. As war contracts are terminated and are not replaced by new war business, manpower supply available for civilian production should correspondingly ease, though it seems unlikely much labor would be permitted to accept employment in nonwar production so long as shortages in war production areas continue.

With the military authorities emphasizing that the war is yet far from won, and the pressure for war production unabated, it may be wishful thinking to anticipate any marked early diversion of manufacturing facilities and raw materials to civilian goods production other than essentials. Still, it is evident that with the war production organization functioning smoothly, and official thinking increasingly in the direction of Demobilization Day, reconversion problems are certain to come increasingly to the fore as time passes. The rapidity with which reconversion accelerates, of course, will depend upon how the war is going.



SCRAP TO RE-ENTER SCRAP: Armor plate from the ill-fated U. S. S. ARIZONA, salvaged at Pearl Harbor, has been shipped to the Gary, Ind., works of Carnegie-Illinois Steel Corp. where it will be melted and used again in the fight against the Axis. NEA photo

D. C. BAKEWELL

# Convention Told War Intensifies Labor Problems

F. H. CLAUSEN

*Foundry manpower difficulties complicated by high war plant wages. . . Castings need placed at 35,000,000 tons annually. . . . Renegotiation, taxes, contract termination discussed*

UNDER stress of war, need for castings of all kinds in this country has grown to about 35,000,000 tons annually, D. C. Bakewell, Blaw-Knox Co., Pittsburgh, told members of the National Founders Association at their forty-sixth annual convention, Waldorf Astoria hotel, New York, Nov. 17-18.

Speaking as president of the association, he said that the high rate of activity indicated gives rise to serious problems in manpower—problems that are complicated by the higher wages which war industries are permitted to pay.

He spoke on a program which included discussion of renegotiation of contracts, corporate taxes, national labor policy, the private enterprise system, termination of war contracts and various problems bearing specifically on foundry practice and managerial operation.

President Bakewell, in discussing labor relationships, said that until the war is ended there is little likelihood there will be much change in the restrictions and legislation relative to labor. "The Smith-Connally bill requires for the first time some measure of responsibility from labor unions. It doesn't go very far, but it is a step toward some of the things that must be done to bring fairness and equity back into labor union-management relations."

He believed, actually, that until the Wagner act is drastically amended there can be no fairness in labor union-management dealings. He suggested that the following changes or amendments should be made in the act:

(1) Establish by law the right of a citizen not to join or belong to a union as well as to join or belong; (2) prohibit coercion or force in the solicitation of members to join or not to join, or in carrying on any strike or any other activity of a labor union; and (3) require unions to register and file audited financial reports.

He also proposed: (4) Making unions liable to prosecution under the Anti-Racketeering law; (5) outlawing jurisdictional and sympathetic strikes and boycotts; and (6) prohibiting any person with a criminal record from being an officer of or representing a labor union in any collective bargaining activity.

A strong appeal for the preservation of America's private enterprise system through mass education was presented by Dr. George S. Benson, president, Harding College, Searcy, Ark.

### Restore Free Enterprise

To accomplish full employment and full use of productive resources, Senator Alexander Wiley, Wisconsin, said that it would be necessary for the government to get out of business as quickly as possible after establishment of peace and to provide the incentive to business men to go ahead on their own initiative. The tax structure, he also said, should be such as to provide incentive to people who have money to invest. The country's whole economic development is based on free enterprise and that should be the target at which this country should shoot, he said.

The speaker pointed out that when the war is over the government will have substantial investment in goods and plants. These goods should be disposed of here and in foreign trade through American business channels. The government must not engage in distribution in the postwar period, he emphasized. Wherever possible, plants should be turned back to private ownership.

At the end of this year, Senator Wiley declared, the following industries will be owned, either outright or to a considerable extent, by the federal government. (1) The entire synthetic rubber industry; (2) 90 per cent of the aviation industry; (3) 50 per cent or more of the aluminum industry; (4) 20 per cent of the steel industry, based on peacetime output; (5) about one-half of the machine tool industry; and (6) 8 per cent of the magnesium industry. These percentages, he explained, are based on Reconstruction Finance Corp.'s ownership of 1500 or more plants.

He thought that a possible debt of $300 billion, while staggering, would not prove fatal. "With a national income of $140 billion, or even $125 billion, we can meet the interest on the debt, which will amount to about $5 or $6 billion. The danger in the situation" he thought "is not the interest on the debt, but the philosophy which might creep into our economic system that the size of the debt does not matter."

If this country is going to maintain its pre-eminent position in world affairs after the war it will have to continue with its development in aviation, said William B. Stout, director, Stout Research Division, Consolidated Vultee Aircraft Corp. In other words, this country can no longer rely upon rail—water and automobile transportation, but must become a three-dimensional country by going ahead as actively as possible in aviation research.

The world has been made much smaller under aviation and he said that other great nations would undoubtedly be feverishly active in this postwar development of air transportation. He spoke of Russia in particular, pointing out that her most easternly point is farther away from Moscow than St. Louis. Russia, he believed was laying her whole system of future transportation on aviation. However, he was confident that the United States would maintain its leading position in this field, pointing to the marked technical strides that have taken place since the last world war and of the natural adaptability of Americans to flying.

The development in casting practice has been marked over recent years, he said, citing certain examples of work now being done.

Officers of the association were reelected as follows: President, D. C. Bakewell, Blaw-Knox Co., Pittsburgh; vice president, F. H. Clausen, the Van Brunt Mfg. Co., Horicon, Wis.; secretary and treasurer, J. M. Taylor, Chicago.

SEN. HARRY FLOOD BYRD
*"Administration surrendered to John L. Lewis"*

# Chaotic Wage Policy Shakes U. S. Stability

*Steelworkers ready to move into breach made by coal wage settlement. . . WLB under attack by rival unions. . . Who will remember the "forgotten millions?"*

CHAOS continues to be the national administration's wage policy. Its agencies charged with "holding the line" are hiding their heads in the sands and are resorting to "explanations" and self-justification.

The battle against inflation is being shoved back to the secondary lines—to the press and Congress.

With the anti-inflation line breached by the concessions granted to the United Mine Workers by the War Labor Board and Secretary of Interior Harold L. Ickes, practically all other units of organized labor are either moving up to the line or are in the process of mobilization.

Next attack apparently will come from the United Steelworkers of America. This group probably will ask increased wages and higher vacation pay from the United States Steel Corp. subsidiaries within the next few. weeks.

The USA wage and policy committee will meet in Pittsburgh Dec. 1 to discuss the demands they will make on the industry. Notice of these demands probably will be served on U. S. Steel a few days after the meeting.

Under provisions of the contract, the union may give the corporation ten days' notice for the start of a conference on the new wage demands. After the date set for the conference, in this case probably around Dec. 15, there follows a period of 20 days for conference, during which a new contract might be negotiated. If no new contract is agreed upon, the present contract expires at the end of the 20 days, in this case about Jan. 5.

Obviously, no settlement can be reached during the 20-day negotiation period. Under present government regulations, U. S. Steel is powerless to grant whatever increases the steelworkers demand, even if it were so inclined. At the end of the 20-day period, the issue, in all probability, will be submitted to the War Labor Board.

The War Labor Board which approved the coal wage settlement while a nation-wide strike was in process will be in a tough spot. Having allowed the miners a $1.50-a-day increase in violation of its own "Little Steel" formula, the WLB will have to dig deep in its bag of tricks to find a settlement for the steelworkers without openly throwing the whole "Little Steel" formula overboard.

### Board's Position Precarious

Actually the WLB has been jockeyed into an unenviable position. After it had refused to approve the miners' demands, the miners struck for the fourth time this year, causing a direct loss of more than one-third of a million tons of steel production. The mines were seized by the government and placed in the custody of Secretary Ickes. Mr. Ickes negotiated an agreement with the miners which allowed them what they had been asking for with only thinly camouflaged violation of the administration's stated wage policy. The WLB was on the spot; it either could approve the contract at the sacrifice of its policy, or risk continuation of the strike which was striking at the innards of the war production program.

Following its "strategic retreat" public and industry members of the board apparently were assailed by doubts as to

WILLIAM GREEN
*WLB statements "make it increasingly difficult for labor to participate . . ."*

the wisdom of their decision, especially after their approval of the coal wage contract was widely attacked. Belatedly, they warned organized labor that more effective antistrike legislation would be necessary if the unions continued their irresponsible ways.

The four industry members said they wished "to strongly urge the necessity for immediate consideration by Congress of legislation to amend existing laws, in order to require responsibility of unions and to provide additional protection for workers, employers and the public against those who misuse the power presently permitted."

The three public members who approved the coal contract (Wayne L. Morse dissented) admitted the board had no adequate measures for obtaining compliance with its orders and procedures, but were less eager for an immediate change in the laws. They said: "The weeks which lie ahead will be a crucial period for organized labor. Legislative sanctions more thorough-going than now exist may be required unless organized labor itself demonstrates from now on its determination to accept the bitter with the sweet, and to comply with the orderly procedures of government which have been set up to cope with wartime conditions."

These second thoughts by the WLB drew an immediate response from William Green, president of the American Federation of Labor. In a letter to William H. Davis, WLB chairman, Mr. Green issued a thinly veiled threat that the AFL representatives might leave the WLB. "Such statements make it increasingly difficult for labor to participate in the work of the National War Labor Board," he wrote.

The United Mine Workers *Journal*, which viewed the coal wage settlement as a "partial" victory likewise attacked the WLB, and suggested that the public members resign. "The Little Steel formula is dead," it editorialized. "The WLB has lost face."

Congressional criticism of the WLB action in approving the Lewis-Ickes covenant was not lacking. Sen. Harry F. Byrd (Dem., Va.) believes the approval makes general increases and a boost in living costs almost inevitable.

Senator Byrd suggested WLB "could at least have ordered an investigation to determine whether Lewis was encouraging the strike" and added that "they certainly should not have approved a contract while the miners were on strike."

While organized workers, practically all of whom have received at least the 15 per cent hourly increases permitted under the "Little Steel" formula, moved toward even higher rates, the nation's press posed a pointed question: What about the unorganized worker who has received small if any wage increases, but who has suffered from the increase in living costs?

Louis Stark, noted labor writer for the *New York Times*, estimated there are 15,000,000 heads of families who have received virtually no increase in income since the war period's inception, whereas 12,000,000 union members have received substantial boosts.

For these 15,000,000, the WLB frankly acknowledges it can offer no aid. It cannot consider individual pleas. There would be too many.

The administration offers pseudo aid to these fifteen "forgotten millions" by proposing food subsidies, which, if effective, would hold down the cost of living for the forgotten millions and also for the 12,000,000 who have profited handsomely by increased hourly rates and even more by overtime at penalty rates.

# Present, Past and Pending

### ■ GLASS REPLACING COPPER IN ALCOHOL DISTILLATION

PITTSBURGH—Glass fibers are replacing copper bubble plates in a new type of distillation column being used in the production of ethyl and methyl alcohol and acetone, says Dr. J. H. Koffolt, professor at Ohio State University.

### ■ NEW ANTI-TORPEDO WEAPON DEVELOPED IN ENGLAND

LONDON—A simple anti-torpedo weapon for tankers has been announced here by the Ministry of Shipping. If a ship equipped with the device is torpedoed, a compressor pumps air into damaged compartments at the desired pressure, forcing out the water.

### ■ NEW METHOD OF DRESSING IRON SAND REPORTED

WASHINGTON—Japanese reports state that a new method of dressing iron sand will augment their domestic iron production. Dry sand is dropped on a disk revolving at high speed which discards nonmagnetic matter and retains the iron material.

### ■ UNITED ENGINEERING COMPLETES EXPANSION PROGRAM

PITTSBURGH—United Engineering & Foundry Co. has completed its foundry expansion program. New facilities provide melting capacity consisting of 9 furnaces ranging in size from 15 to 100 tons, capable of producing about 5000 tons of open-hearth steel a month. Medium and heavy steel castings, weighing up to about 200 tons each, can be produced.

### ■ USES "GERMAN SHEETING" TO REPLACE BREAKWALL

CHICAGO—Public Service Co. of Northern Illinois is using "special German pattern sheet mill piling" to replace a 700-foot breakwall protecting its power generating station at Waukegan, Ill. The "German sheeting," obtained through the Maritime Commission, is in random lengths of from 40 to 50 feet, 18 inches wide, about ¼-inch thick and aggregates in the neighborhood of 300 tons.

### ■ HALTS PRODUCTION OF ANTI-TORPEDO WIRE NETTING

BUFFALO—Wickwire Spencer Steel Co. has received orders to halt production of anti-torpedo wire netting at its River road plant. Workers will be diverted to other departments.

### ■ RUSSIA GETS MORE THAN MILLION TONS OF U. S. STEEL

WASHINGTON—Shipments of lend-lease goods to Russia to the end of September, amounting to nearly $3.3 billion, included more than 1 million tons of steel and steel products, 300,000 tons of nonferrous metals, and 17,000 metal cutting machine tools.

### ■ NATIONAL STEEL CORP. REJOINS INSTITUTE

NEW YORK—National Steel Corp. and its subsidiaries, including Weirton Steel Co. and Great Lakes Steel Corp., have rejoined the American Iron and Steel Institute. National Steel withdrew from the institute in June, 1941.

### ■ RULES ON CLASSIFICATION OF GALVANIZED PRODUCTS

WASHINGTON—Galvanized steel products in controlled materials form are class A products when sold by a galvanizer who is not a steel producer, War Production Board has ruled. When sold by a steel producer or warehouse, such products are controlled materials.

### ■ WPB CLARIFIES RULING ON PREMIUM PAYMENTS

WASHINGTON—Clarifying its policy regarding limitations on B premium payments to lead producers and B and C payments to zinc producers, War Production Board explains the definition of "mines not already operating" means mines which began work subsequent to Oct. 27, 1943.

### ■ STEEL ADVISORY COMMITTEE MEETS

WASHINGTON—WPB Steel Advisory Committee met here late last week, discussion being devoted to raw materials and the flat rolled steel situation, alloy steel and first quarter requirements.

# War Contractors Find Government Is "Slow Pay" on Cancellations

*Existing termination procedure termed unsatisfactory and legislation to bring about reform urged. . . Difficulty encountered in obtaining reimbursement on discontinued jobs brought out at congressional committee hearings*

THAT existing contract termination procedure is slow and unsatisfactory and that legislation is needed to bring about a reform is the opinion of a number of contractors who have testified before congressional investigating committees.

These include the House Committee on Military Affairs, the Murray subcommittee of the Senate Committee on Military Affairs and the Patman Small Business Committee.

Still another committee, the Senate Special Committee on Postwar Economic Policy and Planning, has interested itself in this subject. On the ground that contract termination ties in with postwar industrial demobilization and disposition of government-owned plants and surpluses, the latter committee studied contract termination in executive session recently and may hold public hearings at a later date.

An interesting witness was Thornton A. Rand, treasurer, assistant secretary, and chief accountant, Acme Steel Co., Chicago, who said his company on May 15, 1942, was awarded an Ordnance contract for $1,260,000 of bomb booster adapter parts. The summer and fall were spent in organizing the various subcontractors and considerable engineering work was done. In November of 1942, after the company had produced about 38,000 finished parts, with a great many in process, it received a letter of cancellation.

### Claims Filed Slowly

"We forthwith notified all of our subcontractors and told them to clean the decks by the end of the year, which was the date set by the Ordnance department," said Mr. Rand. "From the end of the year until sometime in March—it took us all of that time to get claims in from the subcontractors of their costs and to prepare our own costs.

"We had done some work ourselves in addition to sub-letting work. In March we finally submitted a claim based upon those of the subcontractors of which we were in no way responsible for the amount. The Ordnance department sent out auditors who spent two or three weeks in auditing our particular costs. The only point of debate involved was the question of what base we were to be allowed a profit due to the contract being canceled, and whether or not we would be allowed anything for supervision of the contractors.

"I put in a figure of 10 per cent for supervision of subcontractors; I felt that was reasonable. Our own administration expenses on general work figures around 15 per cent of the cost. I will admit that 10 per cent was a shot in the dark and that we had no factual figures, as it is an intangible overhead that cannot be determined. That 10 per cent was not allowed.

"We had also felt we were entitled to this 10 per cent profit on the claims of the subcontractors because it was our argument if the contract had gone to its logical conclusiion we would have been allowed 10 per cent on the subcontractors' work as well as on our own. That was part of the unit price in the contract. We were informed by the Ordnance department that no profit would be allowed on the subcontractors' termination claims, although they did allow us a profit on the finished parts the subcontractors had made and which we had paid for.

"They were proposing to allow only the actual cost of the products that were not finished, and they also allowed the subcontractors a profit on their costs eventually, but we were not allowed anything for the time, trouble, and expense that we had gone to, to organize these subcontractors, and I want to tell you it was a job to nurse along a group of small companies like that when they did not have any engineering staffs and had never made any such things before.

"At any rate we have paid out of our own pocket all of the other subcontractors' claims which have been agreed upon, and those payments, $107,000 which we have paid ourselves, in addition to $116,000 in costs, make up a total of $225,000, roughly, that we have invested in the thing.

"We took up quite strongly with the Ordnance department along in August to get a partial payment. We argued with them that we thought this thing had dragged on long enough. We received, on Sept. 22, $125,000 partial payment, which just about reimburses us for the money we have turned over to the subcontractors but does not reimburse us for the money we have put in ourselves."

### Payment Impasse Reached

J. Whitney Bowen, president, Bowen Stamping & Mfg. Co., Cambridge, Mass., told a particularly harrowing tale about a contract for war-head containers his company obtained from the Navy in July of 1942. Due to Navy delays the company encountered enormous procurement difficulties. Due to faulty Navy design of the war-head, later corrected by the company, there were high rejections. In February of 1943 the contract was canceled. There were numerous delays, duplication of accounting. In July the company received word from the Navy that partial settlement of the claimed amount of $130,604.32 would be made and a check for $93,000 was received in that month. As to the balance still due:

"It finally appeared that Newport would not pay us until the Bureau of Supplies and Accounts authorized it, and they wrote us to that effect on Oct. 12 and referred to the report of the comptroller general dated Sept. 30, 1943. We contacted the comptroller general's office to try to clarify that. Both the Bureau of Supplies and Accounts and Newport told us informally the thing was at an impasse and there was nothing further they could do. They referred us to your committee, and that is why I am here," said Mr. Bowen.

L. L. Pollak, president, Pollak Mfg. Co., Arlington, N. J., manufacturer of bomb racks and other war items, said termination allowances are not sufficiently generous.

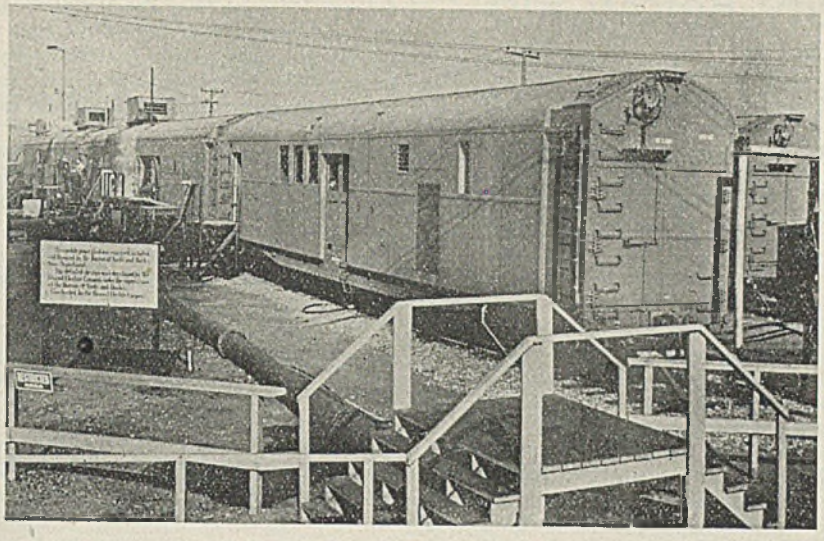
"I think on every canceled contract that, if the contract is of any size at all," said Mr. Pollak, "the contractor is bound to lose money. There are handling charges on the raw material and administrative charges on the raw material; there are trucking charges—they do not permit trucking charges—but then we are working with borrowed money, and we have to pay interest on that borrowed money, so by the time we get through I am sure practically every canceled contract that we have will show us a loss."

## REPORT ON STEEL

**One of the most sought-after documents in Washington after Jan. 1 and for the remainder of the war will be a confidential report on how the United States met the demands for steel during World War II.**

**This report, to which various members of the War Production Board's Steel division staff contributed, is said to describe in detail the difficult problems of producing and distributing steel in wartime. It was edited by James A. Rowan, special assistant to the director of the Steel division.**

**The report, prepared by order of H. G. Batcheller, WPB vice chairman, is described by various Steel division heads as a "book of facts", and is said to contain statistical and other data on all phases of steel distribution and procurement. Until the war ends it will be available to only a few of the highest government officials.**



MOBILE POWER PLANTS: One of two mobile railway power plants built for the Navy by General Electric Co., Schenectady, N. Y. Each plant consists of a three-car unit comprising a complete 10,000-kilowatt steam-electric generating station. Apparatus involved is the same type used in regular central station and industrial power plant installations. They carry a supply of fuel oil so that power can be generated before tank cars are hauled up and connected

# Galvanizers Study Postwar Markets

*Rehabilitation of farm buildings will require expenditure of $20,000,000,000, much of which will be four zinc-coated products. . . Other demands may total 3,000,000 tons annually*

POSTWAR planning vied with technical developments for interest at the thirteenth annual meeting of the Galvanizers Committee of the American Zinc Institute. A large attendance was present in Hotel William Penn, Pittsburgh, Nov. 17 and 18, to hear reports of the postwar demand for galvanized sheets and to hear of new developments in treatment of metals before galvanizing.

Sessions consisted of open meetings on Wednesday and meetings open only to committee members on Thursday.

The Wednesday morning session was devoted primarily to study of the future of the galvanizing industry. Highlighting the session was a report by R. J. Ritchey, Carnegie-Illinois Steel Corp., Pittsburgh, on postwar industrial markets for galvanized sheets. According to figures compiled by Mr. Ritchey and his organization, galvanized sheets will continue to get a fair share of the construction market, both domestic and industrial, and the total market for galvanized sheets, in other than rural markets, probably will reach 3,000,000 tons per year. Construction of roads and airports will require considerable tonnage of galvanized material in drainage alone, while home and industrial building should show an increase of approximately 100 per cent per year in the postwar years over the construction demands in 1939.

K. J. T. Ekblaw, of the agricultural committee, American Zinc Institute, outlined possibility of future markets for galvanized sheets on the farms of America. According to Mr. Ekblaw, the 6,000,000 farms of America require an average of 100 squares of galvanized roofing per farm. Because of the economic situation of the American farmer today, he will be in position immediately upon close of hostilities to rebuild his physical requirements, which include primarily the farm buildings of America. The vast majority of American farmers, said Mr. Ekblaw, prefer galvanized steel roofing to any other type. According to the latest available figures, 50 per cent of the farm buildings are now inadequate and the rehabilitation of the inadequate units will require the expenditure of $20,000,000,000.

### Discusses Steel's Preparation

Importance of preparing the surface of steel prior to the galvanizing operation was outlined by D. A. Russell, Youngstown Sheet & Tube Co., Youngstown, O. Mr. Russell emphasized that methods now being used in the preparation of steel surfaces for galvanizing have not changed since the initial galvanizing operation was described by European experts over a hundred years ago.

# Collections Are Seen Restricted By Regulations

*Trade spokesman says complete overhaul of government controls necessary if shortage threat is to be removed*

COMPLETE overhaul of government controls on iron and steel scrap to avert a probable critical situation in supply beginning in the late winter months was urged last week by Edwin C. Barringer, president and executive secretary, Institute of Scrap Iron and Steel Inc., addressing a meeting of scrap dealers at Indianapolis.

"In addition to industrial and railroad scrap, which flow automatically, and the outcome of salvage drives, steel mills and foundries annually need seven to eight million gross tons of dealer scrap," said Mr. Barringer. "This dealer scrap is the critical margin which will prevent a possible shutdown of some steel furnaces.

"For many years the established scrap industry has functioned satisfactorily. There was no need of scrap drives in the first World War or in lush 1929 and 1937, but present governmental policies and the dispersion of controls are throttling the scrap dealer at the time he is most needed to support the war effort.

"The deposits of high-grade iron ore are rapidly being depleted while scrap is rusting away uncollected. At the rate iron ore is being consumed, an emergency a decade hence will find the country dependent upon lean ores requiring expensive treatment, whereas the ore supply should be conserved by the fullest use of scrap," he said.

## Consolidated Vultee To Produce P-38s

Nashville division of Consolidated Vultee Aircraft Corp. has started production on the Lockheed P-38 long-range twin-engine fighter plane. Two months ago the plant was instructed by the Army Air Force to stop production planning and tooling on the Douglas A-20 twin engine attack bomber and swing into immediate preparation for the P-38.

Coincident with the announcement comes word from the War Department that a vast expansion program on the P-38 has been effected, running into hundreds of planes per month—five times the AAF requirements of one year ago. Among the manufacturers participating in the program is the Vultee division of Consolidated Vultee at Vultee field, Calif., where wing sections will be built.

# Steelmaking Capacity Below Rio Grande To Total 1,400,000 Tons

*Mexico and Brazil account for 85 per cent of the Latin American steel industry. . . Plants in Peru, Argentina, Chile and Colombia together to represent little more than 15 per cent. . . Full range of products not produced*

LATIN American nations will have a combined capacity for producing approximately 1,400,000 tons of steel ingots and castings upon completion of new plants now under construction, study by the American Iron and Steel Institute indicates.

At that time, steel capacity in all of Latin America will be somewhat less than the size of the steel industry of prewar Poland and somewhat more than that in Sweden.

Brazil and Mexico together will account for close to 85 per cent of the total Latin American steel industry. Plants in Peru, Argentina, Chile and Colombia together will represent a little more than 15 per cent.

Mexico, with an estimated 600,000 tons of annual steelmaking capacity, most of which has been in operation for some years, is the leading steelmaking nation south of the Rio Grande. Upon completion of a new government-sponsored steel plant in Brazil, however, that country will rank close behind Mexico with approximately 570,000 tons of annual steel capacity, of which an estimated 330,000 tons will be represented by the new plant under construction.

In Peru a proposed government steel plant for which construction contracts have already been awarded, is expected to have a potential capacity of 140,000 tons of steel ingots a year.

Argentina, lacking coal, is not equipped to produce and refine iron ore, but does have steel plants with an aggregate capacity estimated at 65,000 tons of ingots per year.

Plants in Chile are estimated to be able to produce approximately 20,000 tons of steel. A plant under construction in Colombia has been reported to have an eventual capacity of 5000 tons of steel ingots.

The iron ore deposits of Brazil, estimated to total 15 billion tons of ore containing 50 per cent or more iron, are one of the world's largest ore reserves. Until recently these ores have been worked only to a limited degree. Chile also has excellent ore reserves, while other countries in South America have reserves varying in quality and quantity. Mexican ore deposits, though smaller than those in Brazil, are adequate to supply the existing Mexican steel industry for many years.

Completion of Latin American steel plants now under construction will raise finished steel capacity in that area to approximately one million tons of products per year, about 50 per cent of total consumption in Latin America in 1936. However, it is not likely that the full range of products generally imported by Latin American nations can be supplied from domestic plants.

In 1936, a total of 1,660,000 tons of steel products were imported into Latin America from steel producers throughout the world. In that year reported production of finished steel products in Latin America amounted to only a few hundred thousand tons.

## Victory Scrap Bank Drive Extended Indefinitely

Victory Scrap Bank drive, launched Oct. 1 and scheduled to be concluded Nov. 15, has been extended indefinitely. Results of the drive to date have been disappointing at some points and fairly satisfactory in others.

In a memorandum to all regional salvage managers, H. M. Faust, director, Salvage Division, War Production Board, last week said: "It is imperative that we extend the drive into a continuing campaign. The results thus far have been spotty—excellent in some localities, poor in others.

"Mills are now consuming more purchased scrap than they are receiving. Stockpiles are shrinking. Despite any conditions which may have affected results, the fact remains that the winter months lie just ahead and our inventory position is not improving.

"We ask you, therefore, to disregard the announced Nov. 15 closing date and to intensify and speed up collection efforts on all fronts."

## U. S. Gets $1,171,000,000 In Reverse Lend-Lease Aid

The United States has received about $1,171,000,000 in reverse lend-lease aid from the British commonwealth of nations as of June 30, 1943, President Roosevelt revealed in his twelfth report to Congress on lend-lease operations.

The United Kingdom expended about $871,000,000 of that amount and Australia, New Zealand and India the remainder of $300,000,000. Based upon estimates for the first six months of this year, expenditures by the British commonwealth for reverse lend-lease aid to the United States are now at an annual rate of about $1,250,000,000.

# Steel Industry Profits Reduced

*First half 1943 net of producers with 90 per cent of industry's capacity drops 8 per cent under like 1942 period and 40 per cent under 1937 return*

COMBINED first half 1943 net profits of leading steel producers, representing over 90 per cent of the industry's ingot capacity, was 8 per cent below a year ago and 40 per cent less than recorded in like 1937 period, survey by the American Iron and Steel Institute shows.

Net income for these companies totaled $94,522,000 in the first six months this year, compared with $102,743,000 for substantially the same companies in like 1942 months.

Indicated return on investment for the first half was at the rate of 4.9 per cent per year, against 5.3 per cent a year ago.

Lower earnings primarily reflected the sharp increase in total payrolls. For the first half this year aggregate payrolls of these companies amounted to $1,236,485,000, up 30 per cent from the $969,855,000 distributed to employes in comparable 1942 period. In 1937 period payrolls amounted to half the 1943 figure.

Tax provisions for the group during the first six months this year totaled $335,178,000, off somewhat from the $392,913,000 provided in like period a year ago when large amounts had to be set aside before the tax laws for the year were finally enacted. Taxes are currently nearly four times those in first half of 1937.

Dividend disbursements reported by the group for the first half period amounted to $69,372,000, compared with $72,846,000 a year ago. Dividend payments were equivalent to 5.6 cents per dollar distributed in payrolls, against 7.5 cents in first half of 1942.

## Woodward Iron's Third Quarter Net $292,718

Net profit of Woodward Iron Co., Woodward, Ala., totaled $292,718 in the third quarter 1943, compared with $287,310 in the like 1942 period and $300,286 for the June quarter this year. For the first nine months this year the company earned $844,816, against $618,184 in corresponding period a year ago. The company's earnings were erroneously reported in the tabular presentation of steel companies' profits in the Nov. 8 issue of STEEL.

## POSTWAR PREVIEWS

**CONTRACT TERMINATION**—Early settlement of canceled contracts is necessary to prevent costly tieup in industry, says Col. Bryan Houston. See page 55.

**WILLOW RUN**—Henry Ford plans to take over the huge Willow Run bomber plant to produce cargo planes. See page 60.

**ALLOYS**—Greater quantities of alloying materials will be available from domestic sources after the war as result of forced development during the emergency. See page 64.

**DECENTRALIZATION**—Development of new areas of steel production is favored by the Senate Interstate Commerce Committee, which has approved a resolution providing for an investigation of the possibilities of decentralizing present production. See page 69.

**INDUSTRIAL PLANTS**—United States will enter the postwar era with 70 per cent greater industrial plant and equipment than it had at the beginning of the war. See page 70.

**LATIN AMERICAN STEEL**—Latin American steel capacity after the war will total 1,400,000 tons of ingots, or about half its prewar consumption. It is unlikely that the new capacity will provide those countries with the full range of finished products required. See page 46.

**WOMEN OF STEEL**—Experience of steel producers in the employment of women in steel mills during the war presages greater utilization of the "weaker" sex in the mills during normal times. See page 66.

**GALVANIZERS**—Postwar markets for galvanized steel will be huge, according to the Galvanizers' Committee of the American Zinc Institute. Total demand from nonfarm users may total 3,000,000 tons annually; additional tonnage will be required for the rehabilitation of farm buildings. See page 45.

**METALS SYMPOSIUM**—New standards for evaluation, selection and specification of metallic materials are contained in report prepared for the War Metallurgy Committee. It makes clear the long-range implications of a study which not only points out the availability of certain substitutes but also serves as a guide in selecting metals for specific use. See page 72.

**STEEL "GUINEA PIG"**—New Defense Plant Corp. blast furnace at Cleveland, built and operated by Republic Steel Corp., will be subjected to exhaustive tests to find out how much pig iron can be produced daily under excessive top pressure. From such brutal treatment may come improved operating technique for the future. See page 80.

**WELDED STEEL TUBES**—Extensive application of round tube weldments to aircraft construction has shown this system to be most efficient where a large amount of torsion is involved. Freedom of design, strength and simplicity are features which give promise of its wide use in postwar fabrication. See page 82.

**NEW MACHINING TECHNIQUE**—Cast alloy steel drills and other tools facilitate work with difficult materials such as hardened steel and prevent work spoilage by performing many operations after heat treatment, developments with significance for the postwar period. See page 92.

**PACKAGING**—Use of ocean tides as a "delivery method" for military equipment consigned to foreign shores without landing facilities teaches many lessons in proper packaging of metal parts. See page 97.

# Few Open Hearth Furnaces Forced To Close Down

*Accumulation of ingots noted at some points. . . . Switch from alloy to carbon steel a factor*

REPLYING to protests by the United Steelworkers of America to the War Production Board against the shutdown of four of nine openhearth furnaces at the Massillon, O., plant of Republic Steel Corp., company spokesmen last week said:

"The closing down of open hearth furnaces has represented a serious problem which the company has had under discussion for some time with officials of the War Production Board in Washington.

"Every effort is being made through these discussions to reach a satisfactory conclusion. In the meantime no men who have been working on these furnaces will be laid off."

According to information at the War Production Board last week, Republic was forced to take off two openhearths at its Buffalo plant because of an accumulation of ingots resulting from labor trouble in its finishing mills. Several openhearths of the company also were taken off at Cleveland because of a slowing down in plate rolling and finishing at that point, while at Massillon the closing down of four openhearths was due to the switchover of the furnaces from alloy steel to carbon steel production.

Bearing on the situation is what is now being acknowledged as an appreciable over-capacity in electric furnace melting equipment. Steel users have been urged to switch from open-hearth to electric furnace grades of steel to fill this capacity; in fact, reports are heard that some electric furnace steel tonnage now is being sold on an open-hearth steel base.

## Labor-Management Groups Formed in Over 3000 Plants

Labor-management production committees have been organized in over 3000 war plants, shipyards, and mines, covering more than six million workers, the War Production Board reports. The committees are established to handle difficult wartime problems affecting production and manpower requirements.

Government officials are gratified not only at the 50 per cent increase in the number of committees which have been formed since June when the war production drive started but also at definite trends that have taken shape during the last few months, toward increasing productive efficiency in the nation's war plants.

# WINDOWS of WASHINGTON

## Horseplay, Not Sabotage

FBI INVESTIGATIONS of thousands of accidents show that the most serious impairment of war production is not sabotage but, rather, horseplay and practical joking. Several workmen at a Richmond, Calif., shipyard were severely burned by mustard oil placed on them by a fellow worker as a joke. In the same yard, a crew had been "having fun" by putting hot welding rods and lighted cigarettes in each others' pockets. Investigation of a fire in a Detroit plant revealed that employes frequently amused themselves by placing pieces of smoldering string on each others' shoulders. One employe admitted striking matches and dropping them into a cardboard box soaked with oil. Management has solved this problem in many instances through special training of plant guards. In only a handful of the 485 cases of persons convicted under the federal sabotage and related statutes was there any deliberate attempt to impede the war effort. In most instances, the offenders were motivated by personal anger or spite toward a superior.

## Conservation Exhibit

A conservation exhibition consisting of selections from outstanding examples of conservation in costs, materials and man-hours effected in this country and Canada was opened in Room 1622 Social Security building, Washington, by the War Production Board's Conservation division. It is under the auspices of the Conservation Committee of the Combined Production Resources Board and Combined Raw Materials Board of the United States and Canada. Canada alone has more than 1000 items on display. The exhibit will be shown for 30 days.

## First Hand Picture

Office of War Information will pay expenses covering tour of British war plants by a delegation of two CIO and two AFL laborers. They also will visit United States Army installations in the British Isles. Purpose is to let American labor union men find out first hand that production under threats of enemy bombing raids are large and that output per worker can be increased here if labor is sufficiently determined.

## Storm Clouds

Appointment by the administration of five War Labor Board members to make a 60-day study of the cost of living index may be another move of expediency to take care of the gathering demand for wage increases, now that the coal miners have won their strike. Up to this time take-home wages have been increased by the expedient of allowing time-and-a-half for hours worked over the 40-hour basic week stipulated in the Wages-Hours act; that was the way the miners were taken care of. This solution has been so widely used that there are few cases left where it can be applied. Should the five WLB members report in 60 days that the cost of living had increased faster than provided for in the "Little Steel" formula that would provide a good excuse for allowing general increases in hourly wage rates. Such a move would probably hold off the wolves for a few months.

## "Restricted" Films

Nine stirring sound films showing action shots from the numerous arenas of this global war have been prepared by the Navy and are available for exhibition at war plants where management wishes to inform its men about how materiel they are producing is used at the front. Most of these films are "restricted" and cannot be viewed in commercial theaters. Included are action pictures of the Navy's newest and deadliest anti-submarine weapon, the destroyer escort, landing of the Marines on Guadalcanal, the life and death of the HORNET and several reels of German films captured by our forces.

### WON'T DODGE

**Members of the hard-pressed War Labor Board are uncertain where to go from here. The four industry members have appealed to Congress for legislation "in order to require responsibility of unions and to provide additional protection for workers, employers and the public against those who misuse the power presently permitted." The public members have declared "the whole question of the responsibility of unions for antisocial acts" must be brought "into the forefront of consideration and discussion." Says Sen. Tom Connally (Dem., Tex.), one of the authors of the Connally-Smith act: "Why don't they tell us specifically what they want? I'll face the issue if they will do that. I won't dodge it." The senator thought the WLB could at the least have ordered an investigation to ascertain whether John L. Lewis had been guilty of violating the law by encouraging a strike.**

## Ask Travel Ban

Office of Defense Transportation has requested that all government agencies and private employers curtail business travel and to refrain from granting vacation leaves or time off to employes, where travel would be involved, during the period Dec. 17 through Jan. 10.

## Lift Lid

Now that there actually is a surplus stock of aluminum—the stockpile is growing at the rate of around 100,000,000 pounds a quarter—the War Production Board is receiving many applications for allocations of the metal. The lid has been lifted to some extent and numerous exceptions to former restrictive orders have been made. Basic policy is to allocate aluminum only in cases where such allocations will not cause diversion of manpower to civilian work. In numerous instances applications have been denied because of shortage of accessory equipment. Shortage of fractional horsepower motors, for instance, has a bearing in determining whether or not to permit manufacture of refrigerators or washing machines. One manufacturer who several months ago applied for some 2000 pounds of aluminum to be used experimentally to make a new product after the war still is unable to get this small quantity because his plant is 100 per cent on war production.

## Congressional Doghouse

Capitol Hill observers in recent weeks have noticed that the procurement agencies, especially the Army, are getting themselves in the congressional doghouse. This is proved unmistakably by the nature of the questions which the members of various congressional committees have been asking in recent hearings. Congressmen feel the procurement agencies are spending money needlssly, that they do not do all they should to promote efficiency and fuller utilization of labor. All indications are that they are in for a tough time.

## At Your Service

Available to manufacturers on request are the services of nearly 400 safety engineers on the payroll of the United States Department of Labor at $1 per year. They are prepared to study plant operations and make appropriate recommendations. A survey has shown that in plants which have made use of this service, accidents have reduced 66 per cent.

## Food Troubles

Manufacturers whose employes are having trouble obtaining sufficient food should apply for assistance at the Food Distribution Administration's regional offices in New York, Chicago, Atlanta, Dallas or San Francisco. An interagency committee on food for workers has been set up with representatives from the War Production Board, War Manpower Commission and Office of Price Administration. Industrial nutrition representatives of the War Food Administration will co-operate with labor and management in the installation and operation of in-plant food services.

# National Planning Commission's Report Recommends Some Changes

*House committee considers suggestions for improvement but reaches no decision. . . Probe fails to develop any serious instances in which present practice has interfered with the prosecution of the war*

FIRST major move in this Congress to reform the American patent system occurred on Nov. 9 when the House Patents Committee met in executive session to consider the recent report of the National Patent Planning Commission. This body, appointed by President Roosevelt on Dec. 12, 1941, to study the patent system, first was to determine whether any of its features interfered with the war effort, and second, was to ascertain whether the system could be improved so as to stimulate inventive effort to "increase commerce, provide employment, and fully utilize expanded defense industrial facilities during normal times."

The commission is one of the most ably qualified groups ever designated by the present administration. Its chairman is Charles F. (Boss) Kettering, vice president in charge of research, General Motors Corp. Its members are Chester C. Davis, president, Federal Reserve Bank, St. Louis; Edward F. McGrady, vice president in charge of labor relations, Radio Corp. of America; Owen D. Young, chairman, General Electric Co.; Francis P. Gaines, president, Washington and Lee University. Its executive director is Andrey A. Potter, dean of engineering, Purdue University, and its executive secretary Conway P. Coe, commissioner of patents.

Following the executive meeting of the committee a spokesman said no decisions were reached but that further consideration would be given the recommendations of the commission. Indications were that the committee soon may launch a series of hearings at which inventors, patent attorneys, industrialists and representatives of labor will be given an opportunity to express their views.

### Not Hindering War Effort

A digest of the report of the National Patent Planning Commission report follows:

Inquiries addressed to representatives of the War and Navy Departments failed to develop any serious instances in which the patent system has interfered with the prosecution of the war. However, it reached the conclusion that the system, already the best in the world, can be improved.

"The chief beneficiary of our patent system should be the American public," the report states. "This is true whether a patented invention is commercialized or not. In the former case the public has for its use and at its disposal a new product or process; in the latter it has made available recorded knowledge which prior to the effort of the inventor was unknown to the world.

"Despite these benefits to the general public from the operation of the patent system it is nevertheless true that patents may be and have been abused. The abuse arises not from the patent itself but by virtue of secret, improper, and even illegal agreements. The exposure of agreements dealing with patents should minimize these abuses, and, in any event, make them readily detectable."

The commission, therefore, recommends the passage of legislation compelling the recording in the United States Patent Office of:

1—All existing agreements to which one of the parties is a citizen of a country foreign to the United States;

2—All existing agreements regardless of citizenship of the parties which include any restrictions as to price, quantity of production, geographical areas or fields of use;

3—All future agreements regardless of restrictions or citizenship of the parties.

The commission, after studying the needs of this country, as well as the effects in foreign countries of a compulsory licensing system, concluded it would not be advantageous to incorporate such a general system in the patent laws. However, it was impressed with the need of a degree of compulsion in certain fields, such as national defense, public health and public safety.

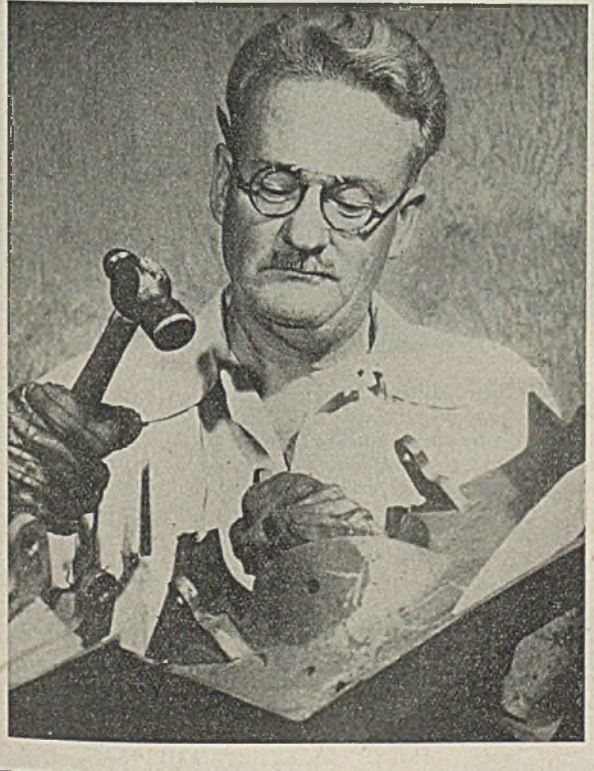
"While the commission is unaware of any case in which a court has prohibited the use of an invention covered by a patent when the effect of such prohibition would be injurious to national defense, public health or public safety, nevertheless, it is felt that the statutory laws should be so clarified as to remove any possible doubt on the subject."

The commission recommends a statutory provision that in a suit for infringement the recovery of a patent owner shall be limited to reasonable compensation without prohibiting the use of the patented invention whenever the court finds that the particular use of the invention in controversy is necessary to the national defense or required by public health or safety.

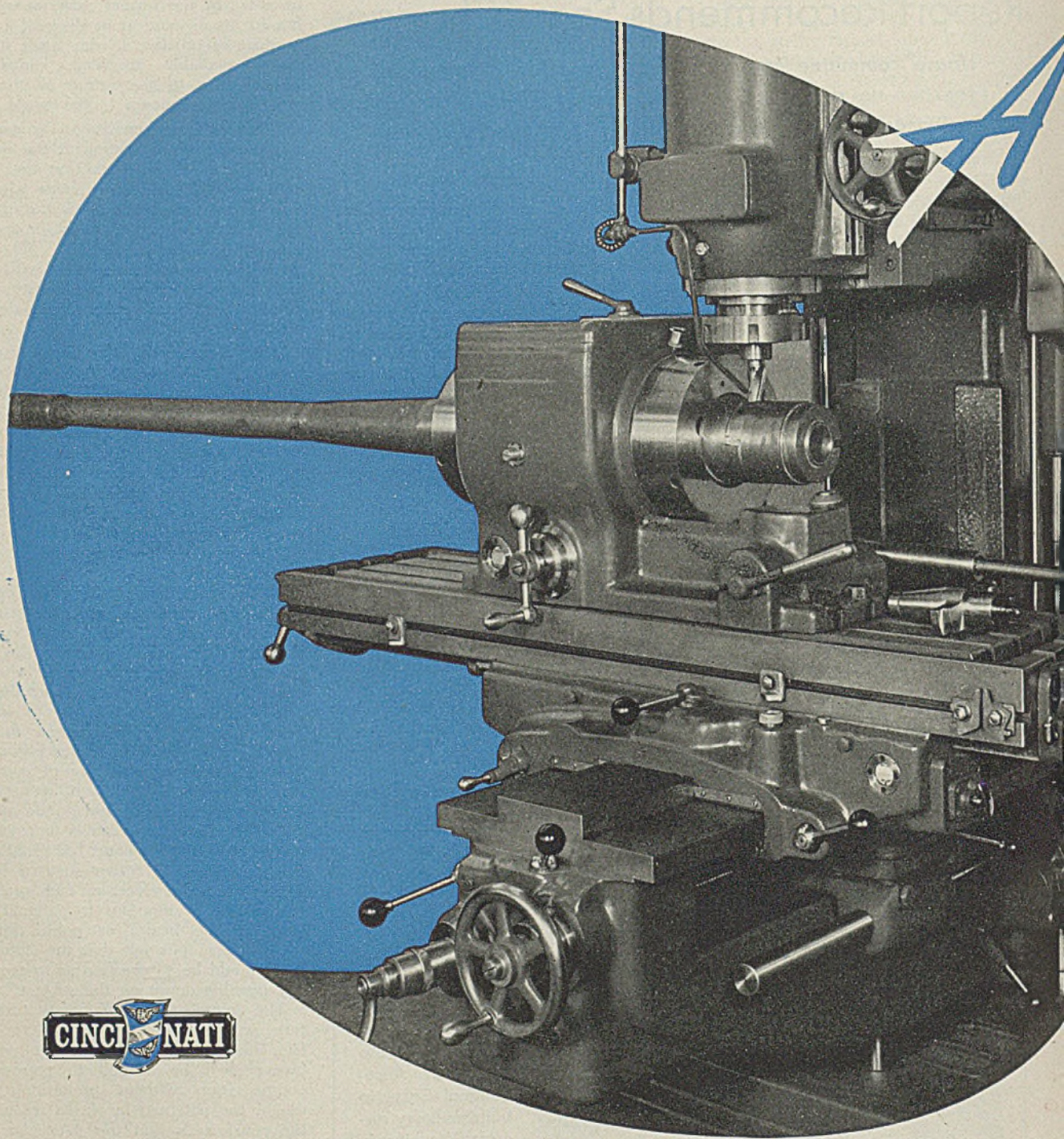
It also recommends that the commissioner of patents be authorized to decide whether a patent falls within one of these three categories upon request from one of the interested parties prior to institution of suit; his decision, however, would be subject to review by the United States Court of Customs and Patent Appeals.

A conclusion was reached that a patent may be and frequently is granted which would have been refused if the Patent Office had been in possession of

(*Please turn to Page* 124)



TRAINED EAR: Noted violinist Godfrey Ludlow is utilizing his musical ear to help Brewster Aeronautical Corp. to build military aircraft. Working in the receiving inspection department, he taps metal parts and is able to detect imperfections through the resultant sound waves. NEA photo



*A CINCINNATI No. 3 Vertical High Speed Dial Type Milling Machine, equipped with a special power feed rotary milling work head. The operation consists of milling a circular recess on an ordnance part, a job which was tooled up by the engineers here at Milling Headquarters. This group of milling authorities will be glad to work with you and give you the benefit of their long experience in solving your unusual milling problems.*

Navy E awarded March 6, 1942 Renewal star awarded August 29, 1942, along with Army-Navy E. The second star was awarded Feb. 23, 1943.

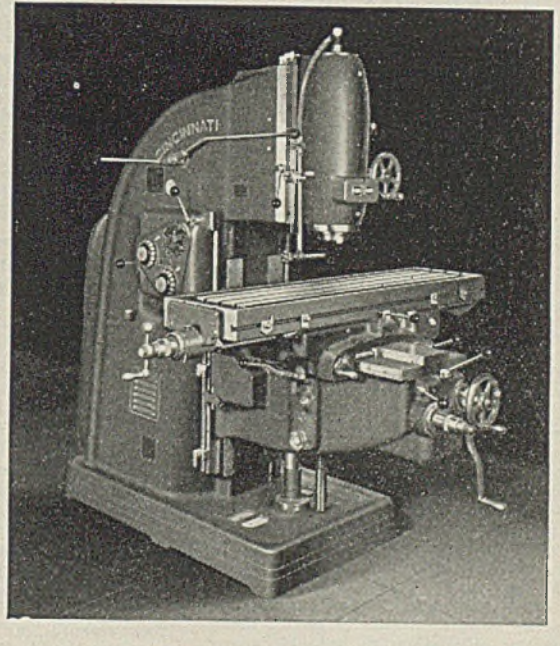
# THE CINCINNATI

MILLING MACHINES

# TWIST OF THE WRIST


## gives you the correct cutter speed

You don't have to walk around or "duck under" to change feeds or speeds on a CINCINNATI Dial Type Miller. It's accomplished easily and quickly, *by power,* from the front or rear of the machine. Think of the time and leg work your operators save, especially on milling operations such as the one illustrated on the opposite page. ¶ This type of job, like many others in the average shop, requires changes in spindle speed (cutter speed) to assure maximum production, good finish, and long cutter life. The part requires a milled relief around the main diameter at the large end. A 1-13/64" diameter end mill, running at 188 r.p.m., mills the principal portion of the relief. This leaves too large a radius at the end of the cut, so it is then removed with a .407" diameter end mill running at 550 r.p.m. ¶ With CINCINNATI Quick Change Collets, the cutters are changed in a few seconds. And with the *exclusive* Dial Type feature of power speed and feed change from the front operating position, the speeds are changed as desired in a few clicks of the speed dial. Not more than four seconds are required to change cutter speeds on this job. A twist of the wrist does the trick. ¶ If there were no others, this feature alone would be well worth your most serious consideration when selecting new milling machine equipment. But this is only one of the many advantages you will find in CINCINNATI Dial Type Millers. You'll be interested in learning more about these versatile milling machines.



*At the right is a CINCINNATI No. 3 Vertical Dial Type Milling Machine. The Dial Types are made in plain, universal and vertical styles, Nos. 2, 3 and 4 sizes, medium and high speed ranges. Sweet's Catalog File gives a brief description. Complete specifications may be obtained by writing for catalog M-970-2.*

ILLING MACHINE CO. CINCINNATI, OHIO, U. S. A.

BROACHING MACHINES • GRINDING MACHINES • LAPPING 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

**PURCHASE ORDERS:** Provisions of CMP regulation No. 1, which prohibit controlled materials producers from accepting other than (1) authorized controlled materials orders, (2) sample orders, or (3) orders which they are specifically directed to accept by the War Production Board, do not prevent such producers from accepting pieces of paper upon which purchase orders are written, although the orders are not authorized. However, persons are urged by WPB not to place orders for controlled materials unless they are authorized orders under one of the three permissible classifications, although WPB recognizes that in some instances consumers of controlled materials will find it necessary to place such orders in advance of being able to validate them.

**WELDING ELECTRODES:** All persons who manufacture spot welding electrodes, whether they manufacture for resale or confine their manufacture for their own use, are included under provisions of general conservation order L-318, as amended Oct. 1, 1943.

**ALLOTMENT SYMBOLS:** Allotments for Army Ordnance tank programs, formerly identified by the program symbols 0-5 and 0-6, will be identified in the future by 0-6. Consumers of controlled materials working on the program allotments identified by 0-5 and 0-6 may consolidate their allotments into a single account. Orders already placed which are identified by 0-5 need not be changed to 0-6.

### E ORDERS

**CUTTING TOOLS:** General preference order E-2-b, which regulated production and distribution of metal cutting tools has been revoked. Producers must still fill rated orders ahead of any unrated orders which may be received and they must comply with inventory restrictions contained in priorities regulation No. 1 which provides in part as follows:

Unless specifically authorized, no person shall make delivery of any material if the inventory of that material of the person accepting delivery is, or will become, in excess of a "practicable minimum working inventory." Producers are requested to continue to file monthly operations reports on form WPB-39. (E-2-b)

**BEARINGS:** Notwithstanding provisions of priorities regulation No. 1, any person who has obtained antifriction bearings with priorities assistance who no longer requires them for the purpose for which the priorities assistance was granted, may dispose of them only in one of the following ways: Redelivered to the person from whom they were obtained, if such person is willing to accept redelivery; or disposed of to fill any order rated AAA; or disposed of to fill any order rated AA-5 or higher placed by the Army, Navy, Maritime Commission or War Shipping Administration, or by any prime or subcontractor of any of them; or if quantity of bearings to be sold in any month had a total cost of $250 or less, he may dispose of them to fill any order rated AA-5 or higher; or, if the quantity had a total cost in excess of $250 and if they are not being disposed of pursuant to the above methods, he must apply to WPB for permission to dispose of the bearings.

Each producer must schedule his total production for the last four months of this year and quarterly production beginning Jan. 1 in such a manner as to make available during such period or quarter 85 per cent of his production for delivery against production orders and 15 per cent for delivery against miscellaneous orders. Specific operations with respect to delivery requirements are made under order M-293 where necessary.

Base rating on deliveries of bearings is raised to AA-5 with the proviso that orders placed prior to Nov. 10 may be delivered on a rating of A-10 or higher. (E-10)

### L ORDERS

**SUPPLIERS' INVENTORIES:** Wholesalers, jobbers, dealers, retailers, or branch warehouses who are required to keep inventory records under limitation order L-63 no longer need file form WPB-825 (formerly PD-336). Suppliers must keep records of total monthly sales from stock and total inventory of supplies at the end of each month, but need not keep a separate record of each type of supplies. (L-63)

**CLOSURES:** All restrictions have been removed on the use of steel in the production of hooks and eyes, snap fasteners, and brassiere hooks made in any part of the country other than labor market areas 1 and 2. Ban has been lifted also on the production of slide fasteners of more than 27 inches in length for civilian use. Steel acquired upon written authorization of WPB under any of its special programs may be used to manufacture any kind of slide fasteners but steel consumption is limited to two-thirds of the average quarterly poundage of all materials used during the year ended June 30, 1941.

Manufacture of buckles for shoes and clothing may be resumed. Use of steel for buckles, burrs, clothing trim or ornaments, corset clasps, eyelets, hose supporters, etc. in labor areas 1 and 2 is limited to the rate prevailing in the 12 months ended June 30, 1941. Manufacture of closed type steel buttons for use on coated fabric garments is permitted.

Zinc is banned for skirt and dress pocket fasteners in uniforms of the nurses' corps at women's divisions of the armed services, except on preferred orders. Its use on garments also is prohibited. (L-68)

**INDUSTRIAL INSTRUMENTS:** Restrictions on chromium and nickel content of extension lead wire for instrument ends have been modified. Specifications now provide that the size of wire, except for wire used on aircraft or for superheater pyrometers on locomotives, shall be limited to NBR 14 B and S gage, or smaller. The new specifications will create a potential use of more than 25 tons of alloy material a year. (L-134)

**WATT-HOUR METERS:** Applications for permission to buy domestic watt-hour meters from existing stocks now must be filed with the regional utility inventory control offices of WPB. The order prohibits the manufacture or assembling of any new domestic watt-hour meter or any new parts for the conversion of such meters from one to another type. It does not prohibit the use or delivery of existing parts for conversion. Authorization for delivery of any new domestic watt-hour meter for a claimant agency or for delivery between persons who operate electric power utilities which serve the public generally must be obtained from WPB on form WPB-1319 (formerly PD-556). (L-151)

**ELECTRIC MOTORS:** Because of possible conflict with general scheduling order M-293, WPB approval of electrical motor production schedules are no longer required. Requirements for certification also have been removed, although restrictions in the order remain unchanged. (L-221)

**FOUNTAIN PENS:** Sale or transfer of fountain pen parts for uses other than those specifically permitted by the order is prohibited. Production to fill preferred orders must be specifically approved by WPB. They may be used or resold for repairs. (L-227)

**FARM MACHINERY:** Additional restrictions have been imposed against selling farm equipment for non-farm use, except on a rated order AA-4 or higher. Dealers are prohibited from selling rationed farm equipment from stock, except in specified cases, such as Army and Navy orders. (L-257)

**INDUSTRIAL TYPE INSTRUMENTS:** Number of sizes, types and special features of industrial and special purpose thermometers has been reduced. Scale ranges in industrial thermometers are restricted between minus 40 degrees and plus 950 degrees Fahrenheit to a definite list. Cases and case fronts shall not be made of copper or copper alloy other than copper tubing, copper alloy tubing, or cylindrical extruded shapes.

Brass cases may be used for the 4½-inch and 6-inch indicating dial pressure gages manufactured with a solid front for use with compressed gases such as hydrogen, oxygen, nitrogen, helium, acetylene and carbon dioxide. (L-272)

**CIRCUIT BREAKERS:** Prohibition has been removed on manufacture of circuit breakers containing shunt trips, under-voltage trips, auxiliary indicator switches or bell alarm switches. (L-300)

### M ORDERS

**ZINC:** Use of zinc is prohibited in making lock parts (except for pin tumbler assemblies, disc tumbler cylinder assemblies and cases for pin tumbler or disc tumbler padlocks); costume jewelry; vending machines (except sanitary napkin machines as permitted by order L-27); closures and associated items (except as permitted by order L-68). Restrictions on use of zinc do not apply for purposes including the following: For applying a protective coating or plating of zinc on plumbing fixture fittings and trim; for universal portable electric tools as defined in schedule 1 to order L-216; for portable pneumatic tools which, in the course of normal use, are lifted, held, and operated by not more than two persons; for light power driven tools as defined in order L-237; for data, instruction and identification plates; for air compressors (functional parts); for airline, water and oil separators; for air regulators, as part of spraying equipment. (M-11-b)

**STEEL DISTRIBUTORS:** A distributor may be classified as a warehouse as regards one product and as a dealer as regards another. Orders placed with warehouses by dealers are given the status of authorized controlled material orders only after acceptance by the warehouse. This permits warehouses to distribute available material equitably among their dealer-customers, rather than be forced to

### INDEX OF ORDER REVISIONS

fill early orders in full to the detriment of late comers. (M-21-b-2)

DIAMOND DIES: Monthly reports from consumers of non-critical size diamond dies have been eliminated. These consumers hereafter will file reports once a year. (M-181)

SILVER: Where one person furnishes silver to another under toll agreement, to be processed and returned for list B uses, the person who furnishes the silver shall be considered as having put it into process. This is an important change in connection with the computation of quotas for list B uses and with the proper charging of quotas. Silver findings, including chain, have been placed in the category of finished silver products. (M-199)

PRINTING PLATES: Beginning with the fourth quarter of 1943, a maker of printing plates is permitted to use only 60 per cent, by weight, of his 1941 quarterly usage of zinc. The order has been broadened to include zinc as well as copper in the provisions for charging the use of 16-gage metal as if it were 18-gage metal when such 16-gage metal was in inventories as finished photo-engravers sheet prior to July 1, 1943. Weight of all gages and sizes of each metal must be combined in determining a person's allowable inventory. (M-339)

### P ORDERS

PLUMBING REPAIRS: All orders for plumbing and heating emergency repairs, accompanied by an OPA rationing certificate, are assigned an AA-5 rating. Persons wishing to obtain steel and wrought iron pipe and steel sheets for use in making repairs may no longer use the CMP symbol MRO (maintenance, repair and operating supplies). (P-84)

### PRICE REGULATIONS

MACHINES AND PARTS: Permission has been authorized for sellers, lessors or suppliers of machines and parts, and machinery services to enter into adjustable pricing contracts pending OPA action on an application for adjustment of the sellers' maximum prices. The seller may agree with the buyer (or lessee) to charge a price which can be increased up to the maximum price in effect at the time of delivery if (1) a request for a change in the applicable price is pending; (2) authorization is necessary to promote distribution or production; and (3) it will not interfere with the purpose of the Emergency Price Control Act of 1942, as amended. (No. 136)

AUTOMOTIVE PARTS: A manufacturer now may accept payment for automotive parts at a proposed new price and to refund, or collect, on the basis of the ceiling finally approved by OPA. Requirements for recomputation of maximum prices when the cost estimates were based on inaccuracies are removed. Purchase costs in the case of a purchased part are made comparable to factory costs in the situation which requires or permits a manufacturer to establish a new list price. In the case of cost reductions, the manufacturer now does not have to establish a new list price until the 10 per cent reduction in costs amounts to five cents or more for the unit of sale. (No. 452)

## Adopts Packaging Standard For Machine and Lag Bolts

Simplified Practice Recommendation R60-43, packaging of carriage, machine and lag bolts, has been accorded the required degree of acceptance by the industry and is effective as of Nov. 15, according to the Division of Simplified Practices, National Bureau of Standards. The approximate weight per 100 bolts, the full container quantity and approximate gross weight for each size and type of bolt covered are shown in the revised schedule.

# Administrator Bowles Fills Key OPA Posts with Business Men

*Fifty experienced executives now occupy top-flight policy-making positions formerly occupied by theorists and others who were criticized by Congress. . . Increased emphasis is now being placed on activities of local ration boards*

REORGANIZATION of the Office of Price Administration under the direction of Chester Bowles, price administrator, is now nearly completed, although "some shifting around of titles" is pending. This was revealed by James G. Rogers Jr. assistant to the "general manager" and who also is holding temporarily the post of deputy administrator in charge of information. He disclosed that the office of "general manager" no longer exists.

Fifty former business men now are entrenched in key OPA positions formerly occupied by theorists who were severely criticized by Congress which directed that, effective Aug. 16, 1943, no man should control price-making policies who had not had business experience.

Thirty-eight of these new appointees are heads of branches or sections while the others are consultants on pricing policy. Mr. Rogers singled out for particular notice the following: Reagan P. Connolly, consumer goods executive, formerly president of Interstate Department Stores, New York; Clarence W. Slocum, also supervising consumer goods, former president of Beckwith Chandler Co., Newark, N. J.; James F. Brownlee, deputy administrator of the price department, former vice president of General Foods Corp. and general sales manager of the American Sugar Refining Co.; Jean F. Carroll, food price executive, former Cincinnati branch manager for Kroeger Grocery & Baking Co.; Col. Bryan Houston, deputy administrator in charge of rationing, former vice president of Young & Rubicam, New York.

Only a half-dozen ex-college professors now remain as section heads but their work is described as entirely satisfactory.

Another far reaching aspect of the reorganization is the new emphasis on local ration boards. Mr. Bowles said recently that every OPA man in an administrative post would be sent into the field for a time to meet local problems.

## Order Backlog for Small Motors Continues Heavy

Producers of light power-driven tool assemblies are having difficulty in obtaining fractional horsepower motors despite the fact production of these motors has increased to seven times the peacetime output, it was stated at a meeting of the industry advisory committee with War Production Board representatives.

There is an eight-month backlog of orders for fractional horsepower motors because of prior requirements for aircraft and the switch to production of special types of motors for military uses which supersede schedules for standard types.

## Steel Substituted Widely For Brass in Shipbuilding

Use of iron and steel for a wide variety of ship fittings has saved more than 15,134 tons of copper and brass in construction of the Maritime Commission's victory fleet. The commission has disclosed that a changeover in specifications from brass to steel had been made for conduit and couplings for electric cable on cargo vessels and tankers.

Fabricated steel portholes for Liberty ships are now in production which will effect a saving of more than 4784 tons of brass a year. The exhaust pipe from the main engine to the condenser on both cargo vessels and tankers has been changed from copper to steel, saving more than 2200 tons of copper a year.

Nickel-plated brass plumbing fixtures have been eliminated and malleable iron or carbon steel, galvanized or painted, are used instead. Specifications for ship bells call for steel in place of brass.

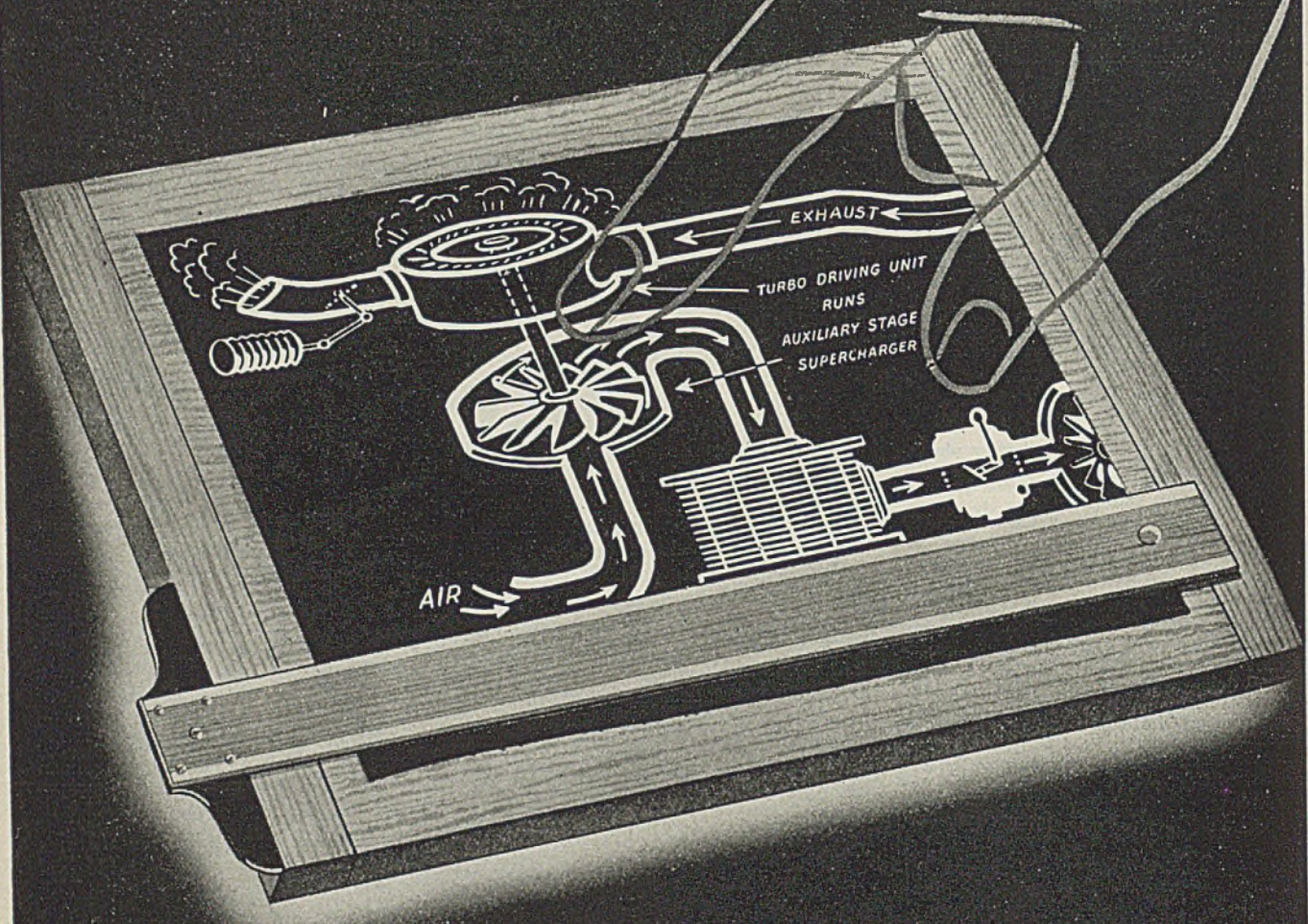
Most aluminum and stainless steel equipment has been eliminated from victory fleet galleys. Single clad steel is used only when absolutely necessary. The design of electrical fittings and lights has been simplified and standardized, eliminating the use of cast aluminum, brass or bronze. A large majority of valves now are of cast iron instead of brass.

## Construction Halted on Two Aluminum Extrusion Plants

War Production Board has halted construction of two major aluminum extrusion plants calling for the expenditure of a total of approximately 37 million dollars.

Following a determination that present extrusion facilities are adequate for all anticipated requirements, WPB ordered preference ratings revoked for construction of a $20 million plant by the Reynolds Metals Co. at Memphis, Tenn., and construction of a $17 million plant by the American Brass Co. of Waterbury, Conn., to be built at Columbus, Neb.

# A ROLLER BEARING AT 25,000 R.P.M. IN 300-DEGREE TEMPERATURES!




## PROGRESS—for Aviation...and for Hyatt

Thanks to Turbo-superchargers, our planes now fly higher and faster...with "full military power"...at altitudes where the air is so thin that engines formerly lost four-fifths of their power.

"One of the toughest of all machines to design and build," its makers have said.

Ours was the job of supplying the roller bearing for a shaft spinning at 25,000 R.P.M. under 300-degree temperatures. This meant pioneering advances in the scientific heat treating of metals to prevent "growth." It meant improvements in grinding practices and refinement of surface finishing technique ...establishment of new manufacturing routines and inspection procedures.

The result: a new *super-precision* Hyatt Roller Bearing, with inner race peripheral speed of 10,000 feet per minute. 51 years of specialized roller bearing manufacturing, research and progress made it possible.

Have you a tough bearing assignment?

BUILD FOR THE FUTURE WITH WAR BONDS

**HYATT BEARINGS**
DIVISION OF
**GENERAL MOTORS**
HARRISON, N. J.

By A. H. ALLEN Detroit Editor, STEEL

# MIRRORS of MOTORDOM

*Secrecy surrounding contract terminations, cancellations and cutbacks bewildering to motor industry converted to all-out war production. . . Some workers already being released. . . Clarification of government policy needed*

WHAT is happening in the war production picture throughout the country? Why the wave of contract cancellations, schedules cut back, working hours reduced, employment reduced? Why the exodus of personnel from WPB? Have the armed forces finally realized the military equipment pipelines to the battlefronts are filled and production must be scaled back to attrition losses? Or does the United Nations high command possess some information about the military situation in Europe which portends an early finish?

These are vital questions which are being asked everywhere around Detroit today. They probably are being asked throughout the country. They may be the explanation behind the rising tide of labor unrest which is sweeping through industry. At any rate, the production readjustments are cold hard facts which do not stack up at all with the dire warnings about manpower shortages which the War Manpower Commission issues, nor with the strong pleas for accelerated production emanating from the generals and admirals.

Take the matter of contract terminations. Col. Bryan Houston, of the Army Service Forces, gave a group of automotive executives here recently some straight-from-the-shoulder facts on terminations. He said, in part:

"I find myself totally inadequate to get this office or any other here or in Washington to agree with me on the importance of the current termination job. I don't know whether it is because you do not appreciate the size of what has gone on, or whether you do not realize the implications of what a continuation of current terminations means.

"From a production point of view, we have already filled out our pipelines, we have already clothed vast armies and vast navies, we have already built many ships, we have already made millions or billions of rounds of ammunition.

"As of Sept. 1, there had been terminated for the convenience of the government 8520 prime contracts. I don't know how many subcontracts that involves, but I think it is conservative to say 85,000.

"It is not uncommon for me to go to a concern now and find 200 or 250 canceled contracts in one outfit—not all big prime contracts, but 250 prime contracts in a single corporation is not a rarity. The face value of those terminated contracts as of Sept. 1 was $5,800,000,000. Now, just by way of comparison, we get so used to kicking around billions, I want to remind you that is still a lot of jack. At the end of the last war, we canceled 27,000 contracts, with very few 'subs' and the canceled value of those contracts was about $3,800,000,000.

"In the last two months the War Department has been about holding its own on terminations, there being about 1000 cancellations a month and about 1000 final settlements and final negotiations a month. We have settled three-fourths of those that have been canceled, in numbers. We have not done as well in dollar value. That is what worries me.

**"Terminations May Solve Shortages"**

"It is my belief that there may be enough men, materials, and machinery involved in these contracts which have been terminated, but not yet settled, to solve many of the real shortages still existent in our supply program now. I know that there are a few scarce items that won't be solved in that manner, but I say to you that there are tremendous quantities of men, material and machinery involved in these cancellations that must be taken back into the war effort, and when we can take that back into the war effort, we will be a long way down the road.

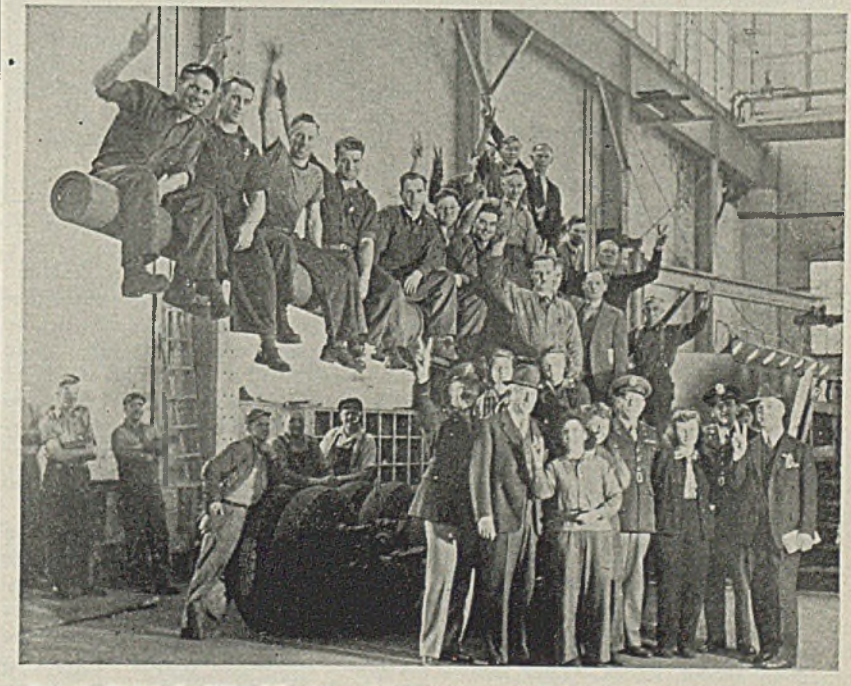
"There is a good deal of talk about how many contracts there are to cancel. You hear the figure of 250,000 prime contracts and 5,000,000 subcontracts. I think there are probably 100,000 important prime contractual relationships, and probably 1,000,000 subcontractual relationships of importance."

Colonel Houston went on to examine in detail the basic problems involved in contract terminations—problems which Bernard Baruch and his staff are even now probably taking apart. In summation, they are:

1. Need for a basic simply stated policy by the government on terminations.
2. Need for a training program, training contracting officers and training contractors.
3. Getting conrtactors' claims in to the government.
4. What to do with materials in contractors' plants.
5. Getting settlement funds out to the contractors.

No. 4 is one of the toughest nuts to crack. Colonel Houston points out that obviously the services are not organized to take over into their possession the materials and work in process which are in plants where contract terminations have immobilized them. At present, contractors are being asked to dispose of such materials before terminated contracts are settled, but the seriousness of the problem suggests some change may be imminent. Suggestions from industry on this critical disposal question are earnestly sought by the services.

Two more paragraphs from the colonel's message are worth including



FINAL GUN CARRIAGE: Assembly crew in the Dunkirk gun shop of the American Locomotive Co., New York, cheers the final 155-millimeter gun carriage to be made by the company. The Dunkirk shop produced the first carriage of this type to be made by private industry in the spring of 1941. Now the company is making locomotive parts for the War Department and is expanding production of equipment for the manufacture of high-octane gasoline

in the record. Bluntly he told the motor industry executives:

"I am not concerned over whether you make a profit out of this war. I am not making a damned bit of profit out of this war. I am taking quite a beating, in case it is of any interest to you. That is my business. That is no worry of yours, and whether you get any money out of it just leaves me cold. Whether labor gets fat out of it leaves me cold. I am frightfully interested and all 'het up' over your usefulness as an employing agency. I am tremendously interested that labor which has gotten high wages, and manufacturers who have gotten high profits, be gotten back promptly into some normal operation, profitable manufacture and gainful employment.

"You are going to pay some two hundred billion dollars for this war. Your children and your grandchildren will be paying on it. The difference between the most penurious, hard-fisted, careful, ruinously slow settlement which could be made of these contract terminations, and the most liberal which could be made, will not amount to $500,000,000. It is very poor poker playing, dice shooting, or business, to gamble a two hundred billion dollar peace against a quarter of 1 per cent, and if you let this thing get into a tailspin, it will cost you many more billions in unemployment wages, in lack of income, taxes, or any other way that you or your favorite economist want to measure your wealth and prosperity. When you realize there is no system which is mathematically able to save the cost of a 90-day tieup in industry, then you begin to understand the significance of negotiated settlements."

### Many Workers Being Released

Contract terminations and schedule readjustments, plus the inevitable rise in production efficiency accompanying the progress of any production job, cannot fail to release working people—in fact such releases have already started. Some of this excess will be absorbed by the draft, some by women returning to the home, but even beyond these inroads it is becoming apparent that a manpower shortage of the dimensions drawn up by the WMC for Detroit (43,000) is just not going to eventuate. Industry leaders have always said this, even Air Force officers have admitted it. The WMC appears to be the only agency clinging to and insisting on the around-the-corner manpower shortage. Why it will not accept the facts is a major mystery.

Already a local company supplying airframe assemblies has released several hundred in recent weeks. Other companies are going from three shifts to two shifts. An armored car contract in this area has been canceled. An aluminum forging job outstate has been called off. No official announcements have been made of these developments, they are supposedly veiled in military secrecy. Why? The secrecy certainly confounds our own industrial effort far more than it does the enemy. Why not bring contract terminations and readjustments out in the open, so that a realistic appraisal of labor requirements can be made.

One thing fairly certain is that 1944 will be a big year for heavy-duty trucks, both civilian and military. R. L. Vaniman, director of the WPB Automotive Division, recently met with manufacturers here and announced a four-fold increase in civilian truck production for next year, projected total being increased from 33,852 to 123,492 units. The program has been given top priority ratings, equivalent to aircraft and high-octane gasoline. All requirements have been pooled through one agency, presumably the Ordnance Department's Tank-Automotive Center here, in order to obtain the huge military requirements along with civilian needs.

Military requirements are chiefly in the heavy-duty 6 x 6 category, as is a large share of the civilian truck program. Truck interests are frankly skeptical that even the proposed military needs can be filled, let alone civilian. It takes more than a mere WPB authorization to get the truck built. For example, out of some 7500 heavy-duty civilian trucks authorized for production in the latter part of this year, only a handful will be built to meet all needs.

The overall 1944 truck production program also includes the requirements for construction and farm machinery, general industry equipment and other uses which may require the same general type of axles, transmissions and engines as trucks. A certain portion of the manufacturing facilities for these critical components will be reserved for the production of replacement parts for civilian use.

Trucks to be produced under the revised program will include 92,057 mediums, ranging in gross weight from 9000 to 15,999 pounds, 21,030 light heavies, ranging in weight from 16,000 to 24,000 pounds, and 10,405 heavies, ranging from 24,000 pounds up. Mr. Vaniman stated that the output of the first six months of next year will be limited to presently existing facilities, due to the lead time required.

### MUCH METAL SAVED

**Over 100,000 tons of steel allotments; 22,000,000 pounds of copper allotments and 85,000,000 pounds of aluminum allotments for the fourth quarter were returned as unused to the Aircraft Scheduling Unit, Dayton, O., by the aircraft industry. These returns are roughly 20 per cent of the gross amounts handed out to the industry.**

**The enormous turnback of allotments represents the aircraft industry's and ASU's achievement in the campaign against "attrition" in the aircraft industry—the failure of industry to place orders for steel, copper and aluminum up to the amounts authorized by CMP allotments (See STEEL, Oct. 25, p. 60).**

Edward T. Gushee, assistant to the president of Detroit Edison Co. and a consultant on procurement of materials, has been named chairman of the local production urgency committee, established to provide a central control for all manpower and production problems in this area.

Steel production here held at a high rate throughout October. The Ford open-hearth department established a new record. Eclipsing the previous high of March, 1943, by some 3000 tons. Meanwhile, Great Lakes Steel turned out enough plate for 33 Liberty ships.

Nonferrous heat and corrosion-resisting alloy which has been used for some time in the manufacture of dental plates, bridgework, bone caps and other parts used by surgeons in patching up wrecked bodies (humans), is proving promising for use in buckets of turbosuperchargers. It is a cast material, practically unmachinable, of the stellite type without tungsten, containing 65 per cent cobalt, 30 per cent chromium and 5 per cent molybdenum. Known as Vitallium, it was developed by the Austenal Laboratories Inc., New York.

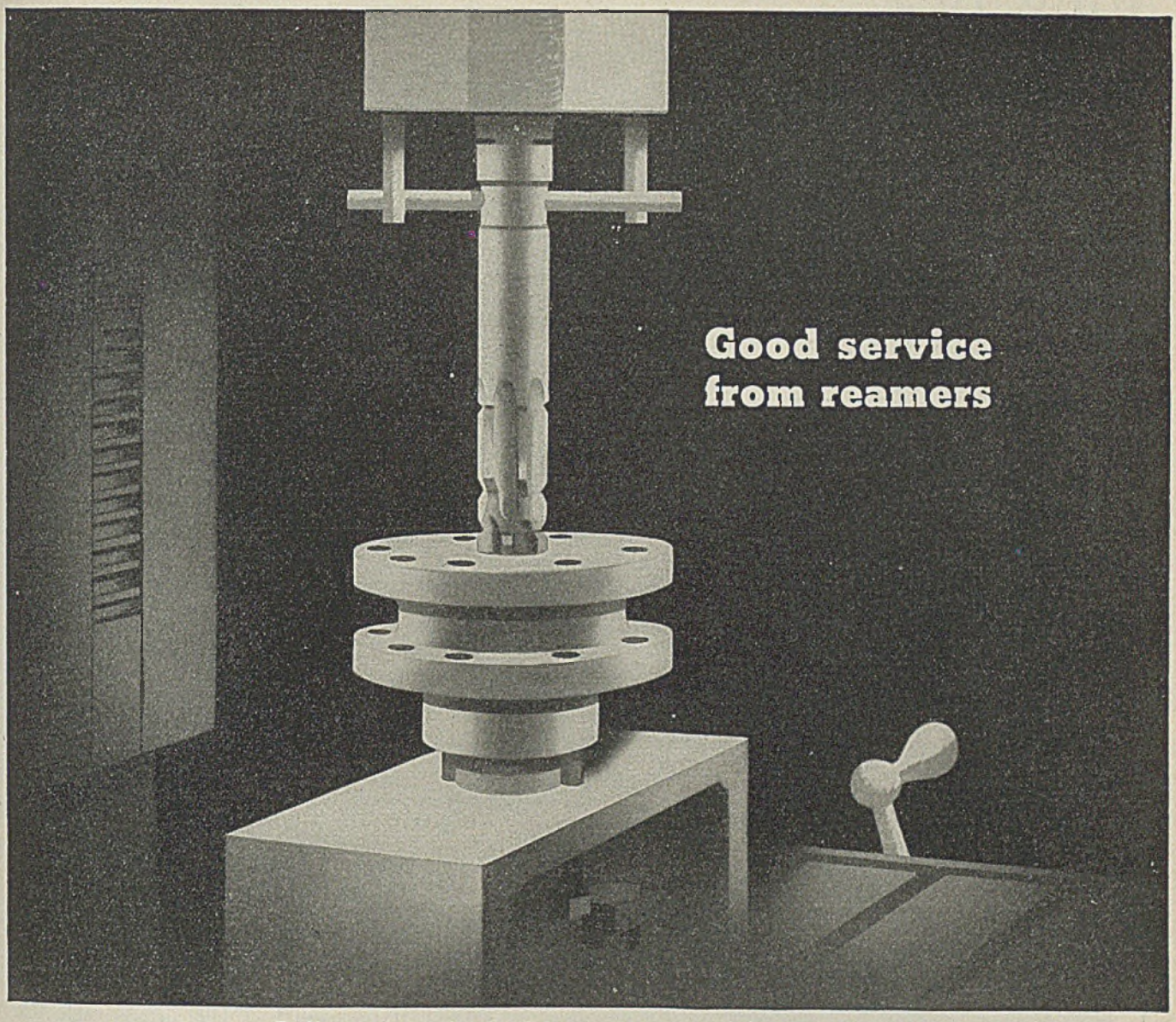
### Trend Back to Brass

Interesting commentary on the materials picture at the moment, reflecting the shifting positions of one material versus another, is that after months, if not years, of intensive development work in the perfection of steel shell case manufacture, to conserve brass, the trend now is back to brass.

Announcement has been made by the Saginaw Malleable Iron Division, General Motors, that it will operate a new $2,200,000 malleable iron foundry plant at Danville, Ill., as soon as the building and equipment can be completed. The plant actually will be on a 54-acre tract of land at Tilton, Ill., just outside Danville, and will provide 130,000 square feet of floor space, employing approximately 500. Electric furnace melting will be the practice.

Output will be confined to Armasteel (malleable iron) castings for use in axles of heavy-duty trucks. No machining will be done at Danville which, incidentally, is the forty-seventh city of the U. S. to accommodate General Motors operations.

French E. Bassett, production manager at Saginaw and formerly sales manager and defense co-ordinator, will have charge of production at Danville, and left for that post early in November, accompanied by several key men including Harold W. Richter, stores superintendent, who will be purchasing agent; Clarence A. Mauch, foundry superintendent, who will be plant superintendent; Donald F. Richter and John D. Malone, engineers.




*Information supplied by an Industrial Publication*

There are two operational factors that have more to do with the life and efficiency of reamers than may be generally known. One is the matter of feeds and speeds; the other, the condition of the hole.

As to the former—with due regard to machine set-up, required finish, and part design—in general, reamer speeds should be from 60 to 70% of drilling speeds, and feeds should be two to three times faster.

The amount of stock left in the hole has considerable effect on reamer life. If there is insufficient stock, the reamer will tend to bind instead of cutting. This is also true with bell mouthed holes, caused by faulty drilling, or drilling without a guide bushing.

For efficient reaming in ferrous metals 1/64 inch of stock should be left on holes up to 1/2 inch diameter, and 1/32 inch left in holes of greater diameter. A smaller amount of stock may be left in softer metals. The correct amount in individual cases can be determined by experiment.

# WING TIPS

*Development of versatile Lockheed P-38 presented vast number of engineering and manufacturing problems. Now used as a fighter, dive bomber, skip bomber and as an aerial photographic reconnaissance model*

"DER GABELSCHWANZ TEUFEL", or "fork-tailed devil", is what Nazi pilots call the Lockheed P-38 two-engine twin-boom fighter plane which, in combat operations, has been used not only as a fighter, but also as a dive bomber, skip bomber or just plain bomber (it will tote a 2000-pound bomb), and, devoid of armament, as an aerial photographic reconnaissance model.

Despite its accepted potency as an aerial weapon today, the P-38 was not always thus. In the early stages of its design and manufacture, it was a production man's headache. No airplane ever presented a greater number of difficult engineering and manufacturing problems. These difficulties were overcome only after months of hard work, of bitter disappointments and constant change to make even the most minute details exactly right.

One by one, the problems were solved —and as fast as they were solved the development of enemy counter-measures in aerial combat dumped new ones into the laps of the Lockheed engineers. Demands for increased production, as the Army demanded more and more Lightnings, obliged the company's manufacturing and plant engineers to go to a continuously moving mechanized assembly line (STEEL, Sept. 20, p. 102).

As a result of what the aerial warfare overseas revealed about the requirements of an airplane that would stand up under constantly changing conditions and combat tactics, there have been, in succession, 16 different modifications of the basic XP-38 which was flown for the first time in secret at March field, California, Jan. 27, 1939.

Each of these modifications is a step forward toward a more deadly fighting airplane, or a better photographic "Recco," or a diversion to produce a plane in a slightly different form to accomplish a different mission.

### P-38 Heavy But Compact

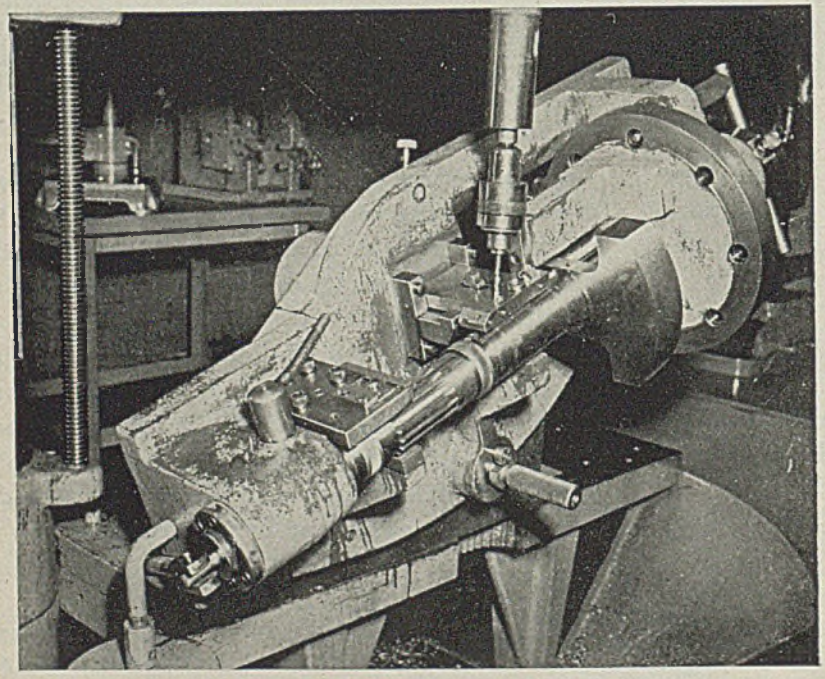
It had always been considered unthinkable that an airplane could weigh as much as a ten-passenger transport and yet carry only one man. In this, Lockheed set a precedent. The P-38 weighs as much as the old tri-motored Ford, its gross weight of 7 tons making it perhaps the heaviest of all fighter airplanes, yet it is compact, and this compactness exacted precision development on a much higher order than had been experienced previously. Actually, the P-38 has the equivalent in instruments, controls, radio, etc., of a 21 passenger transport, and has armament, high speed and high altitude problems in addition.

The original conception, drawings and papier-mache mock-up of the XP-38, or prototype, was the result of a collaboration of minds. From the start, the twin-boom idea was a basis for discussion. There were several reasons for this. First, two engines were to be used to achieve greater horsepower as well as a safety measure in case of engine failure or the disabling of one power plant due to enemy action. Two engines allow for good vision and nonsynchronized armament. Furthermore, in order to get a minimum cross-section-frontal area with retracted landing gear, particularly the tricycle type, it was felt that this arrangement would lend itself readily to the most advantageous solution.

The history of P-38 model 322-61 or "Lightning I" for the British, for which contract was signed in March, 1940, is interesting. Engineering began about that time, deliveries in December, 1941. Some Lockheed men called this the "castrated P-38". The British wanted—and got—no turbosuperchargers, no counter-rotating propellers. Because the higher-powered Allison engine was restricted, not yet having been released to the British via lend-lease, the plane was powered by the old C-15 Allison engine. It had a 20-millimeter cannon and four 0.50-caliber machine guns, a British radio and British instrument panel. As predicted by Lockheed engineers, the British didn't like the plane without supercharger and with props turning in the same direction, and the 143 Model 322s that were built were sent to a modification center operated by Lockheed and Vega at Dallas, and there changed back into an acceptable U.S. Army model for training.

The F-4 version of the P-38 was the first camera ship, on which engineering began in mid-1941, deliveries in March, 1942. This was a redesigned P-38 equipped with four cameras in the ammunition and gun compartment, and was completely unarmed. It was equipped with a drift-sight to aid the pilot in his photo-reconnaissance work and was given a sky blue camouflage.

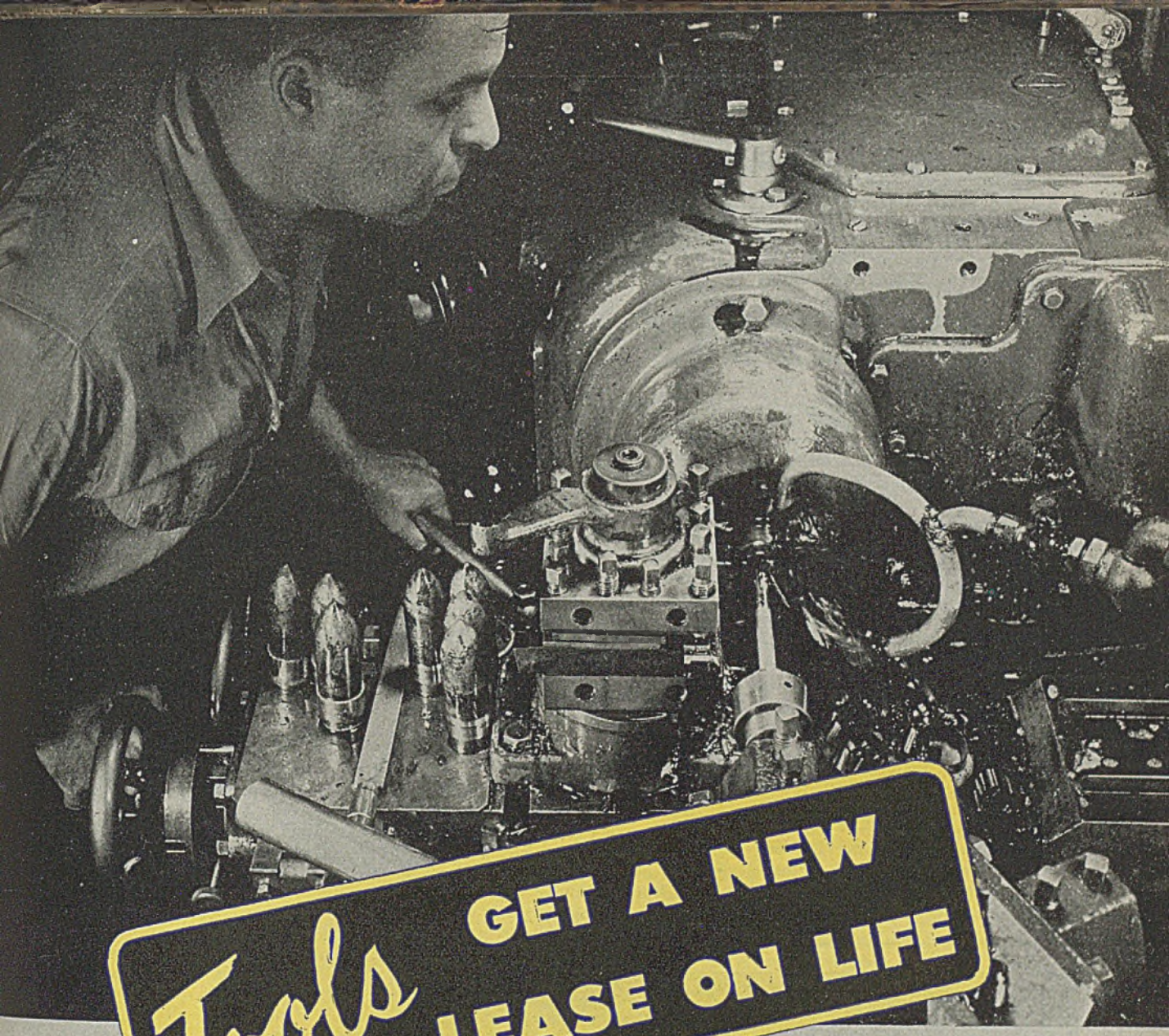
Sixteenth model of the P-38 is now in the works, with engineering begun early this year. No deliveries have been made as yet, and details are restricted.



REDUCES SET-UP TIME: Special drill jig developed by the Lycoming Division of Aviation Corp., Williamsport, Pa., permits drilling and reaming of all small holes in crankshafts for its R-680 radial air-cooled engines in one operation. Five separate jigs formerly were required for this operation. The device reduces set-up time by 80 per cent, cuts loss of critical material due to nicks and scratches in handling

## Keep Employes Informed, WPB Advises Industry

"One of the chief shortcomings of the aircraft industry is its failure to keep its employes properly informed as to what is going on," said C. E. Wilson of the War Production Board to J. H. Kindelberger of North American Aviation at a recent conference at the NAA plant in Dallas. This is not altogether the fault of the industry which in the past three years has been confronted with



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one of the most herculean jobs of expansion ever conceived. Management and supervision have been spread thin, and the intense pressure on production has been unrelenting, so much so that the matter of keeping working people informed about their jobs and their future too often has been neglected.

One result is a considerable degree of confusion in the ranks of airplane plant workers about just what is transpiring in their own plants. The Dallas NAA plant is a case in point. After recent investigations by the Truman committee, the WMC and the WPB, there were widespread reports circulated that the plant was just stalling along with thousands of unnecessary workmen, that 10,000 were going to be laid off, that productivity was poor, etc.

In a statement to employes Mr. Kindelberger explains that no layoffs were planned, but that future employment schedules had been reduced by about 10,000. In other words, practically no hiring will be done between now and Jan. 1, and after that time any increase will be much more gradual than had been first anticipated.

Two principal reasons are involved: (1) Aircraft production quotas have been rescheduled by the Aircraft Production Board, so that peak production at Dallas can be maintained with 4000 fewer workers than originally planned; and (2) manufacturing experience on the B-24 bomber and P-51 fighter has attained a higher efficiency level than advance estimates had indicated possible at this stage—12½ per cent higher to be exact—with the result that peak production can be obtained with 6000 fewer personnel than planned.

Also, at the urging of WPB, new labor-management production drive committees have been established in the two NAA plants at Dallas, to function in purely an advisory capacity. The committees are being asked to consider discussions and recommendations on all subjects except those covered in the collective bargaining contract.

## Ford Plans To Build Cargo Planes at Willow Run

On the heels of statements by spokesmen for the Ford Motor Co. that UAW-CIO leaders in the Army's Willow Run bomber plant were fomenting trouble for the express purpose of "taking over" management of the plant, Henry Ford revealed for the benefit of the newspaper front pages that he is contemplating the building of cargo planes at Willow Run after the war. Specifically, he stated, for the press:

"Although we have not been able to give any great amount of time and effort to the project because of all-out war production, we have been experimenting with small models and engines.

"There will be some new ideas in our design. I cannot say much about it yet because it is not complete, but we are trying to design a plane which will not need such tremendously long runways for takeoff and landing—a plane which can be operated at a fraction of the cost now necessary for flying big planes, and which will be positively as safe as it is possible to make it.

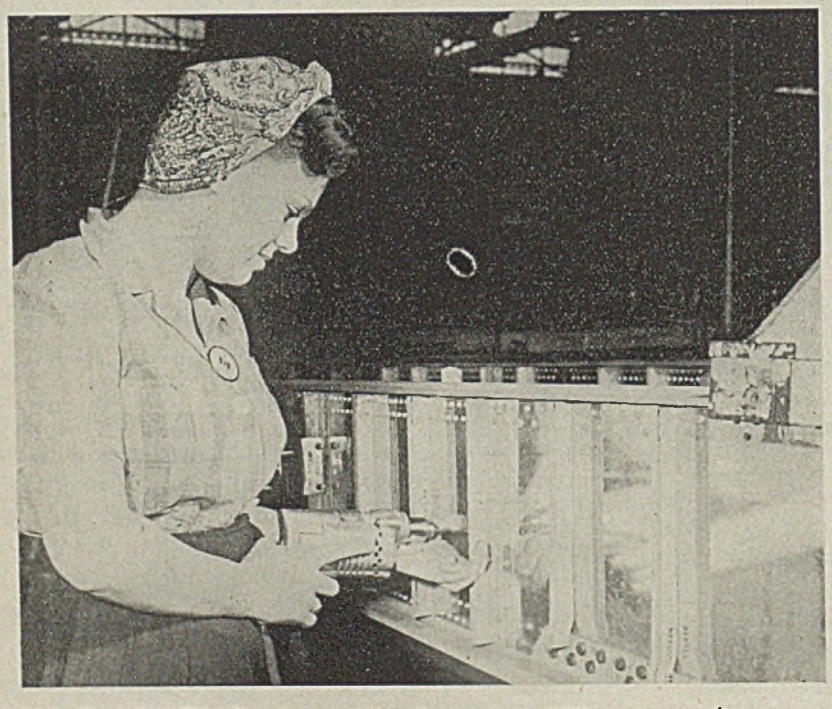
"The federal government has given us first option on Willow Run for postwar use and we plan to take up the option. Our first reason is to create jobs for the people who will need them. Some persons say that people in Washington will not let us have the plant. We have too much faith in the government to believe anything like that. We know that the government is just as much interested in postwar jobs as we are."

The announcement was a distinct surprise to many who smelled in it a slap at union officials who may have designs on getting Ford out of the Willow Run management as noted above. Other than Charles A. Lindbergh, Ford is not known to have any aircraft engineers and designers available for development of a new cargo plane. Reputedly Lindbergh has been spending most of his time experimenting with high-altitude engines and superchargers.

Admirable though Ford's attitude may be, it is a recognized fact that the already overgrown aircraft industry will have to struggle mightily for survival once the demand for military planes eases. If it is able to keep going at a rate of only 5-10 per cent of the present level, it may be accomplishing miracles. And there will be no dearth of capacity for building cargo planes of the very latest design. So Ford will have a colossal job cut out for him in starting from scratch on a new design and making it pay in competition with such experienced cargo plane builders as Douglas, Curtiss-Wright and Lockheed. The latter will be wading into the postwar cargo plane market with everything they have to keep their plants going and their people at work.

Furthermore, Ford's engineering talent should be pretty well absorbed in developing new automotive designs in the postwar period, so that an excursion into the airplane field would prove difficult to say the least.

But it is the difficult jobs that Ford likes. At any rate, his statement is on the record. Time will give the answer.



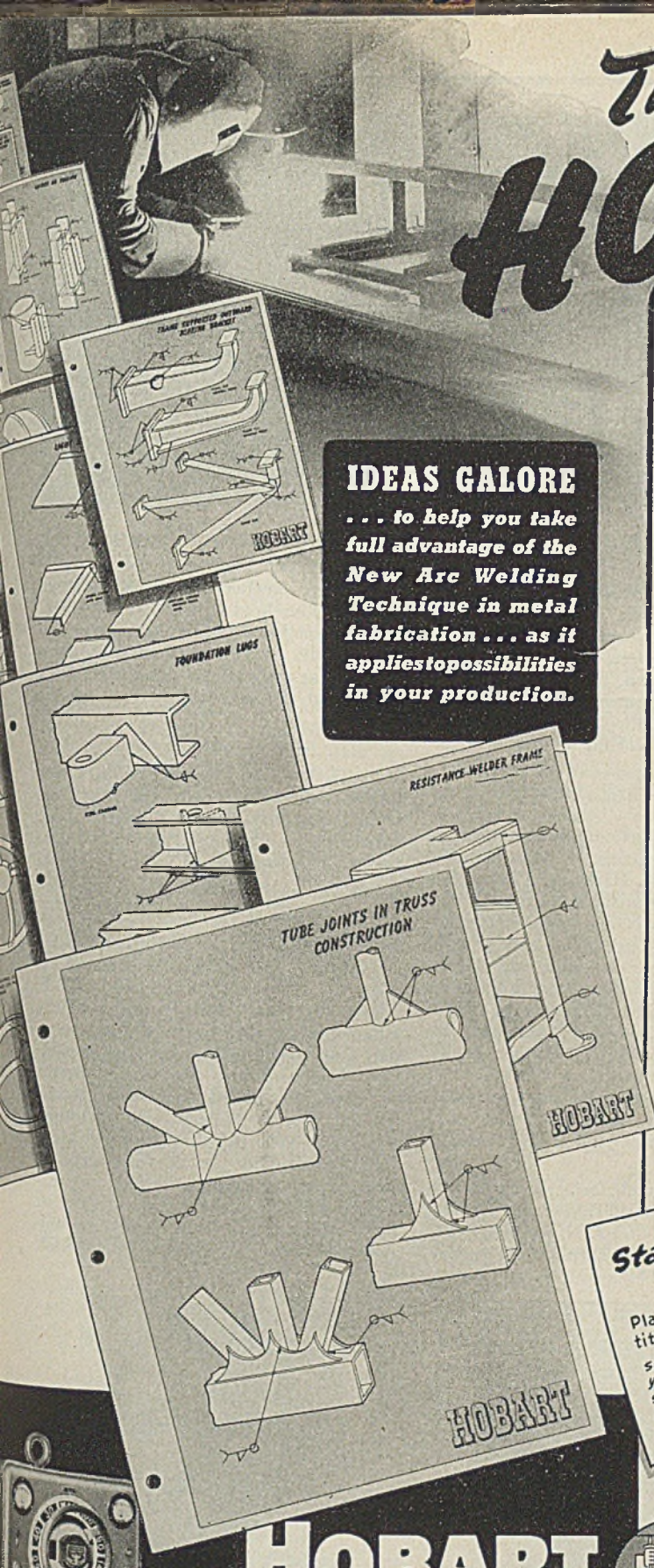
SILENT WORKER: Goodyear Aircraft employs 350 mutes in the manufacture of Navy fighter planes and blimps at its Akron, O., works and is finding they work with unusual speed and concentration. In training these workers an interpreter is necessary to relay the instructor's message to the class

## Absenteeism Reduced by As Much As 60% in Some Plants

Absenteeism has been reduced by as much as 60 per cent in some war production plants by applying corrective measures, Robert C. Goodwin, War Manpower Commission director for Ohio, Michigan and Kentucky, reported recently.

In some cases companies made certain improvements and in others workers served on a "Kangaroo Court." In another case, absenteeism was reduced by setting up facilities for obtaining gasoline, tires, shoes, medical aid, beauty treatments and housing information at the plant.

# The New HOBART

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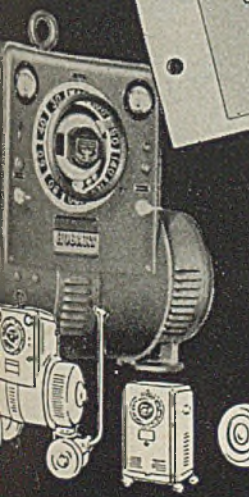

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# MEN of INDUSTRY

J. F. WOESSNER

CLAYTON R. BURT

CHARLES W. DEEDS

M. D. JOHNSON

**J. F. Woessner** has been appointed general works auditor, Carnegie-Illinois Steel Corp., Pittsburgh, succeeding **H. S. Sylvester**, retired. **Dana C. Buck** has been named manager of the corporation's stainless steel bureau, Metallurgical division, Pittsburgh district, and **E. L. Robinson** has been made assistant chief process metallurgist of the Metallurgical division.

—o—

**Arthur Dorman**, director, Dorman Long & Co. Ltd., London, and formerly president of the British Iron and Steel Federation, has been nominated president of the Iron and Steel Institute, London.

—o—

**Denn M. Burgess**, formerly general manager and a vice president, R. G. LeTourneau Inc., Peoria, Ill., has been appointed executive vice president and named a director. Other changes in the company's executive staff are: **Merle R. Yontz**, vice president and treasurer; **Warren J. Wemple**, controller; **Winston Sumner**, assistant controller; **Roy E. McCluskey**, assistant treasurer, and **Marshall E. Taylor**, office manager.

—o—

**F. C. Biggert Jr.**, chairman of the board, United Engineering & Foundry Co., Pittsburgh, has been elected a director and a member of the executive committee of Follansbee Steel Corp., Pittsburgh, to fill the vacancy caused by the recent death of George T. Ladd.

—o—

**M. H. Hofmann**, who has been in the production office, WPB Steel Division, Washington, as special assistant, has resigned to become associated with the Carnegie-Illinois Steel Corp., Pittsburgh.

—o—

**Jerome A. Raterman**, formerly vice president and treasurer, Monarch Machine Tool Co., Sidney, O., has been appointed executive vice president and retains his position as treasurer. **Martin J. Luther**, previously Chicago branch manager, has been made general sales manager with headquarters in Sidney, and **Kermit Kuck**, former Newark, (N. J.) branch manager, also moves to Sidney, as chief engineer for Monarch. **Stanley A. Brandenburg** has been named branch manager of the company's new Detroit office, and **Hugh W. Robinson**, former Indianapolis branch manager, moves to Cleveland to head the new office there. Both the Detroit and Cleveland offices will be opened Dec. 1.

—o—

**Clayton R. Burt**, formerly president and general manager, Niles-Bement-Pond Co., West Hartford, Conn., has been named chairman of the board, and **Charles W. Deeds** has been elected to succeed him as president and general manager of the company. Mr. Deeds retains active management of his former company, Chandler-Evans Corp., South Meriden, Conn., which recently was acquired by Niles-Bement-Pond. **B. H. Gilpin**, formerly executive vice president of Chandler-Evans, becomes vice president and general manager.

—o—

**R. M. Richmond**, formerly director of purchases, Electric Household Utilities Corp., Chicago, and **I. N. Merritt**, president of Meadows Corp., a subsidiary, have been elected vice presidents of Electric Household Utilities. **H. C. Buckingham** has been elected treasurer, and **R. J. Healy**, secretary, assumes additional duties as assistant treasurer. **S. Mintz** has joined the company as advertising manager.

—o—

**M. D. Johnson**, chief inspector, Caterpillar Tractor Co., Peoria, Ill., has been named chairman of the Committee on Inspection of Castings, American Foundrymen's Association, Chicago.

—o—

**Charles H. Weaver** has been appointed manager of the newly-formed Marine department, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. **C. F. Lloyd** has been named manager of the company's General Contract department, and **Tomlinson Fort** has been made manager, Central Station department. **Bertha E. Slye** has joined the Westinghouse School Service department. Westinghouse has awarded the Order of Merit for distinguished service to **George P. Longabaugh**, section manufacturing engineer, Subcontracting division, East Pittsburgh, and to the following employes of the Lamp division, Bloomfield,

C. A. FERGUSON

*Who has been named general superintendent, Gary Sheet and Tin Mill, Carnegie-Illinois Steel Corp., noted in STEEL, Nov. 15, p. 107*

WILLIAM CAMPBELL

*Who has joined the Chicago district sales office of Inland Steel Co., Chicago, as announced in STEEL, Nov. 15, p. 107.*

E. J. BURNELL

*Who has been appointed vice president in charge of sales for the entire Link-Belt Co., Chicago, reported in STEEL, Nov. 8, p. 86.*

J. M. DARBAKER

*Who has been appointed assistant manager of Chicago district operations, Carnegie-Illinois Steel Corp., reported in STEEL, Nov. 15, p. 107.*

H. W. TENNEY

*Who has been named assistant to the vice president in charge of the Pittsburgh divisions, Westinghouse Electric & Mfg. Co., noted in STEEL, Nov. 8, p. 87.*

N. J.: William B. Gero, manager of lamp manufacturing; Dr. Aaron M. Hageman, manager of the Engineering department; Dr. Roy D. Hall, staff supervisor, engineering department, and James B. Whitmore, manager of industrial engineering and equipment development.

—o—

Hugo A. Weissbrodt has been appointed superintendent, Ft. Wayne (Ind.) works, International Harvester Co., Chicago, succeeding C. M. Harrison, retired.

—o—

William S. Gray Jr., president, Central Hanover Bank & Trust Co., Hanover, N. J., has been elected a director of Phelps Dodge Corp., New York.

—o—

Dr. Paul D. V. Manning, since 1941 director of research, International Minerals & Chemical Corp., Chicago, has been elected a vice president.

—o—

John B. Ross has been appointed to the West Coast engineering office (Los Angeles) of Handy & Harman, New York.

—o—

M. M. Greer has been elected vice president in charge of engineering, Edwin L. Wiegand Co., Pittsburgh, and is succeeded as manager of industrial sales by H. R. Miles.

—o—

John C. Graf has been appointed sales manager, hydraulic press and special equipment department, Baldwin Southwark division, Baldwin Locomotive Works, Eddystone, Pa.

—o—

John G. McKissick has been placed in charge of the new San Francisco branch office, Cooper-Bessemer Corp., Mt. Vernon, O.

—o—

R. K. Myers, recently chief of the X-ray Section, WPB, Washington, has been appointed sales manager, Kelley-Koett Mfg. Co., Covington, Ky.

## OBITUARIES . . .

Fred C. Mueller, 70, founder and retired president, Advance Spring Corp., Chicago, died Nov. 10 in Albany, Ga.

—o—

Ross A. Hickok, 67, president, Hickok Mfg. Co., Harrisburg, Pa., died in that city recently.

—o—

George A. Spencer, 56, president, Crown Rheostat & Supply Co., Chicago, died there recently.

—o—

Samuel M. Havens, 66, vice president, Wyman-Gordon Co., Ingalls Shepard division, Harvey, Ill., died recently in Flossmoor, Ill.

—o—

J. W. Ripley, 63, structural steel expert, and co-founder and vice president, Robbins-Ripley Co., New York, died in Great Neck, N. Y., Nov. 10.

—o—

Herbert B. Briggs, 49, who has been engaged for many years in sales promotion of alloy steels for Wheelock, Lovejoy & Co. Inc., Cambridge, Mass, and also for Joseph T. Ryerson & Sons Inc., Chicago, died Nov. 6 in Jamaica Plain, Mass.

—o—

James F. Harmon, 56, general superintendent of the Tonawanda (N. Y.) plant, Chevrolet Motor division, General Motors Corp., Detroit, died in Tonawanda Nov. 4.

—o—

Daniel B. Crane, 71, Rochester branch manager, Bingham Bros. Co., New York, for half a century, died in Rochester Nov. 9.

—o—

Jacob F. Dittus, 53, processing and sales engineer, Detroit office, Motch & Merryweather Machinery Co., Cleveland, died recently in Detroit.

—o—

Henry G. O'Donnell, 36, assistant general counsel, Ford Motor Co., Dearborn, Mich., died Nov. 9 in Detroit.

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James E. Brodhead, 92, formerly a director of Republic Iron & Steel Co., which became Republic Steel Corp., Cleveland, died Nov. 10 in Flemington, N. J.

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George E. Vertrees, 50, manager of the credit department, Northwestern Steel & Wire Co., Sterling, Ill., died there Nov. 13.

—o—

H. F. Max Gramann, 71, mechanical engineer, Ediphone division, Thomas A. Edison Industries, West Orange, N. J., died Nov. 3.

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William A. Rucker, 71, assistant general superintendent, Republic Mining & Mfg. Co., Bauxite, Ark., died recently in Little Rock, Ark.

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George H. Wadsworth, 87, organizer and president of Wadsworth Core Machine & Equipment Co., Akron, O., died recently in Silver Lake, O.

—o—

Maurice K. McGrath, 66, president, Kellogg Switchboard & Supply Co., Chicago, from 1939 until his retirement a month ago, died Nov. 12 in Palm Beach, Fla.

—o—

Robert Tarrant, 65, president, Tarrant Foundry Co. and Robert Tarrant Mfg. Co., Chicago, and one of the owners of Felt & Tarrant Mfg. Co., Chicago, died Nov. 11 in Wilmette, Ill.

# War Demand Stimulates Domestic Production of Alloying Materials

*Marked increases in output of molybdenum, ferrovanadium, cobalt, calcium and other materials accompanies expansion in war needs and restricted imports. . . Entirely new industries established and existing plants enlarged*

SIGNIFICANT changes have occurred during the past two or three years in the alloy steel industry. Entirely new industries have been established in this country to produce certain important alloying materials while capacities of plants making other alloying materials have been expanded tremendously.

Alloy steels having entirely new compositions have been developed and now are enjoying wide application in production of vital war goods.

Expansion in the production and consumption of molybdenum as a result of war demands, for instance, has been one of the notable developments in the alloy field. The combined value for 1943 of molybdenum products produced and ores and concentrates consumed in the United States, the world's major source and accounting for about 90 per cent of the world output during 1936-40, is estimated to exceed $95 million. The average annual value of domestic mine shipments of molybdenum ores and concentrates for the period 1936-40 was just under $18 million. No data are available for value of the output of molybdenum products during the latter period.

The record of vanadium production also is impressive. Vanadium ores and concentrates generally are roasted and leached into vanadium pentoxide, which is then converted into ferrovanadium. During 1936-40 the average annual value of ferrovanadium and vanadium pentoxide produced and ores and concentrates consumed was about $7.75 million. This rate of production has been expanded very substantially due to war demands. For 1943 it is expected that the combined value of these products will exceed $22 million.

The principal uses of cobalt prior to 1940 were in the nonmetallurgical fields, including those for ceramics, protective coatings, inks and chemical purposes. At present, it is estimated that metallurgical uses account for about 90 per cent of United States consumption.

About 50 per cent of the cobalt being consumed in this country currently is used in the manufacture of the stellite and carbide types of alloy which are used for high-speed cutting edges on machine tools. Cobalt gives to an alloy the ability to retain a sharp edge under extreme heat, a characteristic known in the industry as "hot-hardness." Cobalt is used also for this purpose in high-speed steels.

Stellite-type molten nonferrous alloys are becoming increasingly important in the manufacture of certain types of aviation motor accessories and searchlight reflectors for the armed forces. Another characteristic of cobalt is its magnetic qualities and it serves as an alloying material in magnet steels. Some of these steels contain as much as 35 per cent cobalt.

The United States has been almost entirely dependent on imports for its supply of cobalt in the past, the major portion of which was produced in Belgium and the Belgian Congo in the form of metal, oxides, salts and hydrates. When Belgium was occupied by Germany in 1940, the Belgian interests arranged for the importation of the crudes into this country and their conversion into usable forms by a number of American plants on a toll basis. At present about 90 per cent of the production of cobalt products in the United States is produced in this manner.

The average annual value of imports of cobalt ores, crudes and products for the period 1936-40 was slightly under $3 million compared with an estimated 1943 value of more than $19 million.

Development of a calcium metal industry in this country is also of recent date. Until war threatened in Europe this metal had been produced only in France. Foreseeing an interruption in the flow of material from France, a ferroalloy producer began experiments in this country with the result that domestically produced calcium metal entered the commercial market in the summer of 1939.

When importation ceased, the War Production Board found it necessary to place calcium metal under strict allocation. Production increased rapidly, however, to a point which permitted the restriction to be relaxed and recently to be removed entirely.

# Use of NE Steel Specifications Continues To Increase Production

USE of selected permissible steel specifications is steadily increasing steel production, according to C. L. Warwick, administrator of the National Emergency Steel Specifications project.

The steel industry reports 5 to 15 per cent increase in the effective use of existing facilities for a number of commodities through longer runs, fewer roll changes, fewer rejections and greater recoveries. These economies were brought about by the simplification of specifications.

### Modify Many Specifications

Of the 250 odd specifications selected by the 12 NESS Technical Advisory committees, exclusive of aircraft steel specifications, approximately one-half have been modified either by revision or by the issuance of emergency amendments. Sponsor agencies have issued 12 new and amended specifications covering products which have been dealt with by NESS, representing about 70 per cent of the entire steel production of the United States.

Recommendations of the committees are made effective either by voluntary and co-operative support of producers and consumers, or by the issuance of orders by the War Production Board. NESS accomplishments in large measure have been achieved by co-operative action on the part of sponsor agencies in modifying existing specifications at the request of the Technical Advisory committees. By these modifications the specifications have been made less restrictive or the requirements have been co-ordinated with those of similar specifications.

Use of alternate aircraft NE steels has increased month by month as laboratory and type tests were completed until at the present time this conversion represents 15 to 20 per cent of the total tonnage produced for aircraft uses.

Other NESS work covers a standardization of specifications for bars, forgings and castings for pressure vessels and pressure piping, and for heavy steel forgings for the shipbuilding industry and those used in turbines, generators, gears, diesel engines, etc. The work on heavy forgings includes also specifications for blooms, billets and slabs for reforging purposes.

While the NESS effort has been directed toward standardization and simplification of products to obtain increased production to meet war needs, most of the work has been of such character as to be beneficial to postwar and peacetime production. The extent of co-operation between producers and users probably will determine, Mr. Warwick believes, the extent of continuance of these benefits after the present controls are rescinded. Cognizant agencies are fully aware of these problems and since steel mill products are largely sold on specifications it is probable that many of the benefits will be made permanent.

# September Steel for Sale at Record

*Largest total for year, most products gaining over August. . . Bars, plates lead, latter at 142.4 per cent of capacity. . . Nine months' total exceeds same period last year*

PRODUCTION of steel and iron for sale in September totaled 5,655,610 net tons, against 5,535,118 tons in August, according to the American Iron and Steel Institute. This is the largest monthly total for 1943, as announced by the Institute, and exceeds the monthly average for first quarter, when separate monthly figures were not presented.

For nine months, the total was 49,898,903 tons, which is at a rate of slightly over 66,500,000 tons for the year. This compares with 64,813,972 tons made for sale in 1942 and 65,361,688 tons in 1941.

September production also included 764,138 tons of pig iron and ferroalloys for sale and 16,456 tons of iron products, including bars, pipe and tubes.

Practically every important steel product showed an increase over August, in spite of that month having one more working day. Bars continued to lead in tonnage, 1,080,918 tons, 89.4 per cent of capacity, compared with 1,070,939 tons in August. Plates were second in volume, 1,074,646 tons, 142.4 per cent of capacity, against 1,035,733 tons, 132.7 per cent, in August. Total sheets produced for sale in September, including hot and cold-rolled, galvanized and all others, were 697,074 tons, 62.9 per cent of capacity, compared with 672,539 tons, 58.6 per cent, in August.

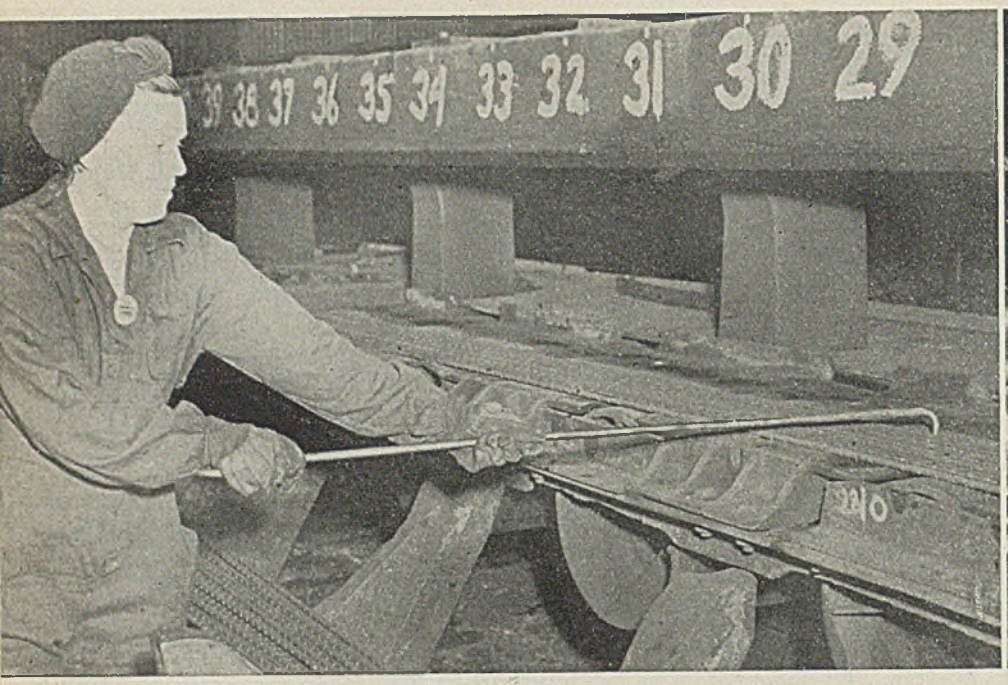
Other products which exceeded rated capacity in September included mechanical tubing, 65,089 tons, 132.6 per cent; black plate, 34,490 tons, 123.7 per cent. During September 405,429 tons of steel products were shipped to other members of the industry for conversion into finished products, compared with 447,846 tons in August. In nine months such shipments totaled 3,140,443 tons.

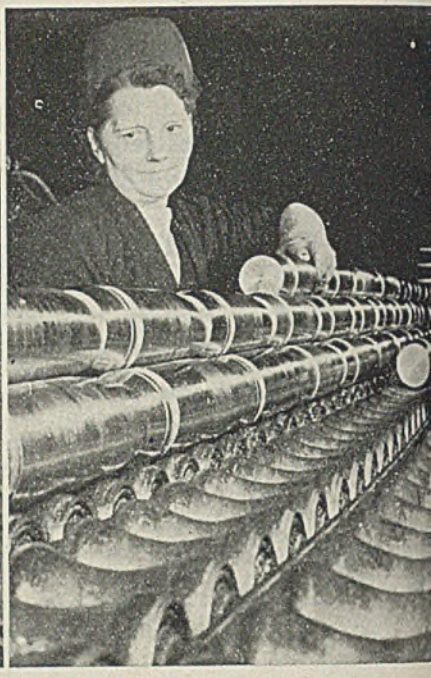
Companies included in these statistics numbered 183 and in 1942 represented 98.8 per cent of the total output of finished rolled products.

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

SEPTEMBER - 1943 (period)

| | | Number of companies | Item | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STEEL PRODUCTS | Ingots, blooms, billets, slabs, sheet bars, etc. | 44 | 1 | xxxxxxx | 710,165 | xxx | | 200,958 | 6,132,648 | xxx | | 1,807,602 |
| | Heavy structural shapes | 10 | 2 | 5,412,580 | 321,495 | 72.3 | | xxxxxxx | 2,830,473 | 69.9 | | xxxxxxx |
| | Steel piling | 4 | 3 | 338,000 | 3,677 | 13.3 | | xxxxxxx | 27,334 | 10.8 | | xxxxxxx |
| | Plates—Sheared and Universal | 21 | 4 | 9,189,740 | 1,074,646 | 142.4 | | 3,052 | 9,561,493 | 139.1 | | 29,069 |
| | Skelp | 7 | 5 | xxxxxxx | 57,146 | xxx | | 33,703 | 596,869 | xxx | | 355,725 |
| | Rails—Standard (over 60 lbs.) | 4 | 6 | 3,629,260 | 185,941 | 62.4 | | xxxxxxx | 1,386,289 | 51.1 | | xxxxxxx |
| | Light (60 lbs. and under) | 6 | 7 | 309,690 | 14,224 | 55.9 | | xxxxxxx | 129,717 | 56.0 | | xxxxxxx |
| | All other (Incl. girder, guard, etc.) | 2 | 8 | 102,000 | 1,333 | 15.9 | | xxxxxxx | 17,989 | 23.6 | | xxxxxxx |
| | Splice bar and tie plates | 13 | 9 | 1,120,270 | 47,541 | 51.7 | | xxxxxxx | 463,743 | 55.3 | | xxxxxxx |
| | Bars—Merchant | 40 | 10 | xxxxxxx | 599,169 | xxx | | 85,573 | 5,328,155 | xxx | | 716,765 |
| | Concrete reinforcing—New billet | 15 | 11 | xxxxxxx | 33,653 | xxx | | xxxxxxx | 321,383 | xxx | | xxxxxxx |
| | Rerolling | 16 | 12 | xxxxxxx | 4,846 | xxx | | xxxxxxx | 62,609 | xxx | | xxxxxxx |
| | Cold finished—Carbon | 23 | 13 | xxxxxxx | 146,896 | xxx | | xxxxxxx | 1,217,657 | xxx | | xxxxxxx |
| | Alloy—Hot rolled | 20 | 14 | xxxxxxx | 257,736 | xxx | | 28,997 | 2,301,746 | xxx | | 323,325 |
| | Cold finished | 19 | 15 | xxxxxxx | 33,645 | xxx | | xxxxxxx | 350,608 | xxx | | xxxxxxx |
| | Hoops and baling bands | 5 | 16 | xxxxxxx | 4,973 | xxx | | xxxxxxx | 70,303 | xxx | | xxxxxxx |
| | TOTAL BARS | 63 | 17 | 14,719,525 | 1,080,918 | 89.4 | | 114,570 | 9,752,461 | 88.6 | | 1,040,090 |
| | Tool steel bars (rolled and forged) | 17 | 18 | 200,840 | 12,998 | 78.8 | | xxxxxxx | 141,027 | 93.9 | | xxxxxxx |
| | Pipe and tube—B. W. | 15 | 19 | 2,231,040 | 110,429 | 60.5 | | xxxxxxx | 991,218 | 59.4 | | xxxxxxx |
| | L. W. | 8 | 20 | 845,400 | 47,183 | 68.0 | | xxxxxxx | 421,380 | 66.6 | | xxxxxxx |
| | Electric weld | 8 | 21 | 1,149,250 | 85,739 | 90.9 | | xxxxxxx | 775,220 | 90.2 | | xxxxxxx |
| | Seamless | 15 | 22 | 3,082,400 | 195,259 | 77.2 | | xxxxxxx | 1,628,714 | 70.6 | | xxxxxxx |
| | Conduit | 7 | 23 | 190,000 | 4,516 | 29.0 | | xxxxxxx | 43,808 | 30.8 | | xxxxxxx |
| | Mechanical Tubing | 11 | 24 | 597,800 | 65,069 | 132.6 | | xxxxxxx | 560,544 | 125.4 | | xxxxxxx |
| | Wire rods | 22 | 25 | xxxxxxx | 101,230 | xxx | | 16,089 | 897,345 | xxx | | 171,801 |
| | Wire—Drawn | 41 | 26 | 2,356,550 | 172,942 | 89.4 | | 2,325 | 1,487,080 | 84.4 | | 42,488 |
| | Nails and staples | 19 | 27 | 1,116,640 | 64,013 | 69.8 | | xxxxxxx | 616,521 | 73.8 | | xxxxxxx |
| | Barbed and twisted | 15 | 28 | 482,280 | 20,885 | 52.7 | | xxxxxxx | 182,890 | 50.7 | | xxxxxxx |
| | Woven wire fence | 16 | 29 | 778,060 | 27,222 | 42.6 | | xxxxxxx | 181,523 | 31.2 | | xxxxxxx |
| | Bale ties | 12 | 30 | 128,420 | 9,603 | 91.1 | | xxxxxxx | 84,938 | 88.4 | | xxxxxxx |
| | All other wire products | 8 | 31 | 78,220 | 4,565 | 71.1 | | xxxxxxx | 44,649 | 76.3 | | xxxxxxx |
| | Fence posts | 11 | 32 | 112,065 | 5,867 | 63.8 | | xxxxxxx | 30,630 | 36.5 | | xxxxxxx |
| | Black plate | 10 | 33 | 339,700 | 34,490 | 123.7 | | - | 240,494 | 94.6 | | - |
| | Tin plate—Hot rolled | 4 | 34 | 483,620 | - | - | | xxxxxxx | 10,597 | 2.9 | | xxxxxxx |
| | Cold reduced | 10 | 35 | 3,841,340 | 190,275 | 60.3 | | xxxxxxx | 1,679,465 | 58.5 | | xxxxxxx |
| | Sheets—Hot rolled | 25 | 36 | xxxxxxx | 465,821 | xxx | | 15,225 | 4,431,817 | xxx | | 152,230 |
| | Galvanized | 14 | 37 | xxxxxxx | 73,508 | xxx | | xxxxxxx | 607,523 | xxx | | xxxxxxx |
| | Cold rolled | 14 | 38 | xxxxxxx | 127,111 | xxx | | xxxxxxx | 1,104,056 | xxx | | xxxxxxx |
| | All other | 16 | 39 | xxxxxxx | 30,634 | xxx | | xxxxxxx | 269,784 | xxx | | xxxxxxx |
| | TOTAL SHEETS | 28 | 40 | 13,497,570 | 697,074 | 62.9 | | 15,225 | 6,413,180 | 63.5 | | 152,230 |
| | Strip—Hot rolled | 22 | 41 | 3,201,690 | 132,486 | 50.4 | | 19,503 | 1,148,791 | 48.0 | | 141,438 |
| | Cold rolled | 39 | 42 | 2,059,740 | 109,903 | 65.0 | | xxxxxxx | 878,361 | 57.0 | | xxxxxxx |
| | Wheels (car, rolled steel) | 5 | 43 | 424,820 | 21,025 | 60.3 | | xxxxxxx | 168,725 | 53.1 | | xxxxxxx |
| | Axles | 6 | 44 | 453,470 | 13,980 | 37.6 | | xxxxxxx | 120,178 | 35.4 | | xxxxxxx |
| | Track spikes | 11 | 45 | 308,350 | 9,919 | 39.2 | | xxxxxxx | 105,492 | 45.7 | | xxxxxxx |
| | All other | 5 | 46 | xxxxxxx | 15,552 | xxx | | xxxxxxx | 147,117 | xxx | | xxxxxxx |
| | TOTAL STEEL PRODUCTS | 159 | 47 | xxxxxxx | 5,655,610 | xxx | | 405,429 | 49,898,903 | xxx | | 3,140,443 |
| | Pig iron, ferro manganese and spiegel | 26 | 48 | xxxxxxx | 764,138 | xxx | | 364,195 | 6,840,203 | xxx | | 3,449,339 |
| | Ingot moulds | 5 | 49 | xxxxxxx | 88,016 | xxx | | xxxxxxx | 736,971 | xxx | | xxxxxxx |
| IRON PRODUCTS | Bars | 10 | 50 | 170,110 | 9,189 | 65.8 | | 569 | 74,230 | 58.3 | | 2,661 |
| | Pipe and tubes | 2 | 51 | 106,000 | 6,369 | 73.2 | | xxxxxxx | 65,233 | 82.3 | | xxxxxxx |
| | All other | 1 | 52 | 56,000 | 898 | 19.5 | | - | 10,561 | 25.2 | | - |
| | TOTAL IRON PRODUCTS (ITEMS 50 to 52) | 11 | 53 | xxxxxxx | 16,456 | xxx | | 569 | 150,024 | xxx | | 2,661 |



*Left, woman steelworker hooking specified lengths of concrete reinforcing bars from back shear table into bundling rack. Right, Mrs. Hazel Moore, of National Tube Co.'s Christy Park works, operates the same shell-finishing machine*

# Mothers, Wives, Sweethearts Capably Filling Mill Jobs

By M. F. BALDWIN
*Assistant Editor, STEEL*

*Performance in many occupations heretofore the exclusive province of men proving satisfactory, work records of recent months show. . . Adaptability of women to many unusual tasks demonstrated*

WOMEN "steelmen" have won their spurs. In the hustle, bustle of war production they have met the test, their performance in many jobs heretofore the exclusive province of men demonstrating they are equal to demands of the work.

In actual numbers women operatives have fallen far short of replacing the steelmen who left their jobs for service with the armed forces. American Iron and Steel Institute figures show about 37,000 women working in steel plants (office workers excluded), which is only 22.4 per cent of the 165,000 steel men now in military and naval service. But addition of this number of women to the mill working forces, plus maximum utilization of equipment and improved and most efficient practice, have enabled the steel companies to break all past production records.

The successful performance of women workers in steel plants possibly holds implications for the future. While it has no bearing upon the interests of those steelworkers who will shed service uniforms to return to the jobs they left, there is little doubt work possibilities will be open for women for which before the war they were not considered.

In the case of the returning soldier, re-employment in his old job is assured under the terms of the Selective Service act; also, steel companies view this "right to the old job" as a moral obligation on them to be placed above all other considerations.

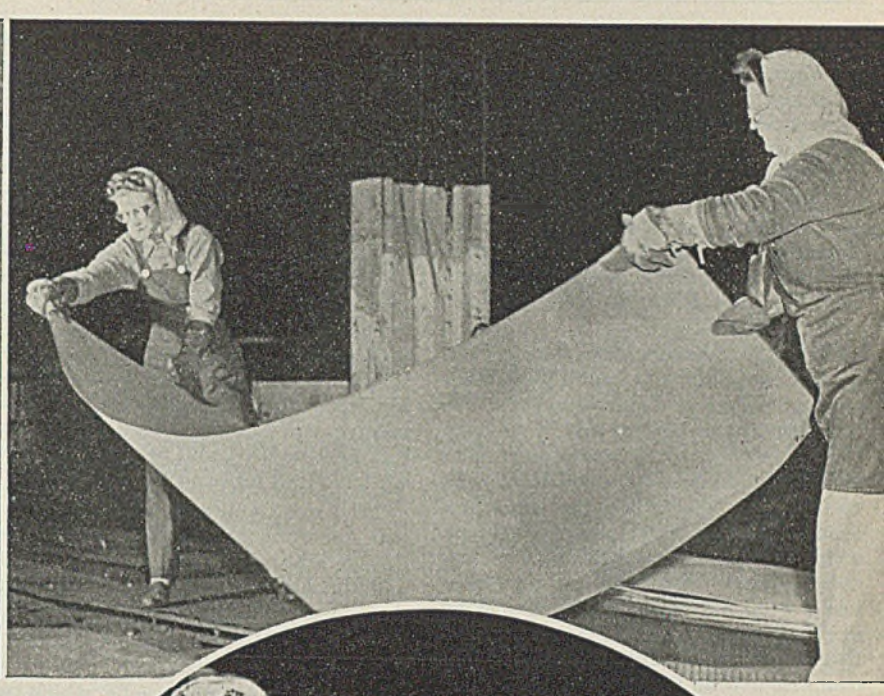
There is another phase steel executives are not overlooking. Manufacturers of durable consumer goods—from motor cars on down the line—are piling up huge backlogs of orders. A public which has been doing without new cars, electrical appliances, and innumerable other conveniences, has at the same time been earning plenty of money beyond actual living expenses. Put together the built-up desire for these goods and the capacity to pay for them, and the result is a huge market for steel. For several years this stream of orders may keep the steel plants operating at top pace, with plenty of work for duration-trained women as well as for ex-service employes.

Also, women steelworkers whose husbands have been killed or seriously incapacitated in war service can continue in their positions as the family's support.

Speaking this month before the Industrial Hygiene Foundation at Pittsburgh, Mrs. W. B. Hobart, advisor on employment of women for Secretary of War Stimson, prophesied an important peacetime place for women plant workers in steel and other industries.

"Management's experience with employment of women has on the whole been very satisfactory from a production viewpoint," said the speaker. "The result will be that after the war all industries will have a very much larger percentage of women. Many will be the sole support of their households."

Of course, women steelworkers bring their share of problems for the personnel manager, as do men. In order to cover various phases of the subject, STEEL in-



*Above, woman inspector examines surface of tin plate produced at Irvin works of Carnegie-Illinois Steel Corp.*

*Above right, Anne Trevino and Mary P. Matthews do men's work as helpers on a Republic Steel Corp. normalizing furnace. They have six relatives in the Army*

*Right, Gula Green and Jean Murphy make an experimental batch of steel in the metallurgical laboratory of Republic's Alloy division*

terviewed executives of two large steel companies which have gone far in the efficient use of women in their steelmaking branches. The American Steel & Wire Co.'s comment, especially interesting for its impartial evaluation of women's plant service, is as follows:

"It has consistently been this company's policy to avoid asking military deferment for any employe where there was reasonable assurance a woman could be secured and trained to handle his duties. The interpretation of this policy has been broadened from time to time as women employes have proved their capacity to fill additional positions formerly held only by men.

"Women work out well as laboratory technicians and on some types of research. They have proved most satisfactory in important clerical positions, such as production planning and time study, which men alone had handled previously. And these are big departments.

"Some of our women are doing good work making time studies, even though at the start they lacked the background of mechanical knowledge which helps a person to fill this position effectively. A man possessing this essential perspective can be trained to make time studies in three months; we train some women in five months for this work, the extra two months being needed chiefly to impart to them the background knowledge.

"Women assigned to fairly simple work—such as testing, inspection, and packaging lighter items for shipment—have shown excellent results.

"On actual production jobs requiring a moderate amount of skill and knowledge of mechanics and products, women learn the work as quickly as men, sometimes quicker. Furthermore, women continue to maintain a good standard of production.

"This is not hard to understand when one realizes that the average all-around level of the women we employ is higher than that of the available men. For some time now the men have represented the last available in manpower reserve, whereas we are able to secure many

women having a relatively high potential.

"Women have done surprisingly well on heavy traction jobs such as driving tractors and operating cranes. We find them just as satisfactory as men on this work.

"On the mine-run of common labor jobs and those just on the upper fringe of that bracket (making up to eight or ten cents an hour more, say) women have not fully filled the bill. There are three good reasons:

"First, state labor laws make it necessary to assign them to easier jobs. Their male associates resent what looks like favoritism, and the women themselves often object because work limitations may mean limited opportunity. Second, on these jobs women feel no burning incentive to work hard, for it is difficult to identify the tieup between their work and the war effort. The woman who helps wield a tap rod feels that she is 'making steel'; the women on common labor miss that inspiration. Third, these labor jobs comprise a wide variety of duties calling for considerable flexibility, and under these conditions in a steel mill men's services are more satisfactory.

**Absenteeism Not Too High**

"We find that absenteeism among the women is but slightly higher than for the men; the difference is negligible. On the other hand, we have discovered that there are more instances where a woman has legitimate reasons for not wanting to put in a full 48-hour week."

Broad scope of women's potential services in steel plants, and employment methods which build company loyalty among both men and women employes, are covered in this commentary by the Republic Steel Corp.:

"Republic was one of the first large steel producers to treat the employment of women with full seriousness. With the armed forces continuing to drain men from our personnel the development was inevitable, and we laid plans accordingly.

"Extent of such employment is indicated by a comparison of the number of women serving in the corporation's steel districts in December, 1941, and the total as of September, 1943. The Central-Alloy, Youngstown, Cleveland, Warren, Buffalo, Chicago, and Southern districts had a total of only 556 women workers at time of the Pearl Harbor raid. By September of this year the total had risen to 5166, of which 4488 women were handling duties formerly performed by men.

"Republic's readiness to hire women has not been confined to replacement of men in armed service. There are cases where illness or some other good reason makes it necessary for a male employe to give up his job. In those cases we have inquired whether the wife or some woman relative would be interested in taking employment with us, and in many instances we have thus replaced the man.

"The same policy is applied where a man enlists or is inducted, and there are definite advantages. The wife 'gets a lift,' and the husband feels satisfied because the money will be coming in regularly for his family's needs.

"Our personnel department places women only on those jobs which we know they can be expected to handle. This selective care at the outset sidesteps wasted effort in replacing misfit workers and decreases labor turnover.

"In many cases wives of present employes have applied for work and have been hired.

"In order to pass along to all districts the sound ideas developed by each district on employment of women, Republic is just completing a motion picture entitled 'Women of Steel,' the first industrial film produced on this subject.

"Only by glancing over a list of some of the positions occupied by Republic's women employes can one realize the wide scope of their services. Among the men's jobs these women are filling for the duration are the following:

"Weigher; checker; chainman; pickle helper; tester; tractor operator; crane operator; inspector; repairman; saw helper; transfer operator; scrap loader; annealing and normalizing furnace helper; finisher; swing grinder; metallurgical observer; carpenter; laboratory helper; furnace recorder; pitman; ingot shipper.

"Bessemer ten-inch skelp oiler; stationary engineer; car record clerk; bessemer toolman; kick-off operator; mixer operator; sintering plant worker; wharfman; open-hearth laboratory clerk; tinhouse tankman; continuous pickler-lineman; welder; mechanical oiler; cold strip oiler; sinter chuteman; boiler ashman.

"No one can foretell what changes the postwar world will bring for Republic's personnel. Our paramount postwar obligation is to provide a job for every one of the employes, over 16,000 in number, who left Republic to join the armed forces. Our present women employes know this.

"Our general experience with women as steel plant workers has been very satisfactory. They are rendering fine service on war production jobs where work is tough and temperature is high."

## Kettering To Speak at ASME Meeting in New York

Charles F. Kettering, vice president and director of research, General Motors Corp., Detroit, will speak at the sixty-fourth annual meeting of the American Society of Mechanical Engineers at the Hotel Pennsylvania, New York city, Nov. 29 to Dec. 3.

The symposia will include talks on fuels, production engineering, thermodynamics, metal cutting research, aviation, furnace performance factors, oil and gas power, materials handling, power, hydraulics and a number of other subjects. The presentation of medals to recipients will be performed at the annual dinner.

## NAM's Second War Congress At New York, Dec. 8-10

The second war congress of American industry, which marks the forty-ninth annual convention of the National Association of Manufacturers, will witness the world premiere of the Army's latest documentary film, "The War Department Reports," when it meets at the Waldorf-Astoria hotel, New York city, Dec. 8-10.

## They Say:

"There is a popular misconception on the part of many of our citizens that all we have to do is retire within our ivory towers, decide what is best and then impose on the rest of the world what is best for them."—**Dr. Herbert Wright**, Catholic University.

° ° °

"As long as the war lasts there will be a continuing need for iron and steel scrap to keep the mills well supplied. Accordingly, the collection of iron and steel scrap from all sources must be a continuing operation."—**H. M. Faust**, director, Salvage division, War Production Board.

° ° °

"Our expanded resources will do a large part of our postwar planning for us. They will increase our national income, furnish jobs for many ex-servicemen and provide great volumes of freight for railroads and trucks."—**Brig. Gen. Leonard P. Ayres**, vice president, Cleveland Trust Co., Cleveland.

° ° °

"We are tired to death of wasting public funds and public time in appearing before useless and fruitless committees of investigation."—**Secretary of the Interior Ickes.**

° ° °

"Today, the designers of the future have but a single choice of frames for their pictures, each plainly labeled with the brand and price by the bitter experience of the past decade—the frame of force and the frame of freedom."—**Dr. Virgil Jordan**, National Industrial Conference Board.

# Moves To Study Decentralizing Of Industry

*Senate group approves bill to investigate possibilities for developing new areas of steel production*

THE Senate Interstate Commerce Committee has favorably reported S. Res. 190, providing for investigation of new potential steel, iron and other metal production, and the possibilities of decentralizing present production of these products.

Pointing out that "shortages of scrap, of iron ore, and steel continue serious" the committee reported that "vast natural resources for steel production remain unexploited."

The report stressed that iron ore in usable quantity and quality is known to exist in 34 states; 27 states have both iron ore and coal, but only 13 of these states have any iron or steel production. Of the 13, it was added, 7 which do produce iron or steel lack, as part of their natural resources, either coal or iron ore.

The committee recommended that the investigation cover the following ground:

Whether states now having small production should not be enabled to substantially expand their steel or iron output; whether natural or economic factors are hampering states with potential production, which are not now producing; effects of centralization.

## BRIEFS . . .

**Niles-Bement-Pond Co.**, West Hartford, Conn., announces it has acquired the Chandler-Evans Corp., South Meriden, Conn., through an exchange of stock.

—o—

**Yuba Mfg. Co.**, Benicia, Calif., is manufacturing 155-millimeter howitzers for the Army at its plant in Benicia.

—o—

**Columbia Shipbuilding & Drydock Co.**, Portland, Oreg., announces plans to build a general ship construction and repair plant at Columbia City, Oreg.

—o—

**Monarch Machine Tool Co.**, Sidney, O., will open a new Detroit office in the Fisher building, and a new Cleveland branch office Dec. 1.

—o—

**International Machine Tool Corp.**, New York city, announces its directors with the directors of the Detrola Corp. are making a proposal to stockholders for merger of the two companies under the name of International Detrola Corp. as a step in launching into a diversified field of postwar production.

—o—

**Baldwin Locomotive Works**, Philadelphia, announces present orders for locomotives are larger than ever before on the books of the company at one time.

—o—

**Allis-Chalmers Mfg. Co.**, Milwaukee, Wis., has published a four page bulletin describing its new "400" ac welder.

—o—

**National Steel Co.**, Chicago, celebrated its twenty-fifth anniversary on Nov. 11.

—o—

**Ann Arbor Machine Co.**, Shelbyville, Ill., is operating the Oliver Farm Equipment Co., Chicago, under a long-term lease signed Nov. 1.

—o—

**Chicago Association of Commerce** reports that industrial plant capacity in the Chicago area was extended further in October by expenditure of $6,348,000.

—o—

**General Electric Co.**, Schenectady, N. Y., announces the formation of the General Electric Credit Corp., an investment company organized under the New York state banking law.

—o—

**Pullman-Standard Car Mfg. Co.**, Chicago, converted plants at Hammond from production of tanks to heavy artillery carriages in less than a week.

—o—

**Lithgow Corp.**, Chicago, industrial coatings, has purchased the one-story building which it occupies.

—o—

**Gaertner Scientific Corp.**, Chicago, manufacturer of scientific instruments, has started a substantial expansion of its plant, a second story addition.

—o—

**Chicago Screw Co.**, Chicago, has made another substantial addition to its plant, the fourth enlargement of manufacturing facilities since early 1941.

—o—

**G & J Engineering Co.**, Chicago, has completed a substantial addition to its plant.

—o—

**Industrial Abrasives Inc.**, Chicago, has developed a method of metal bonding of diamond particles in the making of abrasive wheels for grinding and polishing carbides and other difficult-to-machine materials. Diamond impregnation up to ⅛-inch is achieved.

—o—

**Elgin National Watch Co.**, Elgin, Ill., has made several additions to its plant in recent months.

—o—

**Zenith Radio Corp.**, Chicago, has made further additions to its plant.

—o—

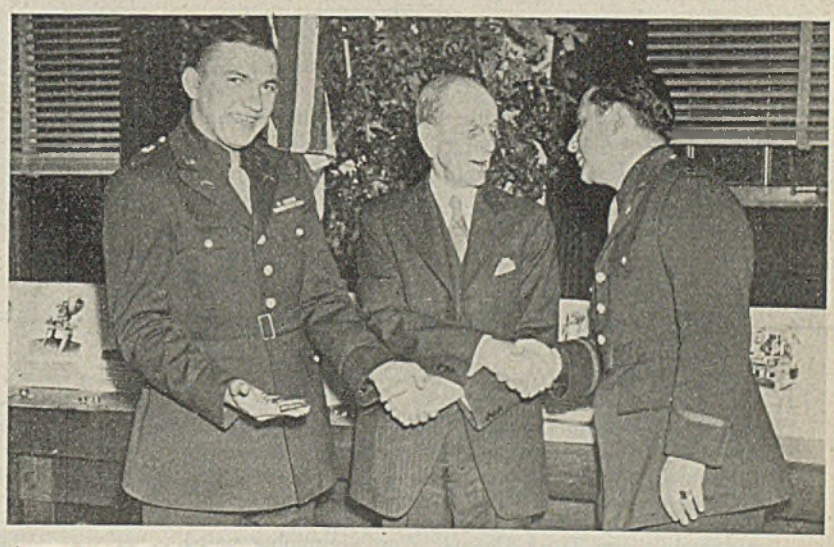
**Handy Mfg. Co.**, Chicago, machinery, has purchased the building it has occupied for some time. Building contains about 15,000 square feet.

—o—

**Cuneo Ordnance Division**, Cuneo Press Inc., Chicago, has leased the one-story building at 3900 South Wallace street to be used in the expansion of its ordnance work.

—o—

**American Steel & Wire Co.**, Cleveland, is producing more than five carloads of a new type of fragmentation bomb casings used in antipersonnel bombs.



SIXTY-SIX-YEAR VETERAN: Henry A. Janvier, widely known authority on presses, dies and plastic working of metal, has retired after 66 years' service with Ferracute Machine Co., Bridgeton, N. J. He served as chief engineer, a director, and recently as vice president of Ferracute, which, as noted in STEEL, page 84, Nov. 1, has just celebrated its 80th anniversary. Mr. Janvier is receiving congratulations on that occasion from Capt. Alvin Grauer, right, and Sgt. Bernard A. Bennick, a guest from the Mediterranean front

# Scarce Help, Cold Weather Cut Hopes of Output Gains

WITH success of special manpower programs too localized to reduce the general labor shortage materially, and labor groups restive under the "do likewise" implications of John L. Lewis' victory, prospects for raising production levels are not bright. Onset of winter weather, halting lake traffic and delaying railroad and highway shipments, also means that continuance of present output rates may in itself be an achievement.

Stringent manpower plan now operating successfully in West Coast cities will be extended to other sections, warns the War Production Board, unless contractors cease placing subcontracts in labor shortage areas. This program, developed by Bernard M. Baruch, has substantially revived the waning production of California aircraft plants. Dayton also is using a manpower program which thus far has yielded notable results.

Concentration of labor upon its respective war production is being hampered by the inevitable unrest following the coal miners' wage increase, and this lessening of intensified effort is likely to be reflected in output levels of the next few weeks. Negotiations for steelworkers' increases are scheduled to begin next month.

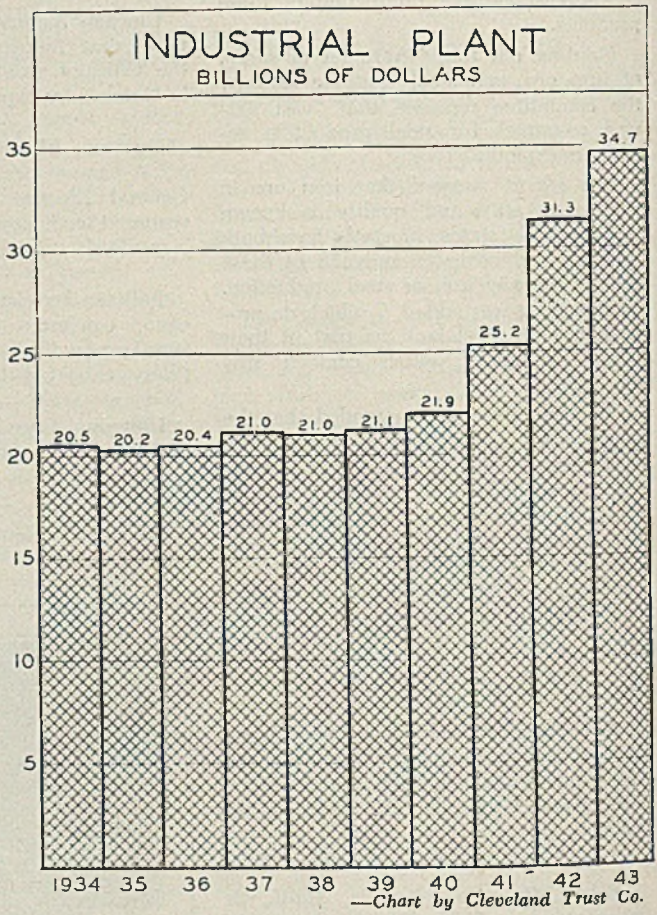
**INDUSTRIAL PLANTS**—Dollar value of the nation's industrial plant has been increased by nearly 70 per cent since the European phase of the war began four years ago. In 1939 the fixed assets of all U. S. manufacturing companies—plant and equipment, excluding inventories, working capital, and securities—amounted to about $21,100,000,000, according to Treasury Department figures. Present value, as shown on the accompanying chart, is approximately $34,700,000,000 after allowance for depreciation. Most of the new plant is government financed. Postwar use of those new factories which are adaptable for peacetime production may prove a key factor in steps to defeat inflation by relieving scarcity of civilian goods.

**WAR EXPENDITURES**—October government expenditures for war purposes totaled $6,988,000,000, or 3 per cent less than for September, with reduced disbursements by the Reconstruction Finance Corp. and subsidiaries explaining the decrease. War expenditures for the first ten months of 1943 amounted to $70,000,000,000, or slightly more than the $68,000,000,000 expended in the period from July 1, 1940 through Dec. 31, 1942.

**FOURTH-QUARTER CARLOADINGS** — Railroads' strenuous efforts to keep war traffic rolling in spite of equipment and manpower shortages are reflected in the .8 per cent gain in revenue carloadings estimated for the fourth quarter by regional shippers' advisory boards. Actual carloadings for the same period of 1942 totaled 8,911,673, whereas the estimate for this fourth quarter is 8,982,274.

Railroads will probably originate about 40 per cent more carloads of revenue freight this year than in 1938.

**MOTOR TRANSPORT**—Plants producing trucks and trailers are getting top priority on available labor as a step toward easing the shortage of such vehicles. Independent parts companies are greatly in need of production help. The nation-wide shortage includes both passenger and commercial units, though scarcity of the latter is more acute at this time.



—Chart by Cleveland Trust Co.

## FIGURES THIS WEEK

| INDUSTRY | Latest Period* | Prior Week | Month Ago | Year Ago |
|---|---|---|---|---|
| Steel Ingot Output (per cent of capacity) | 99.0 | 99.5 | 100.5 | 98.0 |
| Electric Power Distributed (million kilowatt hours) | 4,483 | 4,414 | 4,382 | 3,776 |
| Bituminous Coal Production (daily av.—1000 tons) | 465 | 1,638 | 2,003 | 1,897 |
| Petroleum Production (daily av.—1000 bbls.) | 4,436 | 4,389 | 4,412 | 3,880 |
| Construction Volume (ENR—unit $1,000,000) | $63.0 | $35.2 | $72.8 | $304.2 |
| Automobile and Truck Output (Ward's—number units) | 19,300 | 19,585 | 19,535 | 20,205 |

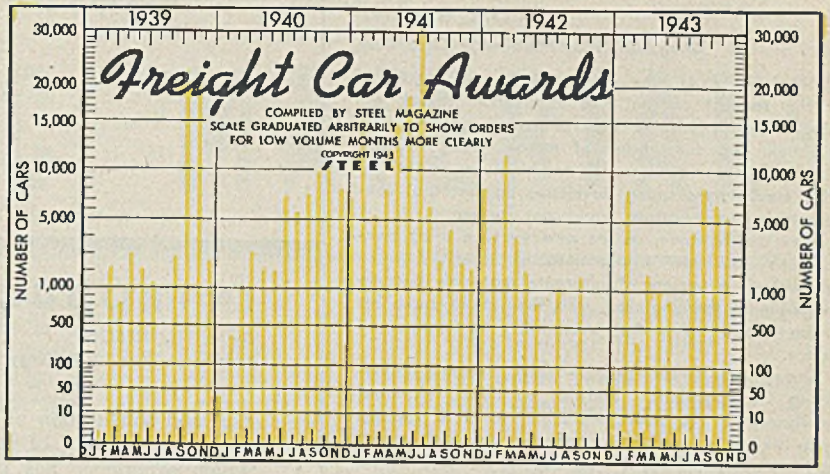
*Dates on request.

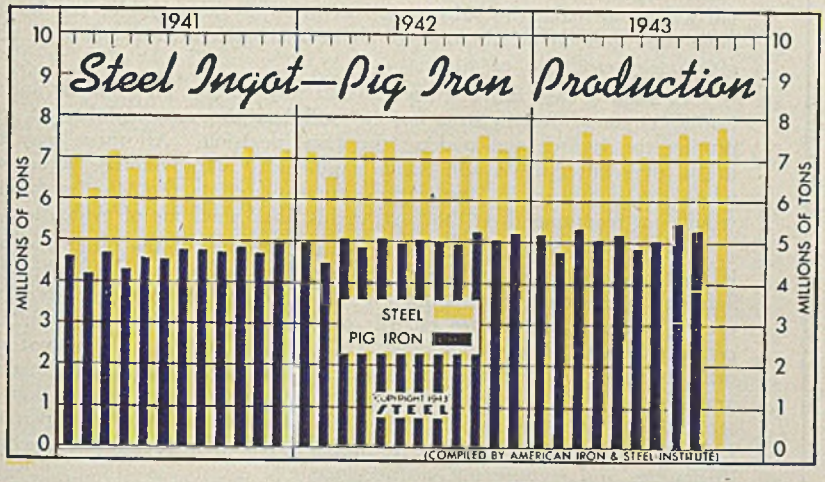
| TRADE | | | | |
|---|---|---|---|---|
| Freight Carloadings (unit—1000 cars) | 845† | 841 | 906 | 836 |
| Business Failures (Dun & Bradstreet, number) | 30 | 42 | 40 | 148 |
| Money in Circulation (in millions of dollars)‡ | $19,514 | $19,354 | $18,978 | $14,408 |
| Department Store Sales (change from like week a year ago)‡ | +10% | +12% | −5% | +15% |

†Preliminary. ‡Federal Reserve Board.

### Freight Car Awards

| | 1943 | 1942 | 1941 | 1940 |
|---|---|---|---|---|
| Jan. | 8,365 | 4,253 | 15,169 | 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 | 18,630 | 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 |
| 10 mos. | 37,585 | 25,893 | 110,871 | 50,474 |
| Nov. | ..... | 0 | 2,222 | 8,234 |
| Dec. | ..... | 135 | 8,406 | 7,181 |
| Total | ..... | 26,028 | 121,499 | 65,889 |




### Iron, Steel Production

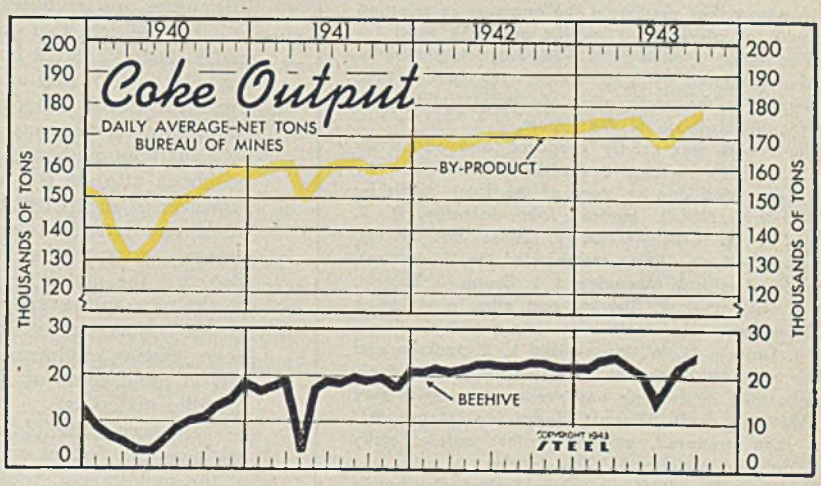
(Net tons—000 omitted)

| | Steel Ingots 1943 | Steel Ingots 1942 | Pig Iron 1943 | Pig Iron 1942 |
|---|---|---|---|---|
| Jan. ..... | 7,424 | 7,112 | 5,194 | 4,983 |
| Feb. ..... | 6,826 | 6,512 | 4,766 | 4,500 |
| Mar. ..... | 7,870 | 7,392 | 5,314 | 5,055 |
| Apr. ..... | 7,374 | 7,122 | 5,035 | 4,896 |
| May ..... | 7,545 | 7,382 | 5,173 | 5,073 |
| June ..... | 7,027 | 7,022 | 4,836 | 4,935 |
| July ..... | 7,376 | 7,148 | 5,023 | 5,051 |
| Aug. ..... | 7,562 | 7,233 | 5,316 | 5,009 |
| Sept. ..... | 7,489 | 7,067 | 5,226 | 4,937 |
| Oct. ..... | 7,778 | 7,584 | ..... | 5,236 |
| Nov. ..... | ..... | 7,184 | ..... | 5,083 |
| Dec. ..... | ..... | 7,303 | ..... | 5,201 |
| Total ... | ..... | 86,061 | ..... | 59,959 |

### Coke Output
### Bureau of Mines

(Daily average—Net tons)

| | By-Product 1943 | By-Product 1942 | Beehive 1943 | Beehive 1942 |
|---|---|---|---|---|
| Jan. .... | 174,044 | 168,508 | 21,440 | 20,874 |
| Feb. .... | 175,107 | 168,414 | 23,991 | 21,771 |
| Mar. ... | 175,051 | 167,733 | 24,369 | 21,032 |
| Apr. .... | 175,857 | 168,960 | 22,932 | 21,843 |
| May .... | 174,240 | 170,187 | 21,270 | 22,571 |
| June .... | 168,735 | 170,593 | 14,055 | 22,487 |
| July .... | 169,936 | 170,400 | 20,009 | 22,300 |
| Aug. ... | 176,396 | 171,443 | 23,102 | 22,333 |
| Sept. .. | 178,090 | 172,110 | 23,637 | 23,106 |
| Oct. .... | ..... | 172,211 | ..... | 23,148 |
| Nov. ... | ..... | 173,029 | ..... | 22,106 |
| Dec. ... | ..... | 173,163 | ..... | 22,000 |
| Average | ..... | 170,549 | ..... | 22,122 |




## FINANCE

| | Latest Period* | Prior Week | Month Ago | Year Ago |
|---|---|---|---|---|
| Bank Clearings (Dun & Bradstreet—billions) | $8,762 | $8,631 | $6,813 | $6,233 |
| Federal Gross Debt (billions) | $169.5 | $169.0 | $165.3 | $98.3 |
| Bond Volume, NYSE (millions) | $51.7 | $44.7 | $36.2 | $46.7 |
| Stocks Sales, NYSE (thousands) | 5,884 | 4,007 | 2,368 | 3,611 |
| Loans and Investments (millions)† | $52,642 | $52,982 | $51,278 | $37,294 |
| United States Government Obligations Held (millions)† | $38,071 | $39,218 | $36,215 | $24,120 |

†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)† | 243.2 | 244.8 | 248.2 | 232.2 |
| Industrial Raw Materials (Bureau of Labor index)‡ | 112.1 | 111.8 | 112.1 | 103.2 |
| Manufactured Products (Bureau of Labor index)‡ | 100.3 | 100.3 | 100.2 | 99.3 |

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

# An Engineering Approach

# Specification of

## PREFACE

By CLYDE WILLIAMS

*Chairman, War Metallurgy Committee*

■ IN LATE 1941, the War Metallurgy Committee, at the request of the War Production Board, attempted to prepare a general report on the conservation and substitution of metals. The situation was changing and new alloy combinations, especially alloy steels, were being developed so fast that consistent recommendations could not be made.

Later on, however, as the new wartime alloy compositions and new applications of metals became established, a variety of alternate materials became available to the engineer, who then could make his choice based upon the availability of component metals.

Among steels for heat-treatment, certain alloy-saving compositions, known as the National Emergency or NE steels, were put forth to replace more highly alloyed steels of the old SAE series. For example, NE-8630 was developed and found feasible for practically all uses formerly served by SAE-4130. Many other cases of practical equivalence of low-alloy and high-alloy steels were found, and individual "case-histories" reported, to which references in easily available sources are made in the appendix.

It soon became apparent, however, that the replaceability for one of the older steels was not confined to a single newer steel, but that there could be many steels of practical equality. Moreover, some of the NE steels that were initially promulgated proved less amenable to preparation from the raw materials available; these were withdrawn and still others put forward. As some alloys became scarce, others were substituted. Thus, compositions could not be frozen. Knowledge of the principles on which compositions and treatments could be based became a greater importance than listing of specific examples.

Thus, it became clear that a more useful treatise than one which pointed out what available metal could be substituted for a less available one, would be a report that would aid the engineer in selecting a metal or alloy for a specific use. The need for such a report is more fully represented in the introduction prepared by S. D. Heron. This introduction, setting forth the engineering viewpoint, guided the form and substance of the report.

The report was chiefly prepared and edited by H. W. Gillett. Successive drafts were criticized by Mr. Heron and one or more of the later drafts by Zay Jeffries, P. D. Merica, John Johnston, R. F. Mehl, J. H. Critchett, G. F. Jenks and V. N. Krivobok (all nine being members of the Committee), as well as by J. B. Macauley, J. L. Gregg, S. Epstein, Val Cronstedt, F. R. Shanley and other engineering staffs of several aircraft corporations. H. C. Cross, R. W. Dayton, H. W. Russell and L. R. Jackson and other members of the Battelle Institute staff actively collaborated in drafting and revision. A preliminary or tentative draft, "Report, Serial No. Metals 90" was then prepared, utilizing further careful study and detailed criticism by Zay Jeffries.

That tentative draft was given limited distribution and more comments and criticisms were requested from members of the Committee and others who received it. These in turn were used in further revision into the present form.

The report covers so much ground and so many conclusions are based upon recent innovations in metallurgy that it does not purport to reflect the views of the War Metallurgy Committee, or even of the men who reviewed or criticized it. To do so would have required much more work and longer time than was justified under the circumstances, and it is doubtful if such a report could have been prepared.

The primary purpose of issuing the report is that it may be helpful to engineers and others responsible for the selection of engineering materials. No attempt is made to try to make metallurgists of engineers. It is hoped, however, that this report will provide both the engineer and the metallurgist with the basis for a better understanding of each other's problems and proficiencies.

## INTRODUCTION

By S. D. HERON

*Member, War Metallurgy Committee*

THE SHORTAGE of alloying elements for steel and similar shortages in nonferrous metals of construction, have brought sharply to the fore the problem of conservation and substitution of engineering alloys. The design engineer is faced with the necessity of specifying a new material in place of an old one which experience has proven reasonably adequate for a given purpose. He wishes to make the substitution as promptly as possible, but he must have such general information, or make such specific tests, as will afford satisfactory evidence of adequacy.

In such a case the engineer has to rely on the metallurgist and the testing engineer for figures, but he still has the responsibility of interpreting the figures and making the final decision. All three may tend to be overconservative and some engineering improvements have come when the engineer, in desperation, tried materials that the metallurgist would not recommend on the basis of his usual methods of evaluation.

One trouble is that each lacks the background of the other and often is not too conversant with the technical terminology used by the other. Seldom do the metallurgist and the testing engineer have full knowledge of performance and failure records or full appreciation of the conditions of normal and abnormal service. The design engineer does not have intimate knowledge of the metallurgical behavior of unfamiliar materials and cannot predict behavior as well as the metallurgist can. Often the metallurgist, who commonly reports to the manufacturing department, lacks the perspective to strike a proper balance between manufacturing difficulties and engineering performance.

It is seldom that one individual is an expert in design, in metallurgy, and in testing, and it is not desirable to take the time of a good designing engineer to turn him into a poor metallurgist or vice versa. There is a too prevalent desire among designers for a reference book to which they could turn for the way out of any particular dilemma in choice of materials, without bothering to think the matter out or to take counsel. This cookbook attitude is a very dangerous one and should not be catered to. However, it seems reasonable that the designer should ask what usual tests he should have applied to a substitute material and how far he may properly go into the interpretation of the test results. It is reasonable also that the metallurgist should ask the designer for precise information on the type and severity of the service to which the material would be put.

A common meeting ground for such consultations among design engineers, testing engineers, and metallurgists, would be better prepared if all had in mind some of the principles of the evaluation and application of metallic materials.

If these principles could be expressed in everyday terms that the engineer can follow without having to learn all the technical terminology of the metallurgist, which is likely to be jargon to the engineer, he might be better able to put the right questions to the metallurgist and vice versa.

Matters like those that will be mentioned a bit later, puzzle many engineers, and it is necessary that they either understand them, or call in those who do.

It is appreciated that in many cases knowledge is still too hazy and the proper tests still too undeveloped to allow precise solution of all these puzzles, so that evaluation and interpretation often become matters of personal opinion. Expression of personal opinion can be convincing if adequate basis is advanced, and in any case, can be usefully thought-provoking.

The general problem seems of such importance as to deserve attention from the War Metallurgy Committee. In ordinary times it would be best to take plenty of time to insure great accuracy and a high degree of agreement among experts on each detail of the subject matter in such a discussion as is being suggested. But considering the war aspect, this is not a sufficiently prompt method. It is therefore desirable that some member of the War Metallurgy Committee draft a discussion, distribute it to other members and to a few interested parties outside the Committee for criticism, then in the light of the criticisms, recast it to the best of his personal appraisal of the problem, without requiring that the final draft

# to the Selection, Evaluation and METALLIC MATERIALS

be approved in every word or every detail by everyone that has been consulted, even though personal bias still remains in the final draft. This should result in a helpful appraisal of the present state of knowledge, to be considered only as a progress report. Such a progress report might well be made available for distribution to interested parties, under the sponsorship of the committee.

Some of the puzzling features of the substitution problem are given below:

How far may chemical composition be trusted to connote the existence of the desired mechanical properties? For example: Does a piece of steel that meets a given NE or SAE specification necessarily fall within a narrow range of properties, or is each heat a law in itself so that its mechanical properties should be determined individually?

Hardenability is being used as a major criterion of equivalence between SAE and NE steels. How far does this equivalence extend?

Engineers generally desire toughness, supposed to be measured by tensile ductility, even though that quality may not have opportunity to be displayed in the actual performance of the part. Conversely, some thoughtful metallurgists do not hesitate to state that many designers are "ductility crazy". Under what conditions are each of these attitudes justifiable?

Fatigue resistance is admittedly important but the fatigue values are usually given in terms of polished specimens with an absence of notches difficult, sometimes impossible, to obtain in practice. In the service history of parts subject to repeated stress, especially in aircraft engines, occasional occurrence of a few hundred cycles of overstress, perhaps accompanied with impact, may occur. A steel possessing "guts" may resist the overstressing while one equally satisfactory under normal conditions may fail in short order. How can the presence or absence of "guts" be evaluated?

A broader phrasing of a broader problem is "reliability" which goes back to the feasibility of manufacturing and processing a material with a minimum of defects. What means have we of predicting reliabilty in service?

Brittleness like that of glass at normal or at subnormal temperature is certainly undesirable, yet aircraft engine exhaust valves of only 0.5 foot-pound Izod at room temperature have been used without serious trouble. High impact figures used to be demanded in crankshafts and were thought to be necessary for reliability. Some observers claim quite direct correlation between impact test values and behavior in some kinds of severe service, others challenge the validity of such a correlation. What meaning do notched bar impact results have in relation to different types of engineering service?

The problem of wear resistance and avoidance of scuffing is one of the most complex that faces the development engineer. Are there reliable methods of appraising such resistance?

So far, experience and intuition have largely guided the choice of materials for high temperature service. More or less standardized methods of evaluation of creep resistance and of life-to-fracture or stress-rupture are now being employed, but the loads in the latter are much higher and the elongation produced much greater than are permissible in service. Are such data reliable guides?

Similar questions might be asked in respect to corrosion testing.

These particular items, selected by myself and by J. B. Macauley, of the Chrysler Corp. Engineering Department, as of particular interest in regard to aircraft engines, in which we are especially interested, are merely samples to bring out the point of view from which the suggested broader discussion should be written in order to clarify the problems of evaluation, testing, interpretation of results and drawing of purchase specifications.

It is not expected that final or complete answers to these and the related but unmentioned problems will be forthcoming, and it may well be concluded in respect to some of them that we are not yet even on the road to satisfactory answers. But it has been said, "It is worth quite a bit to know how much one does not know".

*Presented here is the first installment of a report prepared for the War Metallurgy Committee based largely upon recent innovations in metallurgy—Distribution of this report has been restricted to a relatively few men directly associated with the war effort—It now is being published for the first time in this and succeeding issues of STEEL and will be of great assistance to engineers, metallurgists and others responsible for the selection of engineering materials.*

By H. W. GILLETT

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

## CHAPTER I

### The Need for Interpretation of Test Data

STATISTICS show that our alloying elements for steel must be spread more thinly. Consider the United States use—in short tons—for 1937 and 1943.

| | 1937 | 1943 expected, approximate |
|---|---|---|
| Manganese | 320,000 | 600,000 |
| Silicon | 120,000 | 200,000 |
| Chromium | 35,000 | 150,000 |
| Nickel | 52,500 | 125,000 |
| Molybdenum | 4,000 | 30,000 |
| Tungsten | 4,400 | 10,000 |
| Vanadium | 1,125 | 3,000 |
| Alloy Steel | 2,000,000 | 15,000,000 |
| Sum of Nickel, Chromium, Molybdenum, Tungsten, and Vanadium | 97,000 | 318,000 |
| Ratio of the sum of these five alloying elements to tonnage of alloy steel | 1,000,000 to 48,500 | 1,000,000 to 21,500 |

There are other uses for these elements, so the total applicable to steel alloying is less than that listed. Quite a tonnage of alloying elements has to be reserved for the very highly alloyed stainless and high speed steels.

A considerable tonnage of highly alloyed stainless steel, used not for corrosion resistance, but for toughness, is required for welding tank armor. Such requirements leave less alloy for the armor itself and for the usual constructional alloy steels.

This means that alloy steels must be so formulated that what we have available of the traditional alloying elements, must do the job for which we formerly used twice as much.

Yet the steels must be as good, since we are using them for such things as aircraft engines, guns, projectiles, and armor.

To accomplish this, the alloy content of scrap steel must be utilized to best advantage, maximum utilization of the more plentiful elements, manganese, silicon, etc., must be had, and the more highly alloyed steels must be strictly reserved for the uses which only they will serve.

To this end, the Society of Automotive Engineers, (SAE) steels are being substituted by the National Emergency, (NE) steels, not only on a voluntary basis but also through WPB orders.

### Hardenability Agent Used

As an example, Fig. 13a shows how a steel of 1.36 per cent nickel, 0.58 per cent chromium and 0.82 per cent manganese has been substituted by one of 0.30 per cent nickel, 0.30 per cent chromium, 0.12 per cent molybdenum and 1.10 per cent manganese plus a trace of a hardenability agent, boron for example. In the latter steel, the nickel, most of the chromium, and some of the molybdenum are supplied by the amounts of these elements found in scrap. Because of the prevalence of alloy steels in industry, scrap carries enough of these common alloying elements so that it is extremely difficult to select scrap that will produce a "straight carbon" steel free from residual alloys. The charge of pig and scrap might well contain 0.30 per cent nickel, 0.10 per cent chromium, 0.05 per cent molybdenum, 0.15 per cent manganese after melting down. In the first steel, it is necessary to add 1.06 per cent nickel, 0.48 per cent chromium, and 0.67 per cent manganese. In the second, no nickel, 0.20 per cent chromium, 0.07 per cent molybdenum and 0.95 per cent manganese are added. By swapping 0.22 per cent manganese, 0.07 per cent molybdenum, and a trace of boron for 1.06 per cent nickel and 0.28 per cent chromium, the drain on the nickel supply has been eliminated and that on chromium eased. More manganese is used, but the supply of manganese is not so critical. The residual nickel in the example chosen is lower than is often met. If, as is common, the nickel from the scrap ran at 0.50 per cent, and the manganese was raised a trifle more, the molybdenum addition could be almost, or quite, eliminated. Thus the chemical composition may be juggled to meet the momentary situation as to supply of alloying elements and nature of available scrap, *as long as arbitrary chemical specifications do not interpose a barrier.*

That a wide range of chemical compositions may be utilized when the metallurgist is freed from arbitrary restrictions, with equivalent mechanical properties and equivalent performance in service, will come out in the subsequent discussion. It should be remembered that several NE steels, once specified as to composition and satisfactorily usable when the alloys to produce those compositions were available, have been abandoned because they were not so economical of critical alloys as some of the later NE compositions. These present compositions, in turn, should not be viewed as fixed and immutable for, as knowledge of the use and control of the "addition agents" advances still further, reduction in the necessary amounts of critical alloying elements can be accomplished, provided the metallurgist is allowed reasonable flexibility in composition to permit using to best advantage the scrap he can get and the alloying elements that are freest in supply.

A similar situation, as to stringency of supply, exists in the tin-containing alloys such as bronzes, babbitts, and solders, since the 1943 tin supply will only be about half that used in 1937. Even copper, though the 1943 supply should double that of 1937, is so sorely needed that demand far outstrips supply, and conservation and substitution must be practiced.

The necessity for conservation and substitution of metals and alloys has led to a desire among design engineers for summarized data to which they might turn, without testing, for a complete and reliable answer to the question of what to use in place of the material formerly specified on the bill of material, but no longer available.

### Choose Materials Carefully

This desire cannot be satisfied. Indeed, a word of caution is in order in respect to the unconsidered application of lists, tables, and charts that seek to point out approximate equivalence of substitute material, e.g., between steels with certain SAE numbers and those with certain NE numbers. The desire for such data, to be used without scrutiny, could only be satisfied were each and every property of the substitute material *identical* with those of the formerly-used material. Nevertheless, it is usually possible to find a substitute that is *adequate, for a particular part.* However, for another part, of different section or subjected to a different type of service, a different substitute may have to be selected in order to be adequate.

Case histories of successful substitution, in specific parts for specific services, are accumulating, some extrapolations may be made, and some general conclusions can be drawn therefrom. Engineers are properly hesitant in making extrapolations and drawing conclusions without the direct evidence of specific tests on the new material that offer real proof of its utility for the service planned, rather than mere presumptive evidence.

There are well-known, standardized tests for certain mechanical properties of metals, but there is always a question as to the interpretation of the results of these tests in respect to a particular engineering application. This problem is being faced.

In the Annual Review number of STEEL, January 4, 1943, A. J. Herzig says:

> "In the past a great deal of emphasis has been placed on physical tests which were faithfully performed because we knew so well how to perform them, rather than because those tests precisely described the fitness of material for service—the new viewpoint focuses attention on fundamental characteristics and not on tests whose relation to performance is obscure at best."

H. A. Schwartz, in the same issue, backs him up as follows:

> "A development deserving much commendation is the trend toward judging the suitability of a given metal for the intended use by service or proof tests rather than by conformity to some particular mechanical properties which have been deemed necessary, often on insufficient grounds."

E. C. Bain remarks in the American Society for Metals Review:

> "To insure that each successive pound of our precious alloy brings about the maximum destruction of the enemy, the reduction or, if possible, the elimination of alloy wherever it is not absolutely necessary, is not a 'will you please' but a 'must'. To effect these changes, the use of a well-established science can be applied in the simpler cases; for the others, experience is the best guide.
>
> "The importance of practical testing should be stressed; the best test specimen is an actual part loaded to simulate the state of stress encountered in service but to an aggravated degree if necessary. By such means we may learn to get along well with the least amount of critically needed alloying elements."

### Engineer Realizes Problem

The engineer realizes the problem as acutely as does the metallurgist, as is evidenced by Mr. Heron's introduction and by the recent editorial "What About Metals?" in *Mechanical Engineering* for November, 1943.

This treatise seeks, in accordance with that introduction, to pick out the high spots for the busy engineer, to select and digest existing information, and to phrase it in engineering, rather than metallurgical language. This involves the bringing together of available figures and graphs from the literature, that bring out the information most forcibly. Of necessity, there is much similarity between the material in the present compilation and in the metallurgical discussion in Reference 9 appended.

Since metallurgical language is to be avoided, it is necessary to use less precise phraseology and to make some more general statements than the meticulous metallurgist would approve, unless they were put into more precise phrasing and given detailed explanation.

The design engineer does not have time actually to become a metallurgist. To do so and to keep up with modern advances in metallurgy would take *all*

his time. What he needs to do is to work with metallurgists, and the metallurgists need to work with the engineer. Only by close co-operation of the two groups can there be insurance that all factors, both the obvious and the subtle, are given proper consideration. Through such co-operation, the engineer can keep abreast of the rapidly changing metallurgical art.

No space will be taken to describe testing methods in detail, these can be found in readily available sources. Our primary topic is the *interpretation* of the test data, the *evaluation* of metallic materials. All engineering materials could well be discussed, and the substitution of metals by nonmetallics, such as concrete, glass, rubber, and rubber-like materials, wood, plastics (and the combination of the last two, plywood) deserves and has had, equal attention with that of substituting one metal or alloy by another. Substitution by nonmetallics is a major step in conservation. The problems of selection and testing are analogous, whatever the materials, but this discussion is confined to metals.

## CHAPTER II

### Chemical Composition an Insufficient Criterion

We have unquestionably been using materials for which adequate and less expensive equivalents can be found by proper testing and evaluation.

In war or in peace the aim should be to *use* each material and each alloying element where it will best serve the engineering necessities. Such use is true conservation. Refraining from use of alloy where refraining leads to an unserviceable product, is waste, just as much as it is waste in war to put in more alloy, or in peace more expensive alloy, than is required to make the product serviceable.

It is becoming apparent that if we apply what we now know and what we will soon know (because we will be forced to test suggested alternates for suitability), we can in the future avoid using much highly alloyed steel that has been specified in the past. Just as certainly it will be found that high alloy steels are indispensable for some present uses, and, further, their wider use will allow the designing of better equipment than we now design. It is because high alloy steels are indispensable in warfare that we now have to reserve the alloys for the truly indispensable uses and must appraise each use from that point of view.

Quite as intensive work as is being done to eliminate unneeded alloys is being done to develop new alloys with hitherto unobtainable properties, even though the alloy requirements turn out to be very high, and even for scarce and expensive elements. This is in order to make possible the designing of new instruments of warfare and the introduction of revolutionary economies in peaceful applications. Many such designs are stymied for lack of material that will have the properties the designer

## THE WAR METALLURGY COMMITTEE

The War Metallurgy Committee is an outgrowth of an advisory committee service started by the National Academy of Sciences and the National Research Council in July, 1940 at the request of the Advisory Commission for the Council of National Defense, which subsequently became the Office of Production Management, now the War Production Board.

In late 1941 and early 1942, the committee was reorganized and staffed to include research work for the National Defense Research Committee of the Office of Scientific Research and Development and for the technical branches of WPB. On the formation of the Office of Production Research and Development of WPB, both the advisory and research services to WPB in metallurgy were continued by the War Metallurgy Committee.

The Committee is in constant touch with WPB, National Defense Research Committee, the Army, the Navy and other government agencies. Its principal functions are (1) to provide advisory reports on metals and minerals for the war agencies, (2) to organize and supervise specific researches on metallurgical problems and (3) to collect and distribute to the armed services metallurgical information.

More than 100 research projects now are being conducted under its supervision. Under products, these researches include aircraft materials, armor plate, guns, ammunition, heat-resistant alloys, welding and foundry materials. Processes included are alumina production, magnesium production, mica processing, steel processes and conservation and substitution of metals.

Members of the general committee follow:

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Watertown Arsenal
Watertown, Mass.

knows must be had before his brain-child can exist in more concrete form than a drawing.

In such investigational work, the problems of test methods and of their applicability are just as pressing as in the case of evaluating the equivalence of materials for a part already in huge production. One difference between the two cases is that when the design is a brain-child only, the designer does carefully estimate the desired service conditions, he states them to the metallurgist and he will be nicely satisfied when the metallurgist produces an alloy that *just* fills the bill, without showing unneeded attributes.

From this point of view, the designer, when thinking only of ultimate performance, not of methods of production or availability of material, wants merely a piece of certain final dimensions that will stand the design stresses under the various conditions of service. He doesn't care, when he is in that frame of mind, whether the piece is made of steel or silver, whether it is cast or forged, machined or ground. When in this mood, he designs gas turbines, for example, that would require materials resistant to, for the present, impossible temperatures, for which materials he would gladly pay fantastic prices. Thus he sets a goal for the metallurgist to approach as closely as he can. Until the metallurgist attains that goal, the designer is forced to scale down the stresses and temperatures to those within the range of some material available at present.

Likewise, the designer has to modify his wishes according to the ability of the various possible materials to be fabricated by production methods and to be obtainable.

The design engineer meets his most difficult problems as to choice of materials when he is designing for strength *in large sections*. It is for strength in large sections that alloy steels are needed and it is with alloy steels that the path toward conservation and substitution is not as clear as with other materials. The relation of chemical composition to the properties of large heat-treated steel sections is therefore receiving much attention.

Specification of cast iron and cast steel by chemical composition has long been outmoded. Cast iron is sensitive to the rate of cooling, which of course varies with the size of the section cast, so the same composition gives different properties in different sizes. Hence, it is necessary to evaluate and specify cast iron by its mechanical properties, as tested on specimens representative of the size of section being cast.

Cast steel is notably affected as to toughness by the size and distribution of non-metallic inclusions, which are governed, not by the chemical composition, as ordinarily determined, but by very small additions of control elements, such as aluminum or titanium, put in just as the metal is ready to pour. Few specifications limit the composition of cast steel, only the properties are specified.

Armor, whether cast or wrought, is specified and evaluated on the basis of ballistic tests; the chemical composition may be anything, so long as the tests can be met.

In these cases, unnecessary restrictions upon chemical composition are avoided, but unnecessary restrictions upon the chemical composition of wrought steels to be heat treated are still imposed. This is a remnant of the system of nomenclature in which alloy steels were known by their alloying elements, e.g. as a "chromium vanadium" steel, or by a SAE number which denoted a partic-

## TABLE A

**Representative Compositions and Corresponding Properties. Not Specification Limits. Low Alloy Steels for Riveted Structures. Some Can Be Welded with Suitable Preheating and Stress-Relief Annealing. Usual Requirements, 55,000 Min. Yield, 20% Elong. in 2-in., up to 1-in. Plate. Longitudinal Specimens**
**As-rolled ½- to ¾-in. plate unless noted**

| No. | C | Si | Mn | P | Cu | Cr | Ni | Mo | V | Yield | Tensile | Elong. % 2 in. | Red. of Area | Izod Impact ft. lb. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.28 | 0.25 | 1.50 | .... | 0.50 | .... | .... | .... | .... | 55,000 to | 80,000 to | 20 to 35 | ..... | 40 to 60 |
| | 0.35 | 0.15 | 1.40 | .... | 0.20 | .... | .... | .... | .... | 60,000 | 90,000 | | | |
| 2 | 0.30 | 0.50 | 0.90 | .... | 0.50 | 0.25 | 0.25 | .... | .... | 60,000 to | 75,000 to | 20 | ..... | ..... |
| | max. | max. | max. | | | max. | max. | | | 70,000 | 90,000 | | | |
| 3 | 0.20 | 0.20 | 1.45 | .... | 0.20° | .... | .... | .... | 0.12 | 65,000 to | 90,000 to | 20 to 30 | 60 to 70 | ..... |
| | | | | | | | | | | 70,000 | 95,000 | | | |
| 4 | 0.17 | .. | 1.00 | 0.09 | 1.00 | . | .... | 0.20 | .... | 55,000 | 85,000 | 20 | ..... | ..... |
| 5 | 0.20 | 0.75 | 1.25 | .... | 0.20° | 0.50 | .... | .... | .... | 55,000 | 85,000 | 20 to 28 | 50 to 65 | ..... |
| 6 | 0.25 | .... | 1.00 | .... | 1.40 | .... | 0.90 | 0.25 | .... | 70,000 | 90,000 | 15 | ..... | ..... |
| 7 | 0.22 | .... | 0.80 | .... | 0.95 | .... | 1.90 | .... | .... | 65,000 | 90,000 | 25 | 55 | ..... |

°When specified.
Note that steels 2, 9, and 11 of Table B also show 55,000 yield.
Note that elongations are given on 2-in. gage lengths.

## TABLE B

**Representative Compositions and Corresponding Properties. Not Specification Limits. Low-Alloy Steels for Welding Without Pre-Heating or Stress-Relieving Annealing. Usual Requirements, 50,000 Min. Yield, 21% Elong. in 8 in. up to 1-in. Plate, Longitudinal Specimens**
**As-rolled ½- to ¾-in. plate or 1-in. rod unless noted.**

| | Approximate Composition % | | | | | | | | | | | Elong. % | | R. A. | —Impact— | | Endurance |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | C | Si | Mn | P | Cu | Cr | Ni | Mo | V | Yield | Tensile | 8" | 2" | % | Charpy | Izod | Limit |
| 1 | 0.13 | 0.15 | 0.90 | .... | 0.20° | .... | .... | 0.50† | .. | 50,000 | 80,000 | 23 | .. | 55 | .. | ... | ..... |
| 2 | 0.16‡ | 0.20 | 1.20 | .... | 0.20° | .... | .... | .... | 0.10 | 60,000 | 80,000 | 21 | 28 | 60-70 | .. | 60-110 | ..... |
| 3 | 0.14 | 0.70 | 1.10 | .... | 0.20° | 0.50 | .... | .... | .... | 50,000 | 75,000 | 25 | .. | 40 | 50 | ... | ..... |
| 4 | 0.09 | 0.01§ | 1.25 | 0.11 | 0.35 | .... | .... | .... | .... | 50,000 | 75,000 | . | 32 | 55 | 25 | ... | ..... |
| 5 | 0.08 | 0.05 | 0.38 | 0.11 | 0.65 | .... | 0.75 | 0.10 | .... | 50,000 | 70,000 | 27 | .. | 60 | .. | 130 | 48,000 (on sheet) |
| 6 | 0.09 | 0.40 | 0.70 | 0.10 | 0.60 | 0.25 | 0.33 | .... | .... | 50,000 | 75,000 | 25 | .. | .. | .. | 75 | 49,000 |
| 7 | 0.10 | 0.50 max. | 0.75 | .... | 0.50 | 0.25 max. | 0.25 max. | .... | .... | 50,000 | 70,000 | 25 | .. | .. | .. | ... | ..... |
| 8 | 0.10 | 0.30 | 0.60 | 0.10 | 1.10 | .... | 0.55 | .... | .... | 50,000 | 75,000 | 25 | .. | 60 | 55 | ... | 49,000 |
| 9 | 0.09 | .... | 0.70 | .... | 1.40 | .. | 0.80 | 0.10 | .... | 55,000 | 70,000 | 25 | .. | 50 | 25 | ... | 45,000 |
| 10 | 0.10 | 0.75 | 0.20 | 0.13 | 0.40 | 0.90 | . | .... | .... | 50,000 | 70,000 | .. | 25 | .. | 40 | 60 | 45,000 |
| 11 | 0.08 | 0.30 max. | 0.55 | .... | 1.00 | .... | 2.00 | .... | .... | 55,000 | 75,000 | 25 | .. | 60 | 40 | ... | 40,000 |

°Cu content when Cu is desired.
†For heavy sections, 0.25% Mo for light sections.
§Semi-killed steel.
‡C content slightly above the usual level for this class, due to fine grain conferred by V. Manufacturers allow 0.18 C max.
Atmospheric corrosion resistance greater than for Cu-bearing steel is claimed for steels 4-11.
Note that elongations are given on 8-in. gage lengths.

ular range of chemical composition. This same practice persists in the nomenclature of the NE (National Emergency) steels which have been developed as substitutes for SAE steel, to avoid the unnecessary use of scarce alloying elements.

In the case of low carbon, mild alloy steels that are to be used without quenching and tempering, it is well recognized that the enhanced strength conferred by the use of alloys can be obtained by a variety of combinations of small amounts of different elements. The War Production Board recognized this and brought about the omission of those compositions that required too liberal use of scarce elements, by refusing to allocate alloys for them. The Navy, for example, had to accept other steels in place of its well-tried manganese-vanadium steel, in view of the shortage of vanadium.

Tables A and B show what a variety of compositions have been used commercially to obtain the required 50,000 or 55,000 p.s.i. yield strength, and also to bring out the fact that phosphorus, in amounts not permissible in steels of higher carbon content and barred by steel specifications in general, is a useful alloying element in these low carbon steels.

Lacy and Gensamer[1] studied the strengthening of carbonless iron upon alloying it with various elements to simulate the alloyed matrix in which the carbides of these non-heat-treated steels are embedded. The plastic deformations, i.e. the stress-strain diagrams of the tensile test, could be made identical. The authors say "It makes no difference whether a curve is obtained by using X per cent of Element A or Y per cent of Element B; if the correct amount of alloying element is used, the flow curves will coincide." That is, chemical composition can be widely varied with identical mechanical results.

Chemical composition counts in steels for corrosion-resistant service, because corrosion is a chemical attack. It counts indirectly in certain types of steels for wear-resistant service, because some alloying elements help to produce specially wear-resistant particles (carbides) of different mechanical properties than those in non-alloyed steel. It counts in the extremely highly alloyed steels used for the most severe high-temperature service, because we as yet know too little about the structure required for best performance in such service to describe it in any other way. Yet, both in the special wear-resisting and the heat-resisting steels, there is a considerable degree of replaceability of one alloying element by another.

A clear case of identity of performance, concurrent with identity of structure but unaffected by difference in chemical composition, is met in high-speed tool steel, where molybdenum can be substituted for part or all of the tungsten. Depending on the relative scarcity of tungsten and molybdenum, high-speed steel is made with highly varying amounts of these two elements, yet satisfactory tools are produced.

In the usual, heat-treatable, constructional steels, whose utility depends primarily on mechanical properties of strength and toughness, those properties are essentially conferred *only in an indirect way* by the alloying elements.

Steel is an alloy of iron and carbon. Iron exists in different crystal forms at different temperatures, and the way the carbon is held is different in the different forms of iron. At the temperatures of rolling and forging, the carbon (except in high-carbon tool steels where it is desired to retain undissolved carbides for their cutting power) is all in solution, there are no carbide particles.

As the temperature falls, in cooling from the rolling temperature, as the steel shifts its crystal form, the carbon separates into particles of iron carbide, dispersed in a matrix of iron.

The carbide particles are hard and brittle, the iron matrix is soft and tough. By adjusting the amount of carbon and hence of carbide, and by securing (through the medium of rate of cooling) a dispersion of carbide particles through the matrix, the properties of the steel are adjusted to run the gamut between soft iron and tempered spring steel.

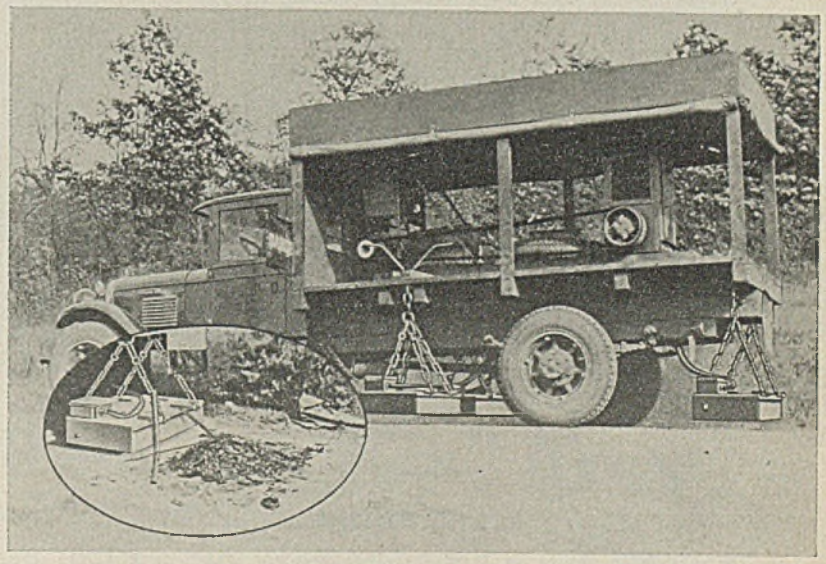
The primary feature that controls the compromise between softness and toughness on the one end, and hardness and brittleness on the other, is *the spacing between* carbide particles. When the carbide particles are few and large, so that the matrix offers only slightly interrupted paths to internal shear resulting from the applied stress, the steel is weak but tough. When the carbide particles are many, small, and uniformly dispersed, so that the paths through the matrix are short, the steel has much greater strength and diminished toughness. The secret of the control of particles in steel is the control of the distribution of carbide.

The carbide particles are precipitated during cooling. The steel is cooled down in the furnace when *annealing* is being carried out, or in the open air in *normalizing* (so called because steel cools in "normal" fashion from the rolling temperature); or, once it has cooled, it may again be reheated to the "normalizing" temperature (at which the carbon is in solution) so as to be ready for air cooling. The lower the temperature at which the precipitation occurs, the smaller are the carbide particles. Hurrying the cooling through the upper end of the range of temperature over which this precipitation occurs, retains more of the carbon to be thrown out at the lower end of the range, and in finer form.

The ability of the carbon to come out rapidly at the high end of the range is somewhat reduced by the introduction of alloying elements; that is, the alloy steel reacts more sluggishly on cooling. This is what gives the steels of Tables A and B a finer dispersion of carbide and a yield strength double that of a comparable unalloyed steel.

*(To Be Continued Next Week)*

[1] Lacy, C. E., and M. Gensamer. The Tensile Properties of Alloyed Ferrites. Preprint No. 15 for October, 1943 meeting American Society for Metals.



WAR-MODEL ELECTRIC "SWEEPER": Airports, war plant parking lots and vital highways are made safe for traffic in jig time when this outfit goes into action. With three road cleaning magnets built specially for this work by Cutler-Hammer Inc., Milwaukee, and mounted 2 to 3 inches above the ground as shown, the motor-generator equipped truck can cover a road span of 8 or 9 feet, drawing from its path nails, wire and other metal debris dangerous to tires. One of the magnets is suspended from each side of the truck body, while a third hangs from the tail of the chassis. Inset shows large quantity of metal collected by the tail magnet in one run

# Automatic Pyrometer Control Of High-Speed Salt Baths

HIGH-SPEED baths are used principally for the hardening of high-carbon (high-speed) steels although, in some cases, they may be used for copper brazing, silver soldering and similar heat-treating operations. Successful hardening of high-speed steel depends to a very large degree upon close temperature control. With some grades of steel, temperatures may vary as much as 15 to 20 degrees without serious damage, but with most of the newer chromium-molybdenum alloys, temperatures should be held within closer limits.

These baths are used principally because of their inherent ability to exclude atmospheric air from the work during heat treatment. When heated parts are taken out of the bath, they are covered with a light film of salt which prevents atmospheric oxidation until they are quenched.

Barium chloride salts are used in all high-speed baths. Approximately 1 or 2 per cent of the baths may be referred to as "borax baths" but it is to be noted that only a very small amount of borax is used as a fluxing agent, barium chloride making up the remainder.

When salt baths made their appearance some years ago, they were heated externally in fuel-fired pot type furnaces. Pot life was short, close temperature control was difficult and, in general, baths in the high-speed ranges were not widely used.

This picture is now changing, with the expansion in use of the direct electrical heating principle. Pots are constructed with thick ceramic walls and heating is accomplished by passing low voltage electric current from step-down transformers directly through the salt. The current is applied to the salt through heavy chromium-iron electrodes (usually 2 inches square) which are immersed to within 3 or 4 inches of the bottom of the pot. High speed baths may be from 8 to 20 inches in diameter and 10 to 26 inches deep.

*CONTROL PROBLEMS:* Close temperature control of high-speed salt baths has always been a difficult problem because of the highly destructive action of molten salt at high-speed temperatures (2300 degrees Fahr. or thereabouts). This necessitated the use of heavy wall chromium-iron or pure nickel tubes in order to obtain reasonable thermocouple life. Even then, frequent replacement was necessary. Base metal couples were used for this service principally because they were less expensive than platinum couples.

The heating rate of high-speed baths may be as high as 0.6-degree Fahr. per second, depending on the current input. Therefore, a responsive temperature measuring element is necessary, to obtain close control.

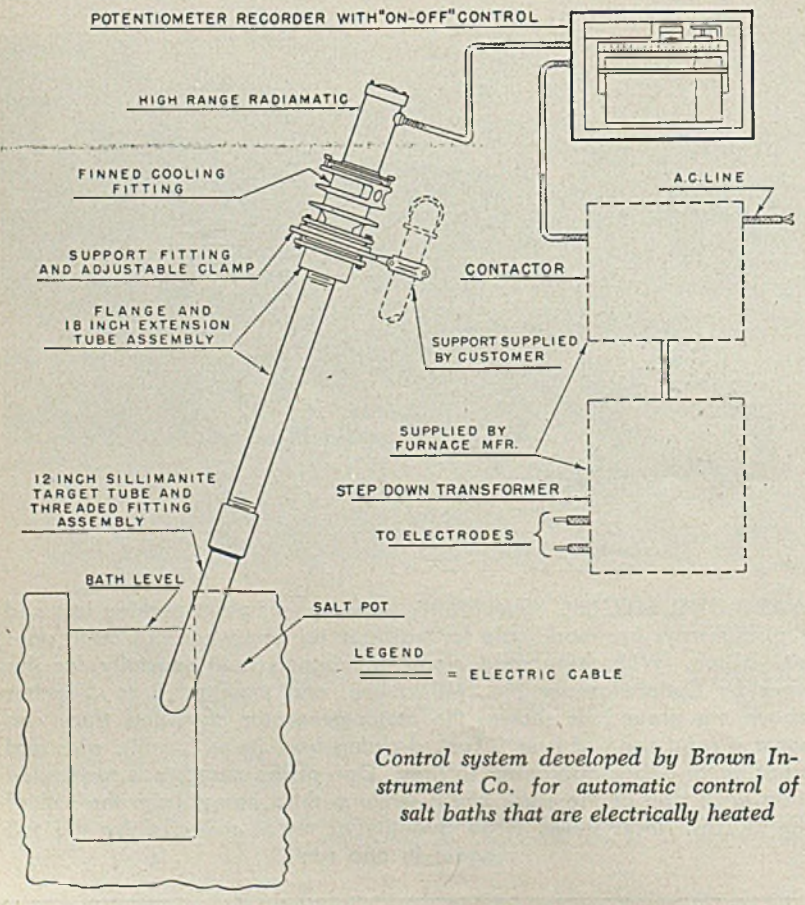
Actual field tests have disclosed that the Brown Radiamatic when sighted into a closed-end close-grained Sillimanite target tube provides much closer control than can be obtained with thermocouples. This is due principally to the greater sensitivity of the Radiamatic element. Table I summarizes the data obtained from field tests conducted simultaneously in a number of plants. The close-grained Sillimanite target tube is reported as responding four times as rapidly as the chromium-iron thermocouple tube. Also it lasts almost three times as long.

*INSTALLATION:* This system is applicable to all high-speed baths, whether electric or fuel fired. Accompanying diagram illustrates an installation on an electrically heated bath. A high-range Radiamatic pickup unit is sighted into a Sillimanite target tube assembly. To prevent excessive radiant energy from the bath surface from overheating the sensitive unit, the target tube is slightly inclined. The detecting element is designed for continuous operation in ambient temperatures to 250 degrees Fahr. If local conditions are such that the element temperature is likely to exceed this value, a metal radiation shield can be made and installed on the extension tube.

The Sillimanite tube is 1½ inches inside diameter by 1⅞ inches outside diameter by 12 inches long and is cemented into a wrought iron fitting. This assembly is threaded on the end of a wrought iron extension tube 18 inches long, making the overall length of the target tube 30 inches. When the tube fails, only the lower 12 inches requires replacement.

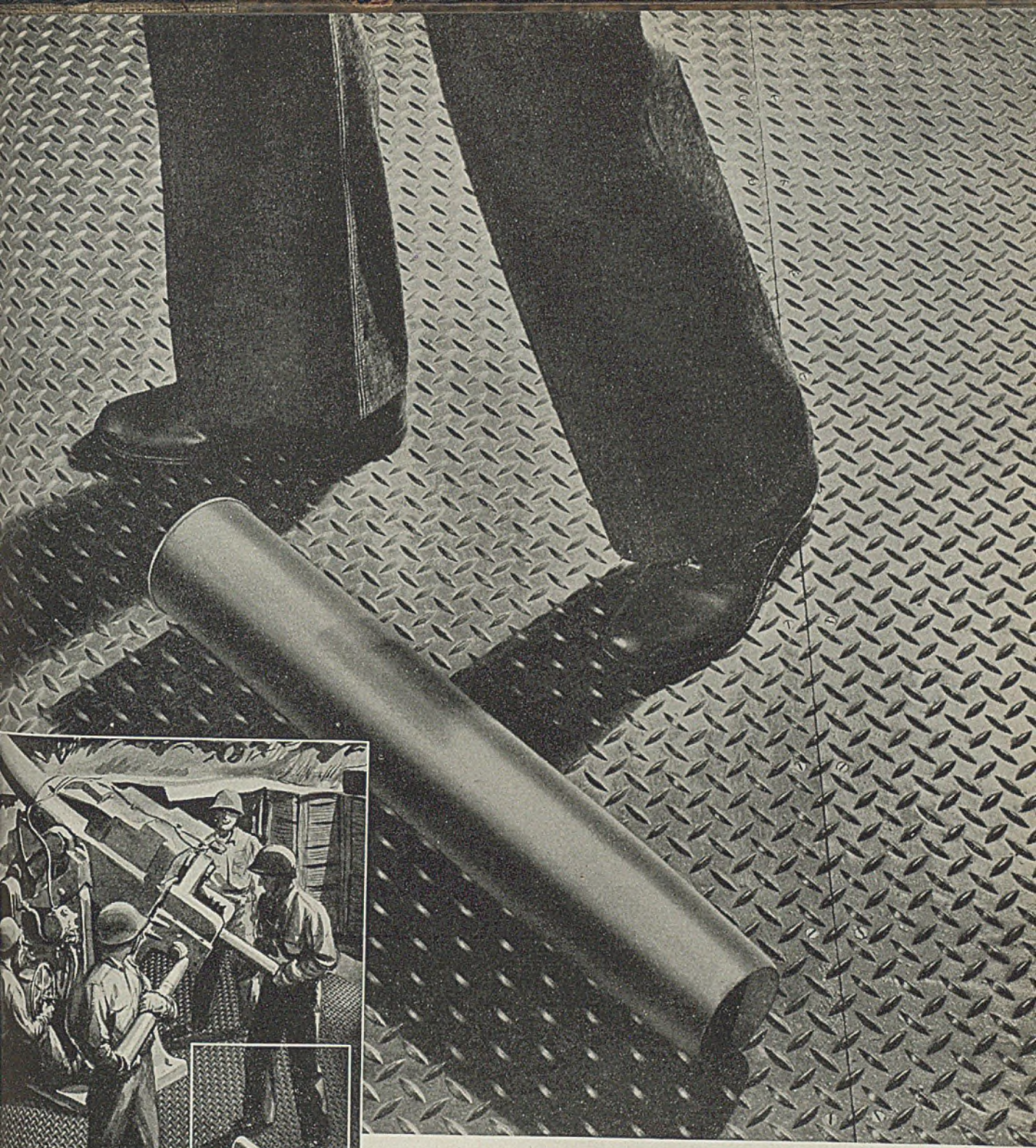
The tube is submerged about 4 or 5 inches into the bath at a point where it will not be mechanically damaged by work being heated or, in the case of an electric bath, by replacement of the electrodes, usually done every three weeks.

*RECOMMENDED CONTROL:* For use in conjunction with the Radiamatic unit and its tappet tube assembly, a complete control system should include ad-




*Control system developed by Brown Instrument Co. for automatic control of salt baths that are electrically heated*

From information furnished by the Brown Instrument Co., Philadelphia.





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ditional equipment such as a strip chart potentiometer with a range from 1100 to 2600 degrees Fahr. and with on-off control action. The temperature of the bath is measured by the Radiamatic. This reading is transmitted to the potentiometer, which actuates the coil of the main contactor in power circuits feeding the electrodes in the bath. Single-phase wiring is shown in the diagram. equipment remains the same in either case.

*LIMIT CONTROL:* For fuel fired baths in which the pot is surrounded by a combustion chamber, limit control of the combustion chamber temperature in addition to throttling or two-position control of the bath is recommended. This is necessary to prevent overheating of the pot, which would seriously shorten its life. A thermocouple installed in the combustion chamber measures the heat potential against the pot and, through a separate limit controller, reduces the fuel input to some minimum value if the temperature exceeds a predetermined safe maximum. Indicating millivoltmeter controllers are recommended for limit control.

Field tests under commercial conditions of operation have demonstrated that the salt bath control system described has the following outstanding operating advantages:

TABLE I—FIELD TEST DATA

| Element | Approximate Relative Response | Average Service Life |
|---|---|---|
| Chromium-iron thermocouple (¼-inch wall) | 1 | 21 days |
| Sillimanite thermocouple tube (⅛-inch wall) | 3 | 25 days |
| Sillimanite target tube (⅜-inch wall) | 4 | 50 to 60 days |

—It is far more responsive to temperature changes. Hence, baths are held to closer temperature limits, which results in improved heat treating.

—The Sillimanite target tube gives greater service life, averaging two and a half to three times that formerly obtained with heavy walled chromium-iron thermocouple tubes.

—Should the tube fail in the bath, the measuring element is protected from damage, since it is located away from the bath. With thermocouples, tube failure involved complete replacement of the detecting unit and thermocouple assembly.

—The measuring instrument is protected from damage from electrical short circuits if the tube should fail. With thermocouples, the alternating current potential of the bath (5 to 25 volts) sometimes damages the measuring instrument, through faulty grounds.

*LIMITATIONS:* Sillimanite is not satisfactory for cyanide or any other carburizing baths in the low-carbon steel range (1400 to 1700 degrees Fahr.) because this material dissolves rapidly in such baths.

The Radiamatic should not be sighted directly on the surface of the salts. Tests have shown that any radiation pyrometer is affected by the presence of surface scum, barium chloride vapors, etc., and the elimination of these is next to impossible on a commercial salt bath. However, immersing the tube as recommended results in measuring the bath temperature at a point in the bath several inches below the surface, thus affording an accurate measurement of true bath temperature.

# New Republic Stack To Undergo Operating Technique Study

THE MOST AMBITIOUS blast furnace operating study ever projected is to be undertaken shortly at the new Defense Plant Corp. blast furnace at Cleveland which was constructed by and is being operated by Republic Steel Corp. The purpose is to find out just how much pig iron can be produced daily—day in and day out—in a modern 27-foot hearth furnace. A description of the stack was presented in last week's issue, page 141.

The stack is blown with 18 tuyeres and under normal operating conditions is designed to produce 1300 tons of iron a day. Three Bailey welded hot blast stoves, 25 x 115 feet, provide a total of 600,000 square feet of heating surface. Blast is supplied to the stack at 1400 degrees Fahr.

It is recalled that one of Bethlehem Steel Co.'s Lackawanna furnaces produced on an average 1491 net tons daily during one month in 1942, thus for the first time fulfilling the long-sought ton-a-minute goal. A few months later a Jones & Laughlin Steel Corp. Aliquippa furnace produced a daily average of 1564 net tons. In May of this year the record again was shattered when Great Lakes Steel Corp. at Zug Island produced a daily average of 1603 tons.

After studying these performances a group of well-known blast furnace men, serving as a subcommittee of the War Metallurgy Committee, recommended to the Office of Production Research and Development, War Production Board, that a comprehensive study be made to determine how present operating technique can be improved in order to get better operating efficiency. Specifically, this question has been raised: Is it possible to get an output of, say as much as 2000 tons daily?

The subcommittee making the recommendation is composed of Prof. T. L. Joseph, University of Minnesota, chairman; W. E. Brewster, International Harvester Co.; H. W. Johnson, Inland Steel Co.; B. J. Harlan, Lone Star Steel Co., formerly with Bethlehem Steel Co. at Lackawanna; J. H. Slater, Republic Steel Corp. and George Steudel, Carnegie-Illinois Steel Corp. Sitting with this group were P. H. Royster, liaison officer for the OPRD, and Gaylord Halverson, liaison officer for the Steel Division.

### Case Scientists Engaged

With the voluntary approval of Republic Steel Corp. executives, OPRD has arranged a contract with Case School of Applied Science, Cleveland, under which two of its faculty members, Prof. K. L. Donaldson and Prof. C. M. Cover, will work with Mr. Slater in launching and conducting the study. In gathering data they will have the assistance of a corps of Case undergraduates.

One objective is to get a better understanding of the relationship between the percentage of flue dust and the rate of blowing. More information also is desired about the relation of increased hearth pressure attributed to higher blast and resulting hanging of the furnace charge.

The committee decided to put on all the wind the furnace would stand without any restriction to the gas. It was the opinion of some, however, that there should be a limit. So 350 pounds of flue dust per ton of iron was set as the maximum and when this production of flue dust is reached it is felt that the stack is being blown under normal conditions.

The furnace is being provided with an automatically regulated choke valve by which the gas pressure at the furnace top can be controlled at from 5 to 10 pounds above atmospheric pressure. This will be used in an attempt to learn whether by increasing gas pressure at the stockline, and therefore by decreasing the velocity of the gas, the amount of flue dust can be decreased.

At the start of the campaign conventional operating methods will be employed. After that extended studies will be conducted to see what happens when high to extremely high blast volume are employed. The furnace is served by a 90,000-cubic foot per minute turboblower at 30 pounds pressure, while a duplicate standby unit is under construction. After the latter is completed the two turboblowers will be operated in series; an air cooler will be installed between the first and second blowers.

The furnace is slated to take treatment which under ordinary conditions would be regarded as brutal. Furnace operating troubles will be regarded as secondary and the furnace will be continued in operation under conditions that normally would be regarded as approaching an unmanageable state; full information will be sought on the reasons why furnaces get into trouble. Resulting data are to be placed at the disposal of all blast furnace operators without charge.

# WELDED STEEL TUBES

## . . . . for maximum torsional resistance

By W. J. CONLEY
*Consulting Engineer*
Lincoln Electric Co.
Cleveland

THE ROUND tube section is recognized as the most efficient for applications where a large amount of torsion is involved. It is for this reason that airplane fuselages are constructed chiefly of tubular shapes. Certain types of bedplates may be subjected to extreme torsion and in such cases it may be advisable to use tubular bracing or even main members of tubular shape to resist the torsion imposed.

Welding has made available the use of tubular sections for this purpose because it permits connections being made directly to other members without the use of a mechanical connecting member. Welded connections can be made of tubular shapes, or tubular shapes and structural shapes at any angle. This freedom of design, with tubular steel members, is just one of the many ways in which welding makes possible economies that cannot be obtained by other methods.

The simplest connection is a straight end-to-end butt connection of the same size tubular shapes. This may be a plain butt joint, Fig. 1, or a butt joint with back-up ring, Fig. 2. The backing is of great assistance in assembly and may permit higher welding speeds. The butting ends may be straight or scarfed, depending on thickness of the tube wall.

When one tube must be connected to another at an angle, the connection can be designed in several ways. The end of one tube may be cut to fit a curved surface on the second member, as shown in Fig. 3, or a hole may be cut in the wall of one member to permit insertion of the other member, see Fig. 4. This hole should be of such shape as to permit a close fit with the inserted member at the desired angle. In both of these joints a loading which causes a deflection of the smaller tube may impose severe stresses on the wall of the larger tube in the vicinity of the joint.

One method of dealing with these local stresses is to insert gusset plates at the joint. Another method is to close the end of the smaller tube by spinning, drill a small hole in the far wall of the larger tube and weld the outside as shown in Fig. 5. This fixes the end of the smaller tube with a weld in shear, and reduces the amount of bending in the tube wall.

Temporary or permanent connections between the ends of tubes and flat surfaces are not difficult to make. Fig. 6 shows a tube flattened for bolted connection to a web of a T-section. The same connection can be made permanent by welding. Also, this joint can be stiffened by inserting a short length of smaller diameter tube into the end of the connecting tube before flattening.

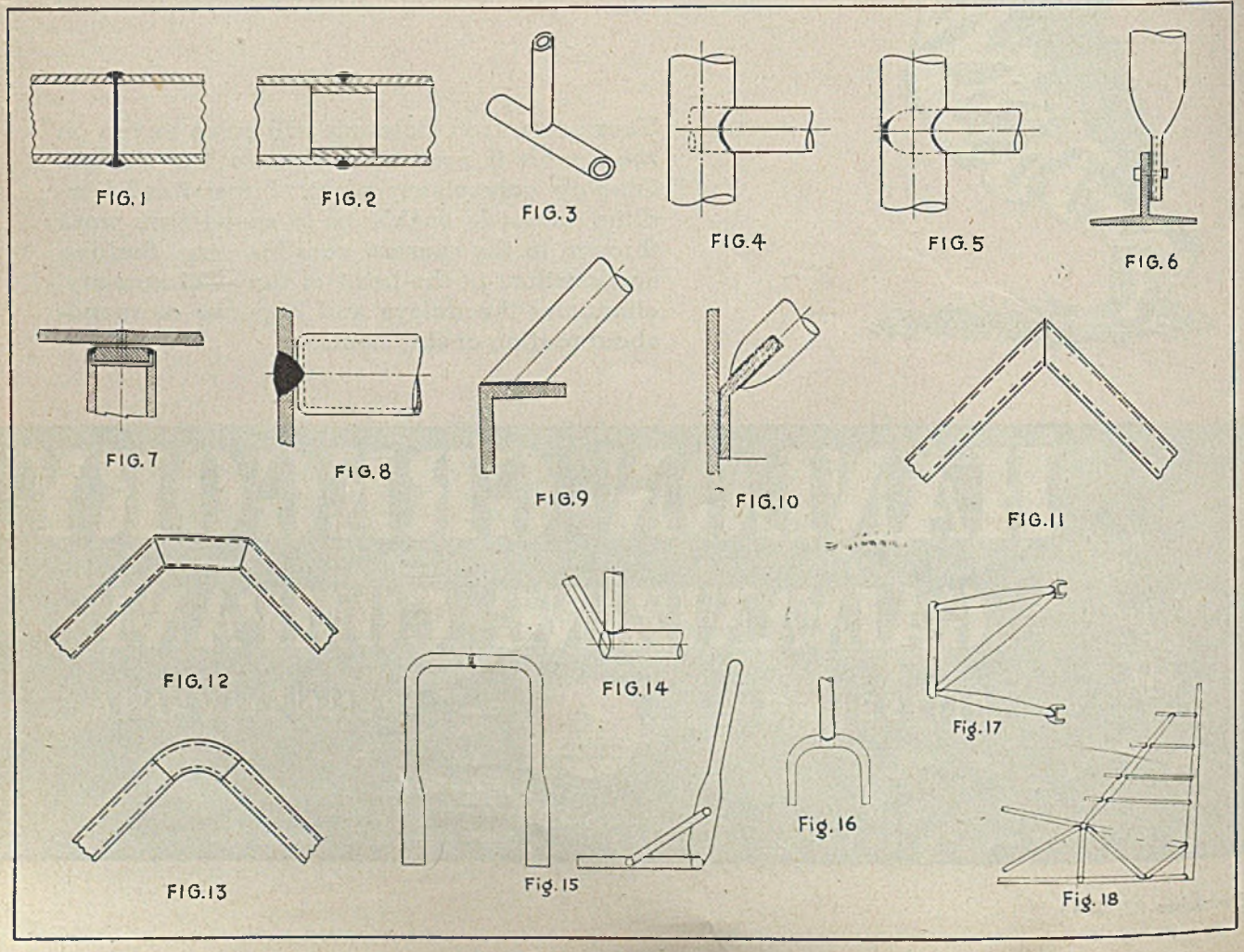
Fig. 7 is an arrangement for bolting the end of a tube member to sheet or plate. Here the end of the tube is machined to receive a small tapped plug which is arc welded in place. Variations of these three methods of end closure and of the devices shown in Figs. 8, 9 and 10 will take care of practically all end-connection problems.

One advantage offered by the type of connection shown in Fig. 4 is that in assembly of several members simpler jigs or fixtures may be required to hold the assembly in alignment for welding.

When it is desired to join the ends of

(*Please turn to Page* 90)





*One purpose . . .*

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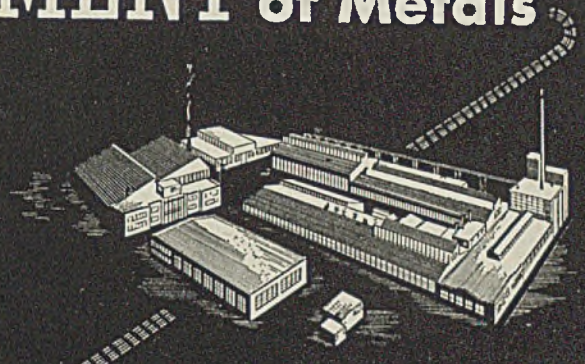

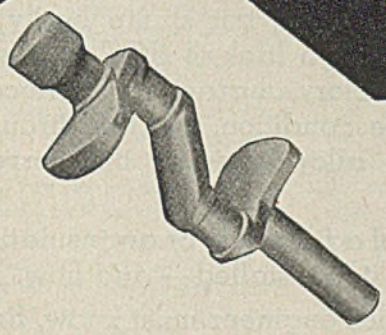

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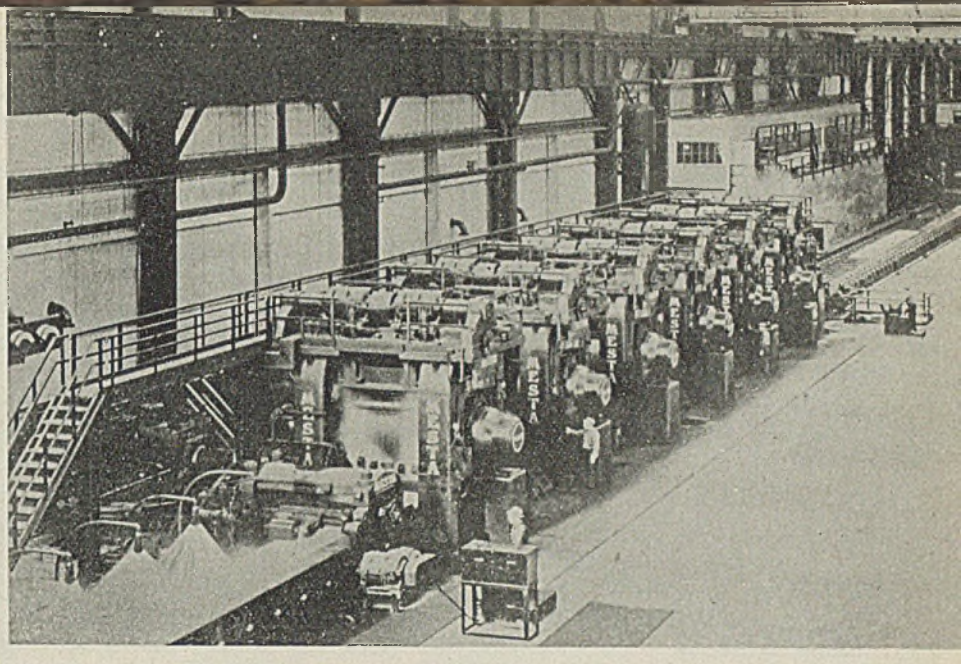


*Fig. 1—General view of hot strip mill. Flying shear can be seen close to finishing stand in left foreground*

By J. D. CAMPBELL
Steel Mill Section
Industrial Engineering Division
General Electric Co.
Schenectady, N. Y.

# FLYING SHEAR ELECTRIC TIE

*Electrical means employed to maintain synchronism between the last stand of finishing rolls and shear afford accurate lengths of cut of hot strip steel. Success of electric tie is attributed to characteristics of two amplidyne machines*

HOT STRIP coming from the last finishing stand of rolls, if not sheared, is 1000 feet or more in length. It is seldom possible to handle such long lengths of metal as a unit because of the space requirements. Hence, the need of cutting the hot strip "on the fly", that is, without impeding its progress on the run-out table, and of piling the sheared lengths. This is accomplished by a flying shear. Fig. 1 gives a general view of this type shear and its associated equipment in a hot-strip mill.

As will be seen from Fig. 2, this shear consists essentially of two drums, each carrying a knife. The drums are geared together and are motor-driven. Each time the knives come together, they cut the metal passing between them. The faster the shear runs the shorter will be the length of the cut for a given speed of the metal. The faster the mill runs the longer the cuts will be for a given speed of the shear. Therefore, in order to maintain good accuracy on the lengths of the cut, it is essential to maintain a proper speed relationship between the shear and the mill which determines the metal speed.

A modern mill may deliver the metal for shearing at a speed as high as 2000 feet per minute. The speed of a given mill may be adjusted within wide limits, usually more than 2:1. The length of the cut should also be adjustable within wide limits, say 2:1. Hence, the problem is not only to keep the shear running "in synchronism" with the mill, but to provide means of changing the speed ratio and then of maintaining this ratio accurately, once the adjustment is made.

Close accuracy in the lengths cut is usually required. For instance, if the length of cut is 30 feet and this length should be accurate within 1 inch, then the error will be one part in 360, or approximately ¼ of 1 per cent.

It is therefore natural that there was at first some skepticism as to whether such extreme accuracy could be obtained by purely electrical means employed to synchronize the mill and the shear, which would be driven by separate electric motors. Mechanical and hydraulic ties originally were provided, the hydraulic tie being shown in Fig. 2.

One should also remember that the duty of the shear and its drive is further complicated because the shear is not running continuously but is started from rest for each new strip coming out of the mill, and after the shearing is completed it is stopped with the knives in the original position. If this were not done, then the first cut would be made at random, cutting 5, 15, or 29 feet off the front end of the new strip, while the desired cut might be 30 feet. By the law of probability, this first random cut would be, on the average, about 15 feet, instead of a foot or so, which is necessary to square off the front end.

Hence, it is important to start the shear from rest for each new strip coming out of the mill, and to start it at a specified time to crop the front end

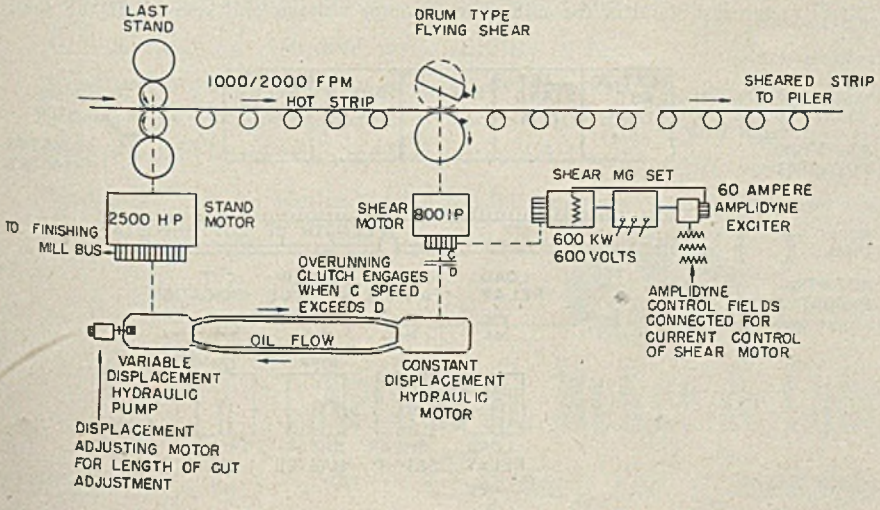



*Fig. 2—Hydraulic gear tie on a flying shear*

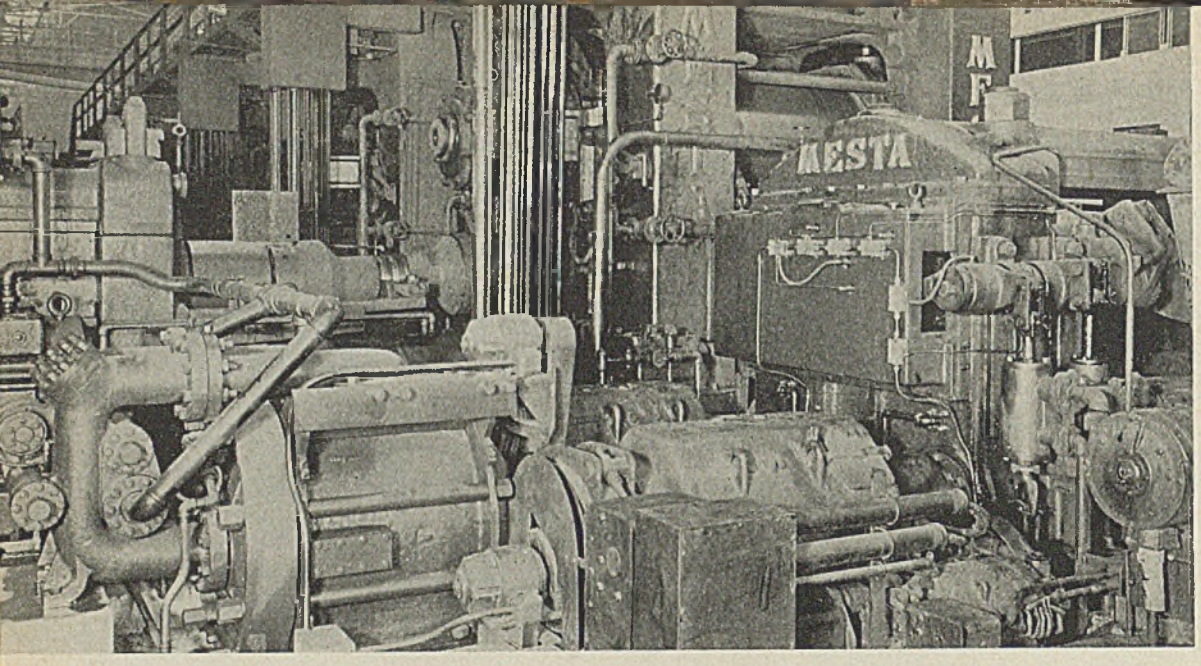



*Fig. 3 — Finishing stand and flying shear from drive end showing shear motors, pinch roll reset motor and two pilot generators*

properly. This usually is done by load relays responsive to the current of one main mill motor. These relays "know" when the new strip is coming through the mill, and by suitable timing relays they initiate the starting of the flying shear. Because of space limitations, this cropping control will not be discussed in detail. It is important to note, however, that the shear is not running continuously but is started from rest for each new bar, and then stopped. This makes the operation of any speed-regulating equipment that much harder as compared with any steadily running drive.

As previously mentioned, there was considerable reluctance on the part of operators to rely for accuracy merely on the electrical tie between the mill and the shear. Mill builders furnished either a mechanical tie, or a hydraulic tie. A mechanical tie is complicated because of the necessity of providing several hundred optional gears to obtain the ratios for different lengths of cuts. This makes the mechanical tie cumbersome and expensive, and the wear and tear on the gearing is often prohibitive. The backlash in the gearing becomes so great that the accuracy of the cut is greatly affected.

The hydraulic tie system shown in Fig. 2 consists of a variable displacement pump located on, and driven by, the last mill stand, and of a fixed displacement oil motor connected to the shear. The speed relation between the last stand and the shear then can be adjusted by changing the adjustment of the variable displacement pump. The system is capable of transmitting power either from the mill to the shear, or from the shear to the mill.

As long as the mill is running, the oil motor runs continuously. An over-running clutch is interposed between the oil motor and the shear itself, so that the shear can be at rest with the oil motor running. In order to accelerate the shear quickly and bring it to the oil motor speed, an electric motor or motors, supplied with power from a separate generator, are employed. These motors are of sufficient capacity to accelerate the heavy shear quickly within the short available time, so as to make the first cut at full shear speed.

After the shear is brought up to speed by its electric motor, the over-running clutch engages. The motors are then, in effect, pushing against the oil motor, which then is acting as a generator and transmitting the power to the oil pump on the last mill stand. The amount of this "push" is limited by a current regulator acting on the field of the generator.

It is obvious from this description that the speed of the shear is determined by the hydraulic tie which, barring any leakage of oil in the system, is considered rigid. The electric motors accelerate the shear from rest, and then bring it to rest again after the shearing is completed. The accuracy of the cut is determined by hydraulic means and not by electric means.

Fig. 3 shows a flying shear with the electric driving motors and the hydraulic motor in the foreground.

For any "tie" to be successful, it must be such that the shear speed is rigidly "tied" to the last stand of the mill. The arrangement shown in Fig. 5 is a schematic form of electric tie control now being used on two hot-strip mills. Two other electric tie controls will soon be placed in operation in other hot-strip mills.

Referring to Fig. 5, the scheme of electric tie control is divided into coarse speed-matching and fine speed-matching.

In the coarse speed tie, the amplidyne control field, AB, gets its indication of speed from the amplidyne tachometer generator (T1) and the shear generator voltage (T2). Insofar as the coarse speed tie alone is concerned, T1 and T2 are, in effect, constantly excited tachometers. The sensitive amplidyne control field will attempt to hold practically zero volts between points AB by having the amplidyne armature excite the main field of the shear generator. Since T1 and T2 are connected with their voltages in opposition, the difference voltage at AB will only be sufficient to circulate a small current from B to A when the shear is running at shearing speed. If the shear should run too slow for a given setting of the length-of-cut rheostat, the current in field AB will be increased because of the relatively lower voltage T2. Increased excitation on field AB will raise the amplidyne voltage and the shear motor voltage and speed. If the shear

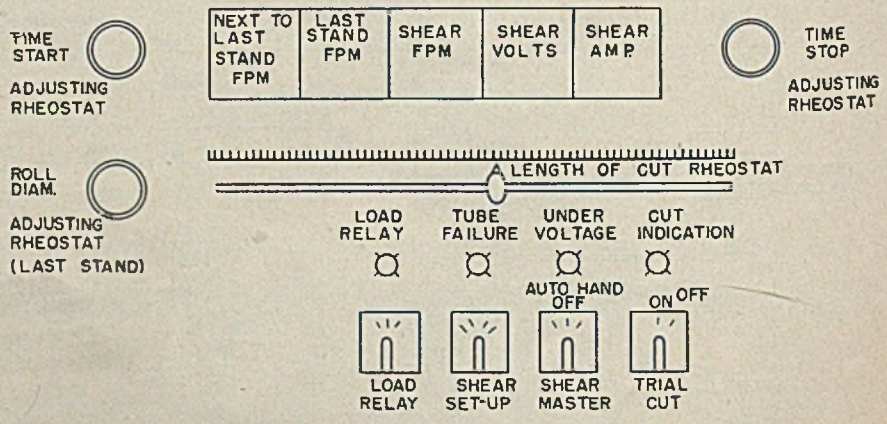
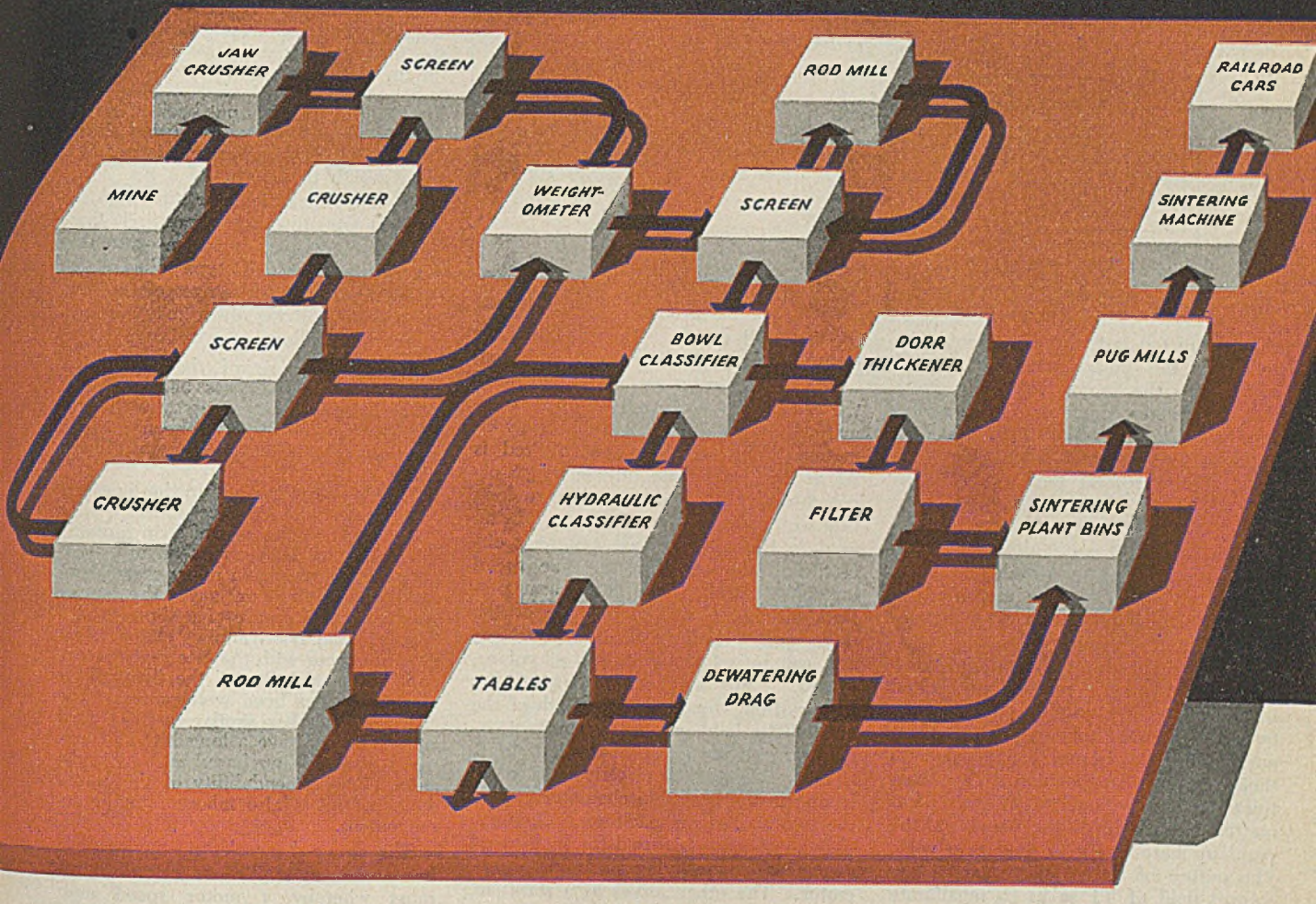



*Fig. 4—Operator's control desk for flying shear*

# Don't *Multiply* Complications By *Dividing* Responsibility

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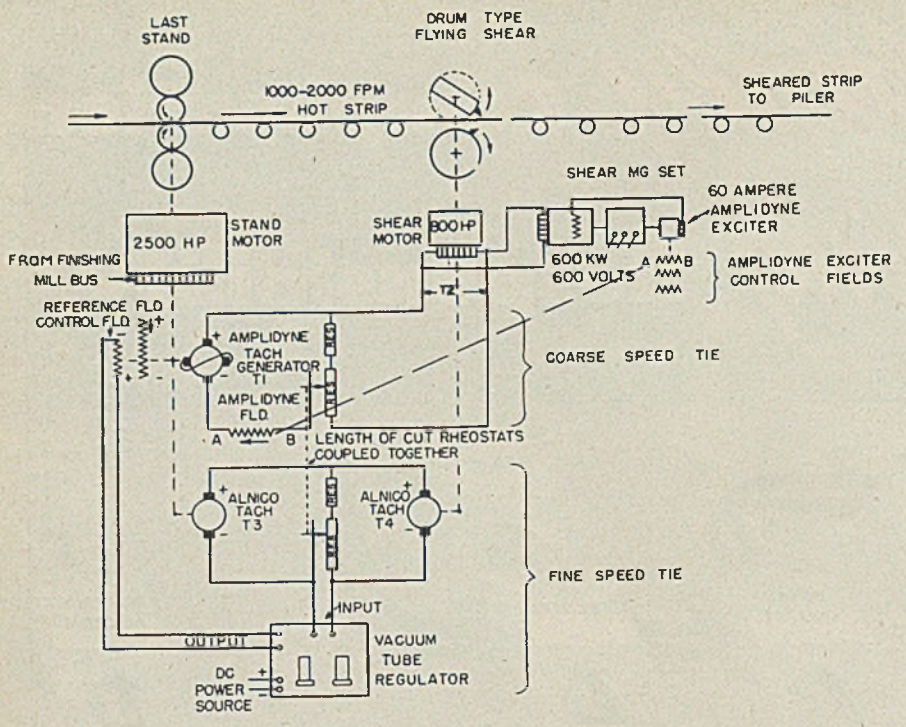


*Fig. 5—Electric tie on a flying shear*

should run too fast, the effect would be to lower the shear generator voltage, and hence the motor voltage. Note that tachometer generator T1 has a constantly excited reference field which is opposed by a control field. The purpose of the second field will be explained later.

The coarse speed tie is not sensitive enough, and if it were used alone, the length-of-cut accuracy would be poor. Fortunately, we can here use the vacuum tube regulator which gives the degree of accuracy required.

The fine speed tie shown in Fig. 5 consists of two constantly - excited tachometer generators T3 and T4, and a two-tube vacuum tube regulator. Generators T3 and T4 are connected with their voltages in opposition. The effective difference voltage of T3 and T4 is on the input side of the regulator, the regulator here trying to hold zero volts. The output of the regulator excites the control field of T1 so as to recalibrate T1. The effect is to decrease the excitation on field AB, lowering the shear generator voltage and making the shear run in "synchronism" with the last stand. Summarized, then, the coarse speed tie, if acting alone, tries to make the shear run about 10 per cent too fast, but the fine speed tie holds the shear speed to "synchronism."

The length of cut can be changed by the double-section length-of-cut rheostat shown in Fig. 5.

The purpose of the fine and coarse speed matching circuits is two-fold. First, if anything should happen to the vacuum tube regulator, the coarse speed tie can still be used, and the length of cut is moderately good. Second, any serious cobbling of the strip will be prevented should the vacuum tube regulator fail while the shear is operating.

The flying shear is operated from a control desk, shown in Fig. 4. Here, the hot-strip mill operator can set the shear for automatic operation and proceed with his usual routine of running the hot mill stands. The shear master switch is the primary control device, which is usually set on "automatic", and the shear is started and stopped automatically from load relays on the mill motors. The length of cut desired is set on the scale plate on the length-of-cut rheostat. This consists of two long tubular resistors, one resistor being used in the coarse speed matching circuit, and the other in the fine speed matching circuit. The slider arm projects through a slot in the top of the desk, and a pointer on the operating arm can be set at the length of cut required. For a given setting of the length-of-cut rheostats, the length of the cut will be held practically constant, irrespective of the speed of the last stand.

The success of the electric tie is largely due to the desirable characteristics of the two amplidyne machines. One amplidyne generator is used for high-speed excitation of the flying shear main generator. The other serves as a sensitive, speed-responsive tachometer generator. Both generators, however, are high in their speed of response and require low excitation power. Both characteristics are common to all amplidyne generators. The two amplidyne machines differ primarily in their kilowatt ratings.

The smaller amplidyne, T1 of Fig. 5, is an accurate indicator of the last stand speed. A conventional tachometer generator will give a voltage output proportional to the stand speed, but the amplidyne tachometer voltage varies approximately as the square of the stand speed. Thus variations in the last stand speed result in an amplified indication from tachometer T1.

Amplidyne tachometer T1 requires an excitation current on the order of 1/40th ampere. The vacuum tube regulator, therefore, requires only small, inexpensive vacuum tubes. Here is a good example of how the range of usefulness of small vacuum tubes can be lengthened by working the tubes in conjunction with amplidyne type machines.

One flying shear electric tie has been in successful operation for three years. Surprising enough, only two sets of vacuum tubes have been used in the vacuum tube regulator, and each pair is changed from month to month. The method of testing these tubes follows:

1. One set of tubes (consisting of one Type-6J7 and one Type-25L6) is used for one month.
2. The first set is removed from the regulator and a new set substituted. If the first set tests satisfactorily, it is put on the storage shelf.
3. At the beginning of the third month the first set is put back in service and the second set is tested and stored. The cycle of tube changing is repeated from month to month.

On one installation, the same two sets of tubes are still in use after nearly three years of continuous operation—a total of four inexpensive radio-type tubes.

The operating advantages of the electric tie on a flying shear may be summarized as follows:

1. Maintenance of the mechanical part of flying shear has been reduced.
2. Length-of-cut accuracy with electric tie has in all cases been at least equal to that of the older type of gear tie.
3. Operators can set up the length of cuts rapidly with the electric tie.
4. Great thicknesses of strip formerly threw heavier burdens on the over-running clutch, which, in many cases, damaged the clutch or gave the wrong length of cut because of a slippage of a "dog" in the over-running clutch. This does not occur with the electric tie setup.
5. Dependability of the flying shear electric tie has been well proven. The "hard" type tubes similar to those used in a radio set have a long life, and normally can be purchased at any radio store. The dependability of the amplidyne control is also inherent in the arrangement.

The flying shear electric tie principle has also been applied to electric apparatus whereby a motor speed must "match" some other reference speed.

—o—

**Development** of a new super-quality synthetic rubber conveyor belt particularly well adapted to all mining operations, including coal and metals, has been announced by Goodyear Tire & Rubber Co., Akron, O. Comparing favorably in flex life, aging, resistance to abrasion and cutting with prewar quality conveyor belts, the new product, designated Style SS, has the additional advantages of resisting oil and high temperatures, according to the company.

The new belt will replace a previous type of synthetic rubber. It embodies quality materials on a par with those used before Pearl Harbor, an official reports, adding that since restrictions as to qualities are lifted, the new synthetic construction belt should make possible lower tonnage costs for users' conveyors.

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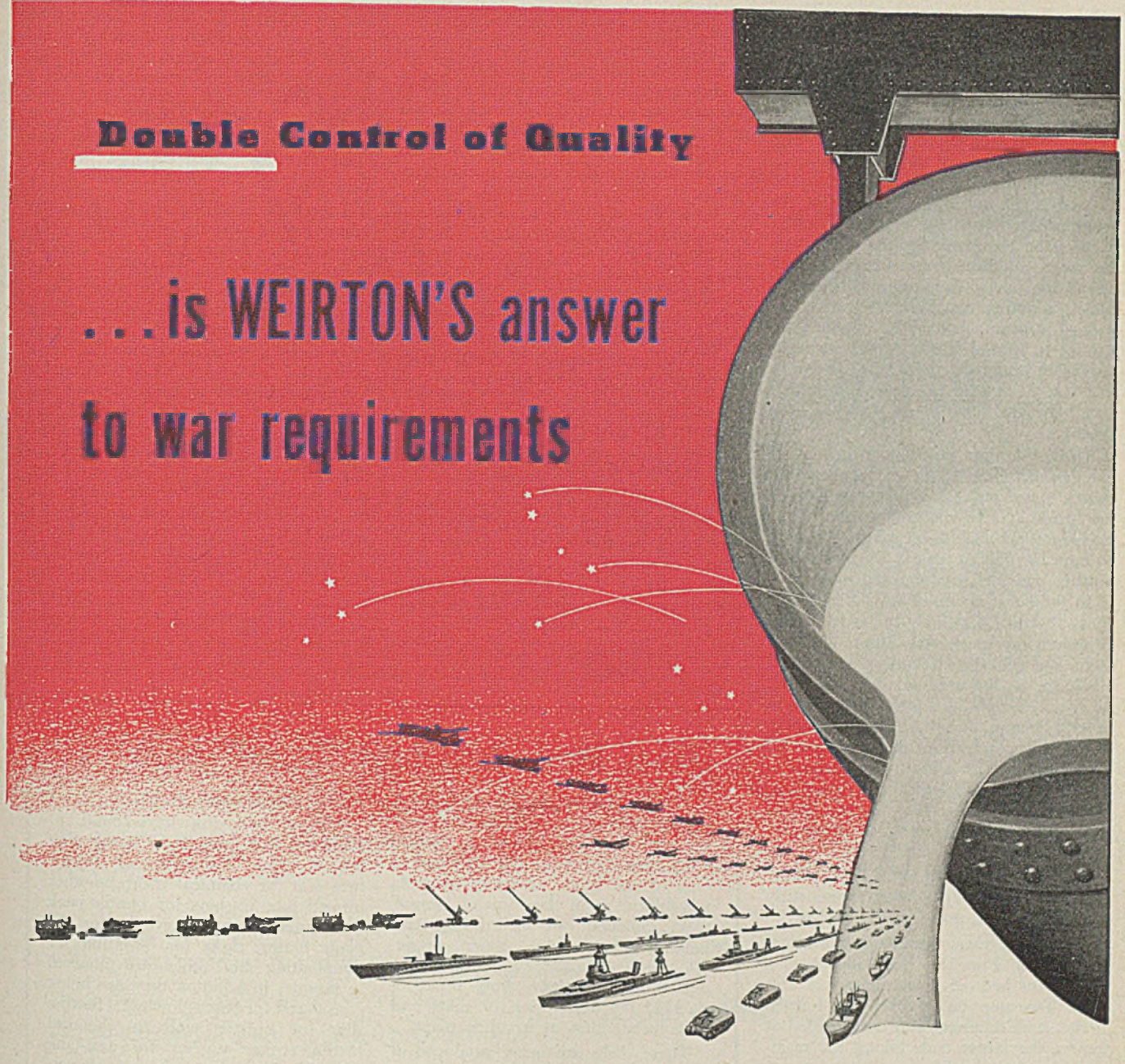

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## Welded Steel Tubes

(*Concluded from Page 82*)

two tubular members other than at a straight angle, any one of several types of joints may be used. The joint, Fig. 11, is the simplest of this type, the ends of both members being mitred to the desired angle to form a butt joint for welding. The sharp corner shown in Fig. 11 may be eliminated by the use of one or more additional members. Fig. 12 shows the use of the additional member which requires two welded joints. Improved appearance may be obtained by use of a special fitting which requires two plain butt welded joints, as shown in Fig. 13. Such fittings are easily formed from straight lengths of standard size tubing.

These designs and connections of tubular members in the same plane are basic; many variations of these designs are possible. In designing connections consideration should be given not only to appearance, but also to the amount of cutting and welding required.

In the construction of frames and supports that are not likely to be subjected to severe overloads, very simple joint designs and tubing of relatively small wall thickness can be used to advantage. Fig. 14 is an example of a joint with tubes in several planes. The necessary shaping of the ends can be done in two operations —by cutting with a tooth saw or friction saw, and then grinding back on a wheel having a contour of the desired dimension. Accurate machining is rarely required except for aircraft structures.

In the field of aircraft production, welded tubular shapes figure prominently in the design of many subassemblies.

One of the many economical practices is shown in Fig. 15, which illustrates a simple method of constructing a seat back. Two-step taper tubes are formed at the small diameter and butt welded as shown, the larger ends taking the maximum bending loads.

Other common weldments in plane design are used in the construction of long oleo struts. The tubes, straight on one end and tapered on the other, can be formed as shown in Fig. 16. This design simplifies upper end connections, and, where gears are retractable, permits a reduction in the opening in the lower surface of the wing.

Additional aircraft structures in which arc welding plays a prominent part include engine mount members joined as shown in Fig. 17, and fin spar members as shown in Fig. 18. Both are typical examples of modern tubular construction made possible by arc welding.

## Reclaims Sand Rammers by Welding, Saves $50 Each

Prior to 1940, practice of the tool repair man at Crucible Steel Casting Co., Cleveland, was to discard sand rammers that had the barrels broken at the packing gland. Since that time, these barrels have been renewed by arc welding at a saving of $50 per barrel.

Repair is done by chucking in a lathe and facing off broken end of barrel. Next barrel is turned from end back ¾-inch to a diameter of 1¾-inch. Now a bushing of cold-rolled seamless tubing is welded on and machined to fit the packing retainer.

M. F. Streidl, 9013 Denison avenue, Cleveland, in a paper entered in the $200,000 award contest sponsored by the James F. Lincoln Arc Welding Foundation, states that this method does not affect the hardness of the cylinder and that the barrels show no excessive wear and have been in service 17 months after repairing with no sign of failure.

## "Jam Riveting" Relieves Jam at Curtiss-Wright

A new procedure for setting airplane rivets called "jam riveting" has been developed by the Airplane Division of Curtiss-Wright Corp. to save manpower and materials in difficult fabricating operations such as cowling construction. It eliminates the bucker of the two-man team heretofore required and is expected, when fully installed, to cut by 40 per cent the number of such riveting teams. The new method is said to combine flexibility and speed, making it much more effective than the gang squeezer method generally used. In addition to increased output, officials say "jam riveting" insures more uniform work with less rejections and salvage.

The riveting tool consists of a regular vibrator automatically controlled by the travel of the driving set through added attachments. One adaptation is a hand tool vibrator with adjustable depth timer attached to a hinged yoke; another is a vibrator adapted to a special yoke of cold rolled steel and mounted on a pedestal. Both are easily adjustable for correct height of finished rivet and stop automatically at that point. The pedestal vibrator was designed to handle 5/32-inch rivets, while the hand tool has sufficient power to head a ¼-inch rivet without difficulty. The latter can be handled easily without the aid of a spring balance.

The riveters were conceived by company's Buffalo Tool Procurement Department and built for Curtiss-Wright by the Ingersoll-Rand Co. which will manufacture them commercially.

## Makes Many Parts from "Scrap"

ARMY Ordnance reports considerable interest is accruing in connection with its efforts to utilize scrap from current war production. One of the items affording valuable possibilities is in the form of "scrap" disks punched out in making steel landing mats. See STEEL, Sept. 20, 1943, p. 122, for fabrication details at one plant; Aug. 9, 1943, p. 112, for description of mats and their production at another plant.

These disks are being produced at rates running into millions of pieces per day per plant. With a number of plants fabricataing these mats, the total "scrap" available in the form of these disks is tremendous. One contract alone will result in production of nearly two billion at rate of six million a day.

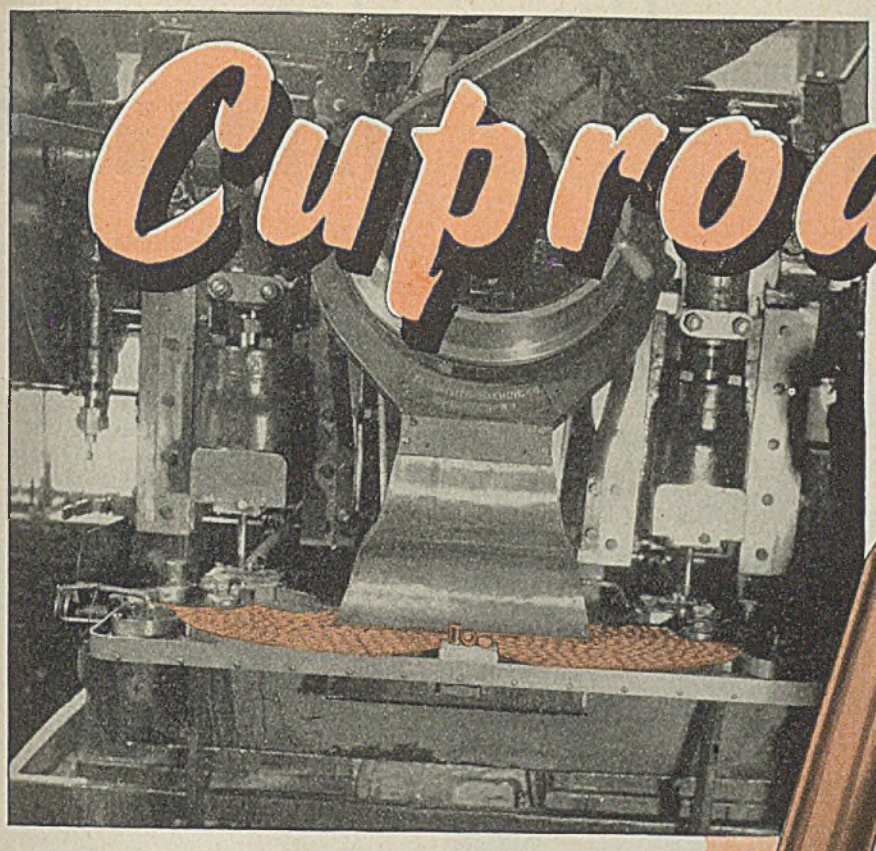
Disks are about 2¼ inches in diameter, 0.132-inch thick with weight of 0.155-pound each. They are made from SAE-1010 steel, soft. Methods have been developed to prevent damage to disks during handling so recipients can be assured of receiving them in good condition.

An important factor that is inducing many companies to investigate the possibilities of using this material is the fact a CMP committee ruled such material can be used for military purposes without the expenditure of additional allotments. That means you can use such material without it being charged against the steel allotted you for the current period.

Already these disks have found applications that include: Closing plug (formed) for anti-personnel mines; fuze seat for chemical bomb, another formed job; washers for bundle-pack accessories; washers for bolts for airplane crates; disks for 60-millimeter illuminating shell (holes are punched in these). In addition they are being considered for the following: Bottom disk for burster well in chemical bomb; striker washer for anti-tank mine; washer for adapter cluster; base for 75-millimeter shell; striker plate for bomb nose fuze; etc.

Some prospective users have been reluctant to seek applications for these disks because they would have to feed them into the presses by hand. However this factor need not deter interested parties because one landing mat producer has been so interested in finding a use for these disks that he has developed a magazine feed to automatically feed these disks into a press. Resulting production rates equal those obtained in blanking from steel strip, it is claimed. Details have been worked out by T. J. Lawless, United Steel Fabricators, Wooster, O.

Anyone interested in obtaining samples of these disks can do so by addressing the Conversion Engineering Section, Cleveland District Ordnance Office, Terminal Tower, Cleveland, or various commercial sources for this type of material.



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F F-11

# Unusual MACHINING

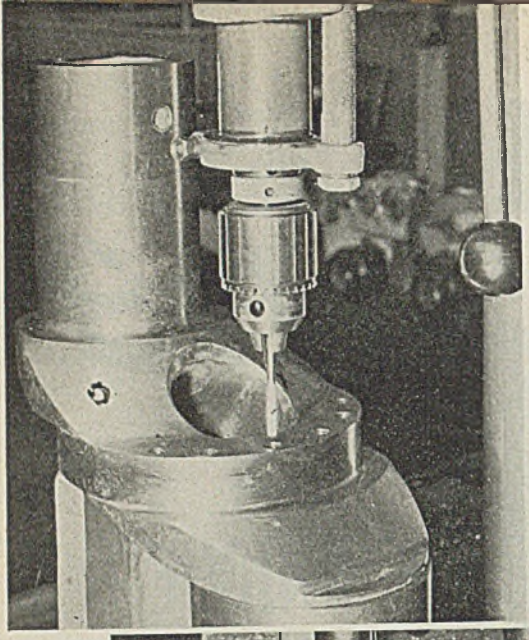


*Fig. 1 (Left)—Removal of broken tap from blind hole in Wright aircraft engine crankshaft is effected by alternate drilling and pencil wheel grinding by ⅛-inch steps until the tap stub collapses without damaging the threads. This setup is in a Walker-Turner drill press*

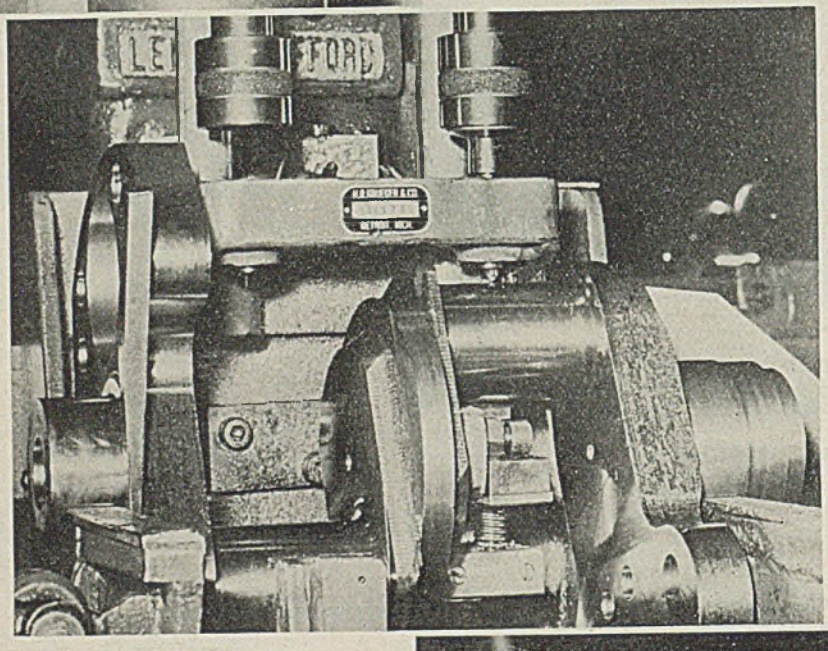


*Fig. 2 (Left)—Operating through jig bushings, this drill—as a production operation—puts true, accurately positioned oil holes into the hardened steel crank pins of Pratt & Whitney aircraft engine crankshafts. Done in a Leland-Gifford machine with a Krueger jig*

*Fig. 3 (Below)—Before "rifle-drilling"—done after hardening in order to insure a straight hole—the rockwell 60 C case of this Rolls-Royce camshaft is penetrated by a hard steel drill set up in a turret lathe*



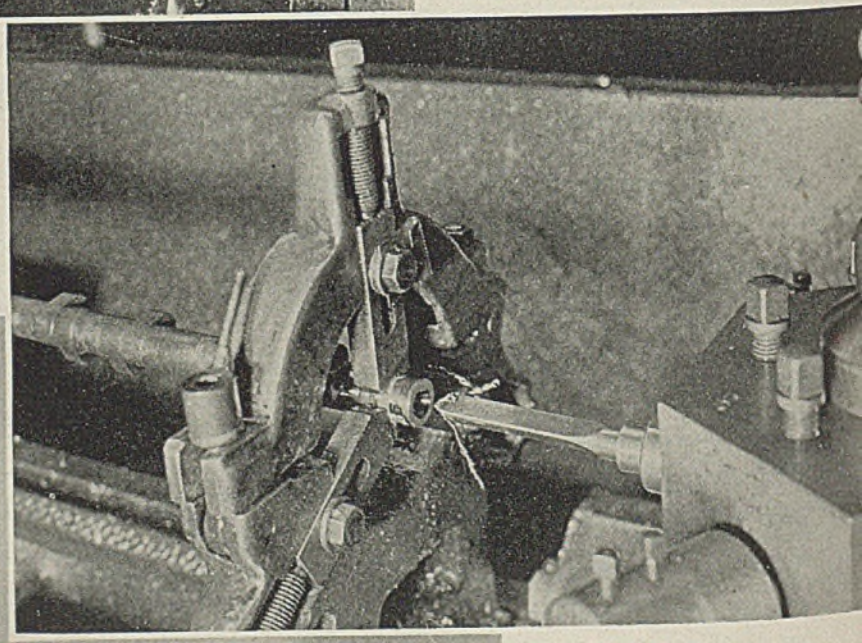
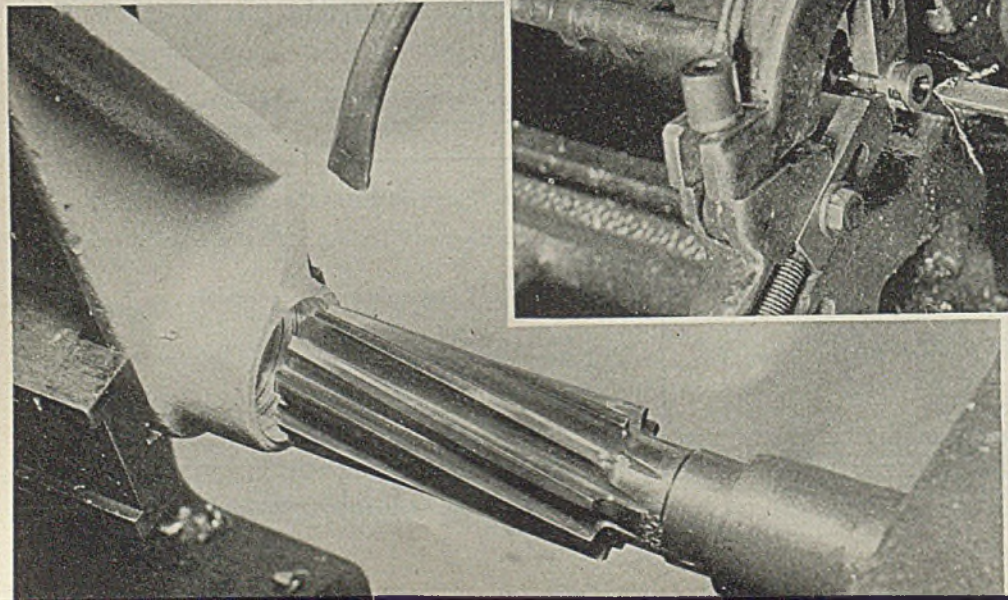


*Fig. 4 (Below)—Made of the same alloy as the drills for hardened steel, this reamer permits long runs at high speed on these cast aluminum alloy bomb rack hinges whose toughness and abrasive qualities caused considerable trouble with regular reamers. These blind holes are 1 5/16 inches in diameter, 5 inches deep and must be held within 0.002-inch on the diameter*



# TECHNIQUE . . . .

By GUY HUBBARD
*Machine Tool Editor*
STEEL

*. . . . employing cast alloy tools facilitates working with difficult materials such as hardened steel; prevents spoilage—makes it possible to perform many operations following heat-treatment; affords valuable tool in salvaging parts with distorted holes or with holes blocked by broken taps*

EARLY in 1941, Franklin G. Gepfert, now vice president of the Black Drill Co., Cleveland, visited my office to show me "something new in drills". The sample which he brought in looked quite like a miniature edition—in oxford gray, fine grain cast alloy—of the star drill used in impact drilling of stone.

Considered as a revolving drill—and such it was as I discovered the moment I saw it mounted for action in a standard drill press—it certainly was different. It reminded me of a round shank, straight sided, three-cornered file with all teeth ground off and with narrow lands or pilot surfaces at the junctures of its three longitudinal faces.

### A Drill of Unique Design

Its "business end" was like that of an impact drill except that it was pyramid-shaped instead of flat. The three flat faces of this triangular pyramid were ground approximately to the same angle as the point of a conventional twist drill. Thus, the junctures of these three faces constituted negative rake cutting edges. Being symmetrical, the point would cut either right hand or left hand.

In order to give chip clearance, small hollows—which might be called short flutes—were ground into the three end facets and for a short distance back into the flat sides of the drill body. This was done free hand on the same tool grinding wheel on which the drill was dressed and sharpened, these flutes being renewed as the point of the drill was ground back in service. This dressing and sharpening, likewise done free hand, required only an ordinary degree of skill and just a small amount of practice, and any common, ordinary variety of tool grinding wheel.

Design of this tool is unique. So is its performance. Operating either dry or with coolant (soda water or soluble oil cutting compound) at relatively high speed, and with a steady and rather heavy feeding pressure (preferably applied by a hand lever through which the operator constantly "has the feel" of the cut), it does indeed make short work of putting smooth round holes through files and other hardened steel pieces which would burn the point off most ordinary drills in a few seconds without even a dent to show for it

Its range of hole-making ability includes oil hardened, water hardened, cyanided and nitrided steel parts; high-carbon high-chromium parts; high-speed steel parts of any degree of hardness; and work-hardening metals such as the high manganese steels. Not included in this list, however, are naturally hard metals which cannot be annealed.

This last statement gives a hint as to the secret of functioning of this drill. While the alloy from which it is made has considerable tensile strength, corrosion resistance and abrasion resistance —the outstanding characteristic is its extreme degree of red hardness. When the rapidly revolving drill (1000 to 1200 revolutions per minute being about the average for one of ⅜-inch diameter when running dry on ordinary tool and die steels) is pressed down on the surface of the work, nothing seems to happen for about 5 seconds. Then, thin, crepe-like chips begin to roll out—frictional heat having annealed the metal directly under the point to the extent that the cutting edges can take hold. This high temperature condition does not affect the drill in the least. In fact, it works best at a temperature just below cherry red.

### How the Drill Is Used

Once the chips start to come, feeding pressure necessary to keep them coming is maintained steadily until about ⅛-inch penetration has been achieved. Then the drill is backed out and its point is cleared of accumulated chips by a swift downward "swipe" with a piece of wood or anything else which won't harm the drill. This step-by-step procedure is repeated until full depth is reached, chips never being allowed to pack under the drill point. Just before breaking through, the drill is withdrawn for several seconds to give the thin section at the bottom of the hole a chance to chill. Then this "wafer" can be drilled out without leaving the extruded burr which otherwise would be formed.

Just a word at this point as to coolants. When work is drilled dry, there will be slight, shallow discoloration around the hole. When a coolant (soluble oil or soda water) is used as with an ordinary drill, this discoloration will not take place. Use of a coolant will allow somewhat higher speed. Don't use ordinary cutting oil or lubricating oil.

The Black Drill Co.'s experience files are filled with hundreds of case histories valuable for reference when new jobs are tackled. While practically all of these to date are in one way or another directly related to war work, postwar possibilities of this hard steel machining technique are quite obvious in the examples I have selected for presentation here. Today, this technique is being used not only for initial and corrective drilling of hardened steel parts but for countersinking, counterboring and reaming after hardening.

### Drilling Forgotten Holes

One of the most common applications, however, continues to be drilling of "forgotten" pin holes in hardened die blocks. Experience also proves that holes in die blocks and other mating parts of hardened steel thrown out-of-round and out-of-line during heat treatment now can be corrected by line-reaming with hard steel drills, provided the size of the hole can be increased by at least 1/16-inch. Attempts to ream out any lesser amount will cause the drill to bind and perhaps break. Incidentally, when used as a reamer the drill should be revolved from 25 to 50 per cent slower than when drilling a hole of like diameter.

An all-too-frequent cause of headaches in machine tool building is discovery at assembly that costly hardened and ground steel gibs somehow have slipped through minus vitally important holes. Formerly such gibs were pretty sure to represent a dead loss, since two or three more annealing or rehardening operations not only would distort them but also ruin their precision ground surfaces. Recently, in the case of six special tapered gibs of SAE-3115 steel, hardened to rockwell 58 C, the missing holes were drilled with neatness and dispatch by use of a set of hard steel drills kept for just such emergencies. Otherwise assembly of several machines would have been delayed.

Another frequent shop headache is the breaking off of taps in work, especially in blind holes. As a case in point, consider the crankshaft for the 1700-horsepower Wright aircraft engine, shown in Fig. 1. A tap of rockwell 64 C hardness broke off below the surface in a blind hole in the center section. Formerly, a pencil abrasive wheel was used to grind out the tap stub, requiring at least 8 hours and often damaging the threads and making it necessary to reject the crankshaft.

With the method suggested by an employe of Ohio Crankshaft Co., Cleveland, the shaft was mounted in a high-speed drill press and a 3/16-inch hard steel drill used to sink a hole into the center of the broken tap to the depth of ⅛-inch. Then a ¼-inch pencil wheel was applied to enlarge the hole to that

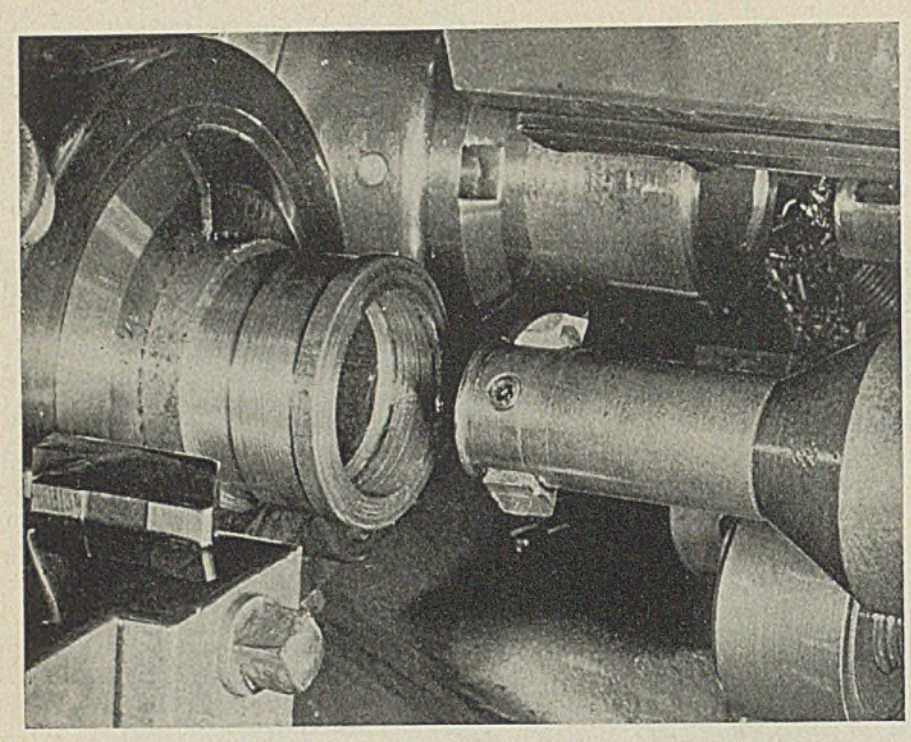


*Fig. 5—Strength, abrasion-resistance and ability to hold an edge at red heat, are primary reasons for employing this hard steel cutting alloy tool bit on the tough metal and scale encountered in boring out seamless steel tubing, in making an adapter collar for bombs. The setup is in a 2⅝-inch, six-spindle Acme-Gridley automatic*

diameter. This procedure of alternating drilling and grinding was continued by ⅛-inch steps until the tap stub was completely penetrated, whereupon its lands collapsed and could be picked out of the hole, leaving the threads in perfect condition. Instead of 8 hours or more this method takes only 2½ hours and the salvage record has been 100 per cent.

While on the subject of aircraft engine crankshafts, let's take a look at the setup on the Pratt & Whitney hardened shaft in Fig. 2. This is a primary hard steel drilling operation, not a salvage job. The illustration shows accurately positioned oil holes being drilled into the hardened crank pins by a jig-guided hard steel drill mounted in a quick action chuck designed to expedite transfer of the drill to operate on the other throw of the crank. When this drilling was done before hardening, there were many rejections because of off-position oil holes caused by distortion in heat treating.

When using jigs with these hard steel drills, it is best to use those with removable bushings which may be taken out after "spotting" the hole, thus shortening chip travel. The bushings must be free fitting on the drills, since they become hotter than the average and must have more room for expansion.

Jigs are highly desirable to prevent slipping on curved work surfaces as in the foregoing example. If they are not used, a small flat spot should be ground on the work at the starting point (this can be done with a pencil wheel), or initial "spotting" should be done with an extremely short drill before attempting to proceed with one of standard length. As a matter of fact, "spotting" with a short drill is good practice on any job involving a fairly deep hole. It will prevent the longer drill from "creeping" or "walking" thereby cutting down on drill breakage and work spoilage.

When used for countersinking, a hard steel drill ground to a point of correct angular shape—and of screw head diameter, or larger—is first sunk into the work to required depth. When using this countersunk hole for "spotting", drilling of the body-size hole may be done with a hard steel drill of body size. If the hole is large, pilot drilling of a smaller hole may be desirable. For holes ½-inch or larger, the pilot hole should be about half the diameter of the finished hole. One example of countersinking, demonstrating the ability of these drills to work with spring-tempered steel, is in an agricultural tool plant, where trowel blades are being handled about 12 times faster than with a previous system.

Related to countersinking, in a way, is counterboring. This involves three steps. First, the body-size hole is drilled through, or to required depth, with one or more of the standard hard steel drills. Next, the counterbored section is roughed out by means of another drill with standard conical point, care being taken not to go too deep with the conical bottom of this secondary drilling. Finally, the counterbored section is given a flat bottom with a special hard steel drill shaped like a rock drill. In case a jig is used, the counterboring can be done first, if preferred, as the bushing will serve as a guide.

An interesting example of production operation in which a hard steel drill is used to start an otherwise well nigh "impossible" hole is given in Fig. 3. This turret lathe setup involves a case-hardened Rolls-Royce camshaft which must be rifle-drilled to close tolerance. In the setup shown, a hard steel drill 43/64-inch in diameter is used first to penetrate the tough, hard case, which tests rockwell 60 C. With the shaft revolving at 700 revolutions per minute in a center rest, the turret-mounted hard steel drill makes short work of the initial ¼-inch of drilling. This is ample to penetrate the case so that the ordinary rifle drill can take up the work from there on. This technique has eliminated considerable spoilage and time-consuming straightening which had been involved when the shafts were drilled soft and hardened afterward.

One of the notably successful hard steel reamer applications to "machineable" metal cutting is that illustrated by Fig. 4. Here, a blind hinge pin hole is being reamed in a bomb-rack hinge made of cast aluminum alloy. This tough alloy, which has been heat treated to increase its hardness, is of highly abrasive quality as far as ordinary tools are concerned. This causes ordinary tools to become dull and lose their accuracy very quickly.

### Aluminum Alloy Reamed Fast

When the hard steel reamer was applied, 1200 parts were run off without a hitch, the 1 5/16-inch holes—which are 5 inches deep—being reamed right to the bottom. This was accomplished while holding a tolerance of 0.002-inch and while removing 0.015-inch of metal on each side at much higher speeds and faster feed than could be used with regular reamers. Cutting oils and coolants ordinarily recommended for the material were used.

The setup shown in Fig. 5 is a six-spindle Acme-Gridley automatic. The material involved is seamless steel tubing of 2½-inch outside diameter and wall thickness of ⅜-inch. The parts being produced are adapter collars for 100 and 150 pound bombs. The job of the hard steel tool bit, mounted in the boring bar, is to "hog out" ¼-inch of this tough metal and scale (that is, ⅛-inch depth of cut) from the bore of this tubing. Machining speed has been stepped up and the bit requires regrinding only once in 24 hours instead of three times a day as was the case of the cutters previously employed.

When mounted in well fitted, solidly designed tool holders, with minimum overhang and as little clearance as possible—say about 7 degrees— hard steel tool bits have been found to allow increased speeds and feeds on tough, scaly and abrasive work that will average about twice those practical with ordinary tools. Considerable reduction in down time for sharpening is also obtained. However,

(*Please turn to Page* 105)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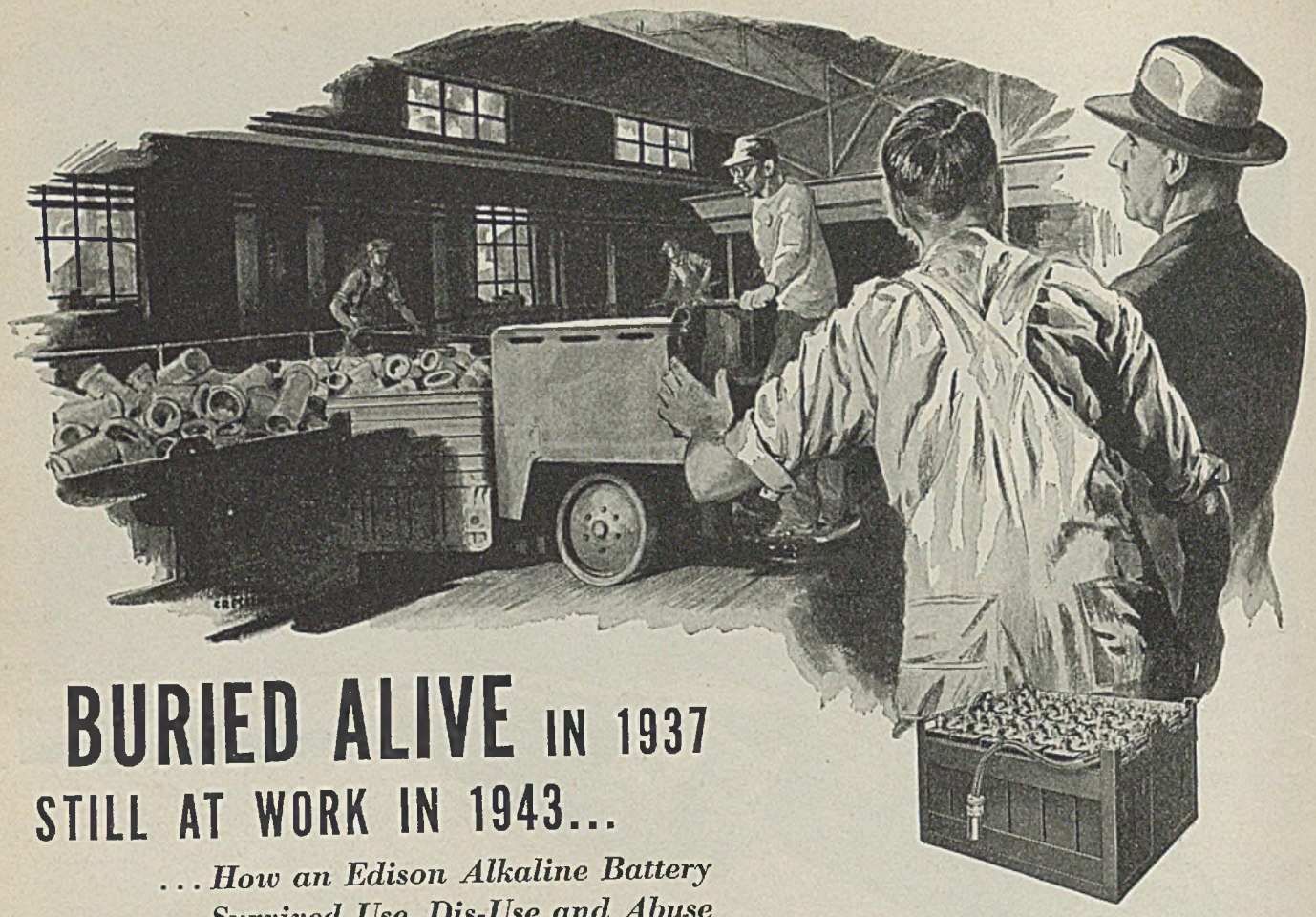

# BURIED ALIVE IN 1937

## STILL AT WORK IN 1943...

*... How an Edison Alkaline Battery Survived Use, Dis-Use and Abuse*

In 1937, a midwestern foundry changed hands after being shut down six months. The electrician of the new owners, in the course of putting the industrial trucks into operation, found one of the batteries buried under a mound of earth beside an open trench.

He knew it must have been there at least six months and, although it was an Edison Alkaline Battery, he was naturally doubtful whether it was still serviceable. Nevertheless, he ordered it cleaned, painted and charged. Much to his surprise, it performed satisfactorily in every way when put into one of the trucks. Now, six years later, the electrician tells an Edison engineer that the same battery is still in regular service.

Edison Alkaline Batteries are meant to stand use—long use and hard use, in mines, railroads and industry. They can also stand disuse, indefinitely, if discharged, short-circuited and properly stored. But the fact that they can, and often do, survive outright abuse is striking evidence of their great reserve of dependability under all conditions.

Some of the unique characteristics which enable the Edison Alkaline Battery to stand up under use, disuse and abuse are cited in the column at the right.

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★ It is durable mechanically. High strength steel construction is used in the container, grids, pole pieces, etc. The electrolyte is a preservative of steel. It requires no renewal of separators throughout its long life.

★ It is foolproof electrically. It may be short-circuited, over-charged, over-discharged, or even accidentally charged in the reverse direction without injury.

★ It can be charged rapidly. It may be charged at full normal rate throughout the entire length of charge and is not subject to finish rate limitations. It requires no equalizing.

★ It withstands temperature extremes. It is not damaged by freezing. Free air spaces on all sides of all cells provide ventilation for rapid cooling under high temperature conditions.

★ It is free from ordinary battery troubles. It is not subject to sulphation, shedding of active material, buckling of plates, jar breakage or other common causes of battery failure.

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

★ Its tray assembly and cell connections are extremely simple.

★ Its life is so long that its annual depreciation cost is less than that of any other type of storage battery.

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

Edison

**ALKALINE BATTERIES**

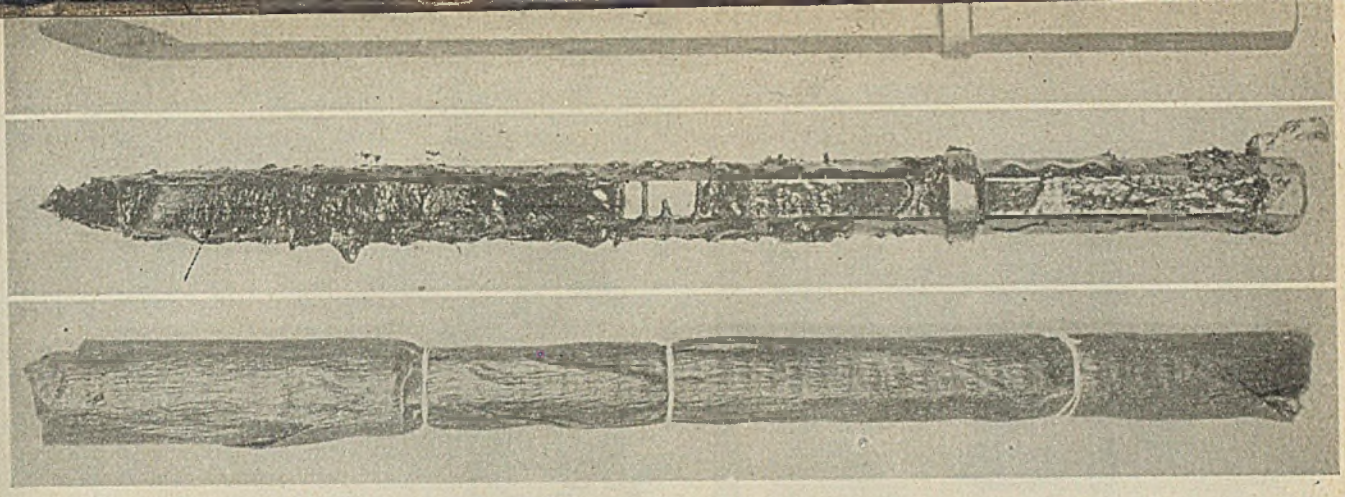


*Fig. 1—Chisel for pneumatic tool is first dipped in hot corrosion preventive compound and then wrapped as shown in special paper*

# OCEAN TIDES

## Now A Delivery "Method"

*Many lessons have been learned in shipping metal products under difficult conditions to the fighting fronts which may prove useful to other companies in the war period and in packaging materials for the export market in the peace to come*

By SAM KANN
*Metallurgist*
Independent Pneumatic Tool Co.
Chicago

PACKAGING, shipping and delivery of products for the market here at home are difficult enough but the problem is further accentuated in getting materials to the fighting fronts. The demands of war make it necessary to use entirely unorthodox methods of delivery but, even so, many lessons have been learned which may prove useful to other companies in the present war period and the peacetime era to come.

As an example of present practice, all Thor power tools manufactured by Independent Pneumatic Tool Co.'s Aurora, Ill. plant for export shipment either to our own bases in far flung outposts the world over or to our Allies under lend-lease are now packed in wax and specially boxed so they will not rust when they are tossed overboard and delivered to shore by the tide!

Yes, delivered by the tide, for much of this equipment must be landed where there are no dock facilities, lighters, barges or other means of carrying these shipments to the beach. Sometimes after being washed up by the tide several days will elapse before these packages can be reached by troops on shore. During this time, they must withstand constant exposure to salt water, tropical sun and other severe exposure hazards.

Sometimes the handling may not be quite so rough. Qualities of crated tools may be placed in a huge net and then tossed overboard for a smaller boat to drag ashore. But to protect the electrical windings, precision valves and other delicate parts of these tools, a highly effective packaging method must be employed. The system utilized at the Thor plant satisfies these special packaging requirements in this manner:

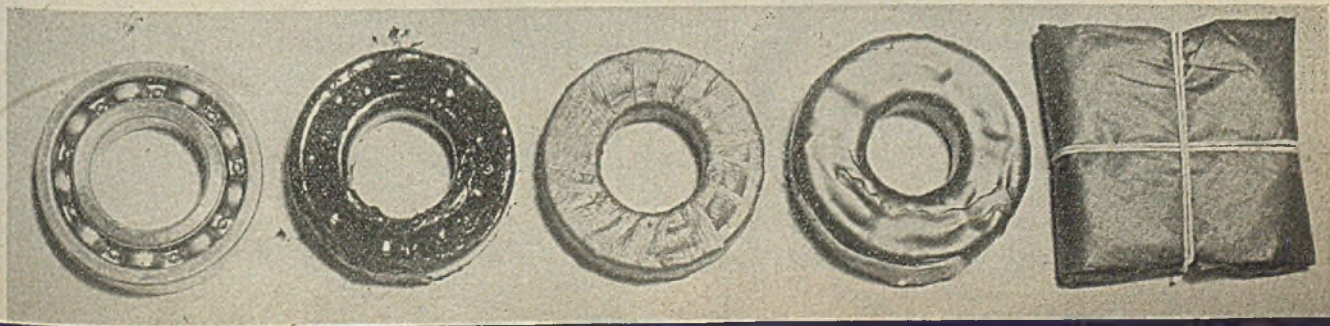
Briefly, the sequence of operations consists of cleaning, application of a corrosion preventive, wrapping in a protective paper, labeling, dipping in sealing compound, with additional wrappings and applications of sealing compound as needed. Job is completed by packing into cartons. This general procedure outline is varied according to the requirements of the particular item being handled as will be shown by typical examples.

The various procedures are designed to meet United States Army specification 100-14A, United States Navy specification 39P16A and United States Engineers specification E.M. 100. Certain revisions were found necessary from original specifications in order to overcome problems arising from odd shapes of electric and pneumatic tools, interference of closely fitting valves or pistons with application of rust preventive, and also to save weight and cubic shipping space by most efficient box design.

In general, all parts are acid dipped or sand blasted before processing to remove any corrosion that may have started during storage or previous handling. Oil, grease and fingerprints are removed in an emulsified neutral solvent and work is rinsed again in clean solvent just before packaging.

The protective wrapping papers used include a red grade A paper that is grease proof and acid free (a pH range of 6.5 to 7.5). A second widely used

*Fig. 2—This illustrates method for protecting critical parts such as bearings, valves and the like. Parts are cleaned, dipped, wrapped, wax dipped, wrapped again to protect wax. Thus perfect hermetic seal is assured. Final pack is placed in small cartons for further protection*



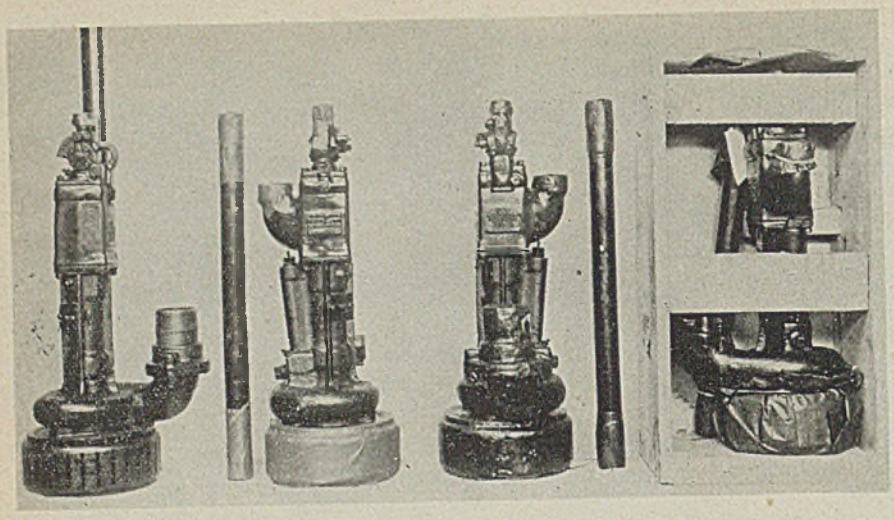


*Fig. 3—Stages in preparing large equipment items. Interior is sprayed with corrosion preventive, openings sealed, protecctive wrap applied and boxed. Unit shown here is pneumatic pump*

paper is a composite made of grade A on one side and an uncolored grease proof grade B paper on the other side. The grade B paper has a larger range in acidity, pH values varying from 5 to 8. Only the red side or grade A paper is allowed to contact metallic surfaces when using this composite.

These protective papers somewhat resemble crepe paper in texture. This greatly aids in sealing air from the package because the paper is easily molded to the contour of the article. It is important to exclude air from the package because corrosion will not only take place in salty or acid atmosphere but also when relative humidity rises above 30 per cent. In fact, silica gel and similar moisture absorbing agents are sealed into certain equipment packages in order to control the relative humidity inside the sealed package. In some instances, a chemical indicator that changes color when the relative humidity reaches the danger range is sealed inside the package and a window provided for inspection of the indicator.

Individual replacement parts are processed according to their operating use. Method I for noncritical parts, such as exterior zinc plated or painted surfaces, rivet sets, clips, triggers, etc. involves dipping the part into an approved hot corrosion preventive compound, wrapping in a grade A paper and labeling. Fig. 1 shows a chisel and how it is packed by this method.

Fig. 2 illustrates method I A. This wrap is used for bearings, pneumatic pistons, air valves, or any critical parts having finely ground surfaces and close tolerances. After cleaning, parts are loaded into racks or baskets and dipped into the hot corrosion preventive, wrapped in grade C paper, appropriately labeled and dipped into hot sealing wax. Then a protecting wrap of an oiled paper covers the pack to prevent any breaks in the air and water proofing wax seal. Next the parts are put into small cartons for further protection of the packages and then labeled as to contents.

Pneumatic tools, such as rotary drills, clay diggers, pumps, chipping hammers, rivet squeezers and airplane riveting hammers, receive a still different treatment. After cleaning, an approved lubricating oil blended with a corrosion preventative compound is "fogged" in through the air chamber, the finely atomized spray coating the interior of the tool completely. The wrapping then consists of covering all openings with grade C paper and wax sealing the paper, followed by applying the label and protective wrap. Fig. 3 shows the steps in so sealing a pneumatic pump.

Electric tools, such as drills, hammers, screw drivers and all high-cycle tools are hand cleaned with brushes to protect windings, switches and rubber covered wires. Then method II wrap is used to eliminate moisture condensation in the operating circuits, an activated dehydrating agent like silica gel being wrapped with the tool inside a moisture and vapor-proof barrier. This wrap consists of either a metal foil, heat-sealed bag or a wax-sealed grade C paper container. When the correct amount of silica gel to be used is determined from manufacturers' data, it is placed inside the bag or container and then sealed with either the heat gun or wax, depending on the container used. A protective wrap then is applied over the wax and the complete unit placed in a carton.

Fig. 4 shows a Thor electric hand drill and the various steps in packaging it according to this procedure.

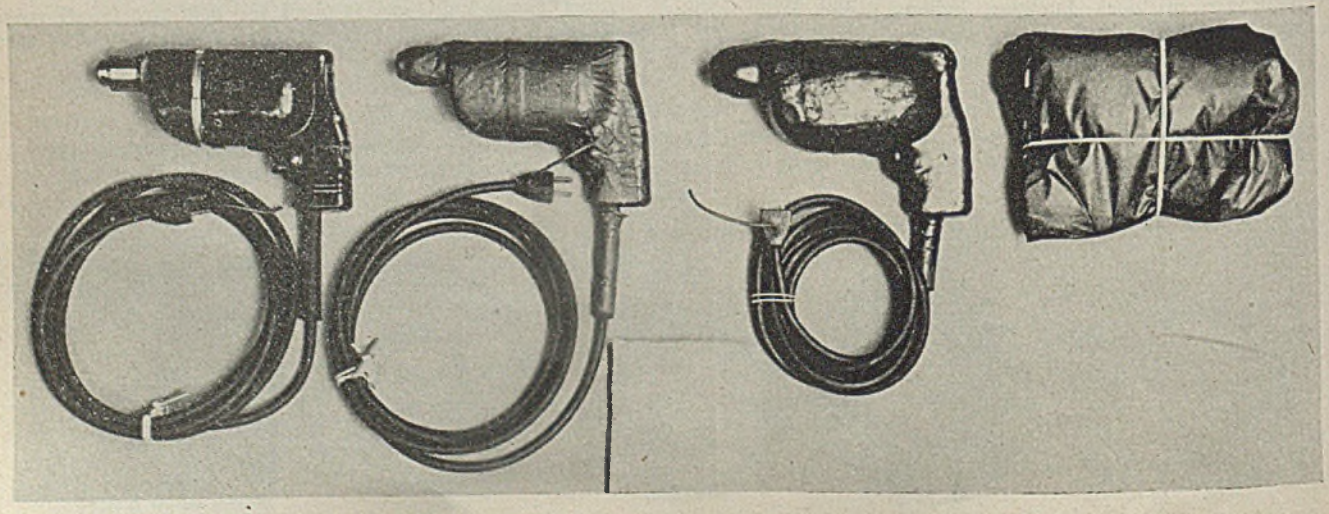
Always the wrap is molded to the contour of the article to exclude as much air as possible for, as previously mentioned, corrosion will take place not only in salt or acid atmospheres but also when relative humidity rises above 30 per cent.

After protective wrapping and sealing, the processed parts are placed into wooden boxes, which conform to Army-Navy general specification. The boxes are first lined with approved water proof paper and the contents carefully blocked or packed to prevent any movement during shipment. The box cover is then sealed tight with a water-proof cement and nailed shut. Wire straps or flat metal bands brace the box securely against rough handling.

The resultant product is now air, water and moisture proof, as well as strong and shock proof. Tidal delivery in perfect working condition can be assured.

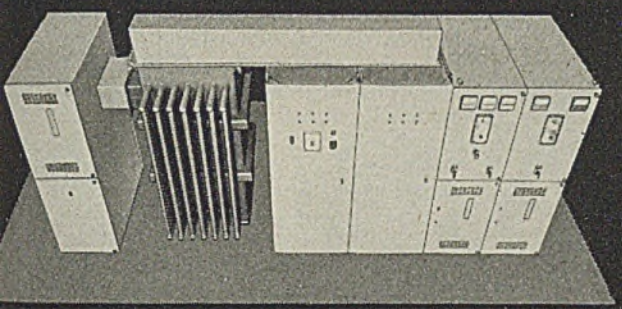
*Fig. 4—Left to right: Cleaned electric drill; paper molded around drill; dipped in wax; finally sealed in moisture proof bag or wrapper with silica gel which prevents condensation. This sealed package then is placed in a carton for further protection*





# new flexibility

## to meet rapid changes in d-c power needs



Type "IUS" Ignitron Unit Substation


**LIGHTWEIGHT, EASILY INSTALLED**

Compact Ignitron substations can be located near the load centers, anywhere in your plant. No special foundations required—can be mounted on balconies if convenient.

When Ignitron Rectifiers are adopted for power conversion, your power supply takes on new flexibility and adaptability.

For example, a complete Ignitron Unit Substation can be easily shifted anywhere in the plant—and installed *near a new load center.* No special foundations are required. The compact, lightweight unit can be installed on any firm, level flooring.

Add to this the other outstanding advantages of Ignitron power conversion:

1. High efficiency over the entire load range—for peak loads, light loads, 24-hour loads.
2. The ability to operate unattended, with practically no maintenance.
3. Protected against dust and corrosive agents.

These are the reasons why Ignitrons are now serving war industry with more than 2,500,000 kw installed capacity. Investigate Ignitrons for your particular d-c power requirements. Your nearest Westinghouse office can give you full information. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pennsylvania.

### In the steel industry

The inherent advantages of the Ignitron Rectifier make it ideally suited for steel mill service. Outstanding features are high, short-time overload capacity and uniformly high efficiency throughout the load range. Also, since there are no major moving parts to be affected by dirt and grit, the Ignitron requires less maintenance.

For further information about the Ignitron Rectifier, write Dept. 7-N for your copy of Book B-3024.

J-10255-1

Westinghouse *Electronics at Work*

**IGNITRON RECTIFIERS**

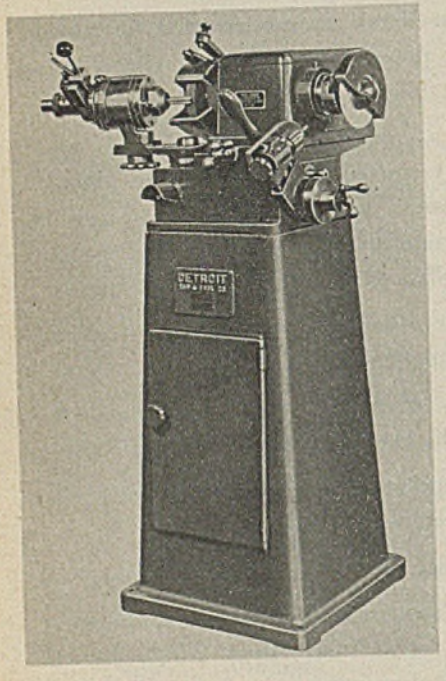
PLANTS IN 25 CITIES
OFFICES EVERYWHERE

# INDUSTRIAL EQUIPMENT

## Tap Reconditioner

A new spindle head that accommodates interchangeably a wide range of motor types for various service voltages, phases and frequencies required in industry is the chief feature of the improved tap reconditioner announced by Detroit Tap & Tool Co., 8432 Butler, Detroit 11. Spiral pointing and spiral-point polishing operations can be performed by integral units of the machine, the former driven from the new spindle.

The tap chamfering unit, at left of the machine, is of the collet type. It facilitates changing of taps and collets, assures maximum locating accuracy. It will accommodate collets from the smallest




machine screw size up to the 1¼-inch standard tap shank size, including long shank taper taps.

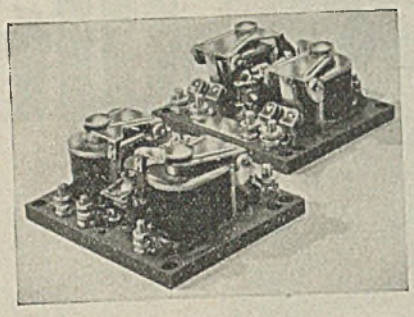
The ½-horsepower spindle motor is controlled by a small switch mounted in the base. Standard motors are 220 or 440-volt 3-phase; or 110-volt single-phase, for either 25 or 60-cycle service.

## Dynamic-Braking Relay

Instantaneous dynamic-braking with split-series field motors is provided in the new electric-motor relay types 68HX100 and 67HXX100, manufactured by Struthers-Dunn Inc., 1321 Arch street, Philadelphia.

Positive action, less weight and simpler mechanisms are provided for a wide range of aircraft and other applications. These include operation of retractable landing gears, wing flaps, trim tabs, bomb-bay doors, hoists, etc., utilizing reversing motors. For winch operations, the relays permit substitution of a simple locking dog for the conventional large magnetic brake.

These relays have what is known as "nutcracker-construction," are a lightweight design with exceptionally strong contact pressure. Positive "memory" con-



tacts select the proper field winding to give reverse torque for braking. All parts and contacts are readily accessible for inspection. The relays operate in all positions and withstand salt-spray, vibration and altitude tests.

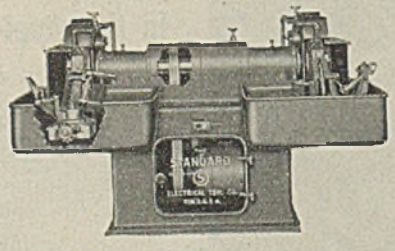
## Motorized Crane Bridge

A device that converts almost any hand-controlled travel crane bridge to a power-controlled unit is announced by Northern Engineering Works, Detroit. Called the Travelator, it can be applied without dismantling the crane or removing any part except the hand chain.

Movements of the motorized unit are governed by pendent pushbuttons either located at a fixed point on the bridge or arranged to travel with the hoist. The latter arrangement allows the operator to control all of the motions from one point. The unit includes mechanical parts that must be applied to squaring of the split design, including the sprocket, bearings, set collar, etc.

## Chisel Grinder

The featured arrangement on the new heavy duty double-end self-contained belted motor-driven grinder developed by the Standard Electrical Tool Co., Dept. D-11, 2490 River road, Cincinnati 4, is the patentetd chisel grinder attachment for production grinding of a



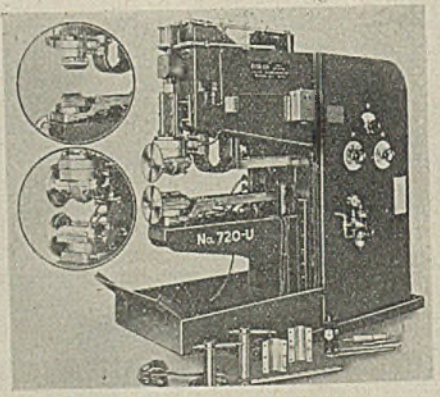

wide variety of chisels. One of these attachments makes it possible to grind up to 1000 chisels per day per man. This attachment also can be used for redressing used chisels.

Twenty-inch diameter high speed resinoil bond wheels are mounted on spindle operating at 1700 revolutions per minute. The wheels are 2½-inch face. The machine is equipped with flanges for 8-inch hole wheels.

The hoods or guards are furnished with all necessary fittings and adjustable nozzles with valves for controlling flow of water. Mounted on back of machine is tank with motor-driven pump having capacity of ten gallons per minute. The chisel is secured in a quick acting holder which permits unskilled operators to accomplish a uniform finish on the chisel blanks. After the heel of the chisel has been ground, the attachment is swung 90 degrees. Here the chisel is held on the attachment by hand for acquiring the desired uniform cutting edge.

## Welding Machine

A universal heavy duty resistance welding machine adaptable for circular and longitudinal seam welding and, by a simple change of electrodes, for spot welding operation, has been placed on the market by Eisler Engineering Co., Newark 3, N. J. It is an air-operated, water-cooled, automatic press-type weld-



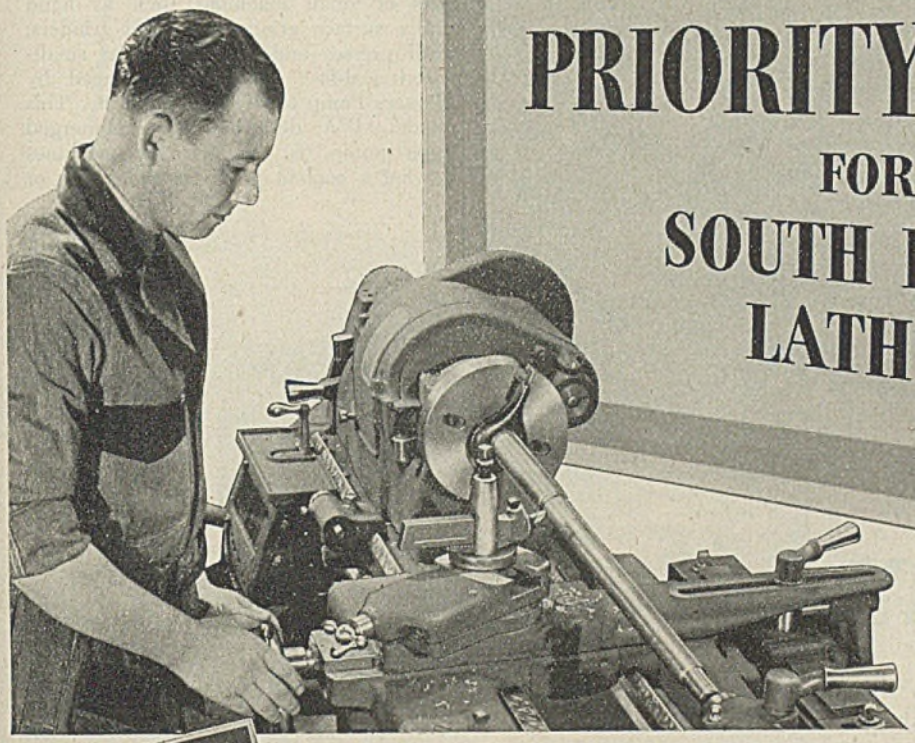

ing machine of high capacity on which adjustment from one to another seam welding position is made by loosening four nuts on the upper and lower turret holders and rotating and fixing both turrets again in the desired position, according to a matching notch which marks the correct alignment. Conversion from seam to spot welding is accomplished by removing the caps from the upper and lower turrets and replacing the seam wheel shafts with proper spot welding horns. In either kind of work, the upper electrode, attached to a big square ram sliding in a guide block, is actuated by a double-acting air cylinder. Electrode pressure is adjustable by an air pressure regulating valve. The air system includes an air filter, indicating pressure gage and automatic lubricator.

Complete automatic control of the entire system can be attained by connecting the unit with a mechanical or electronic contactor and welding timer. Welding transformer is available in 100, 150 and 200 kilovolts and larger sizes, 220 or 440 volts, 60 cycles. Only the upper seam wheel is power driven by

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

# BE FIRST ON THE

# POST-WAR PRIORITY LIST FOR SOUTH BEND LATHES




South Bend Engine Lathes and Toolroom Lathes are made in five sizes: 9", 10", 13", 14½", and 16" swings, with bed lengths from 3' to 12'. The Turret Lathes are made with 9" and 10" swings. They are fully illustrated and described in Catalog No. 100-C.

Post-war employment and prosperity depend upon quick resumption of normal peace time civilian activities, production, and services. To furnish lathes first to those who will be ready to use them (but cannot qualify for a war-time priority) South Bend Lathe Works now offers a practical post-war priority plan.

To take advantage of this plan, place an order now for the lathes you want. No down payment, no deposit is required. Should conditions necessitate, you may cancel the order at any time. All we ask is that it be placed in good faith.

When your order is received, we will issue a numbered Post-war Priority Certificate. As soon as materials and manpower are released for civilian production, South Bend Lathes will be shipped in accordance with the Priority Certificates. Certificate holders will receive the first South Bend Lathes to be thus released, up to 80% of our production. The remaining 20% will be reserved for returning service men who may need lathes.

All standard South Bend Lathes, embodying the improvements developed in meeting exacting war production needs, will be available. No revolutionary models or design changes are to be expected. There will be no price increase—unless material or labor costs, or other conditions beyond our control, require it.

Here is a practical first step in putting your post-war plans into action. Send for Catalog No. 100-C and full information on this plan. Choose the lathes that meet your needs . . . place an order now, and be sure of earliest possible delivery.


*Buy War Bonds Now . . . Save for Lathes*

**SOUTH BEND LATHE WORKS**

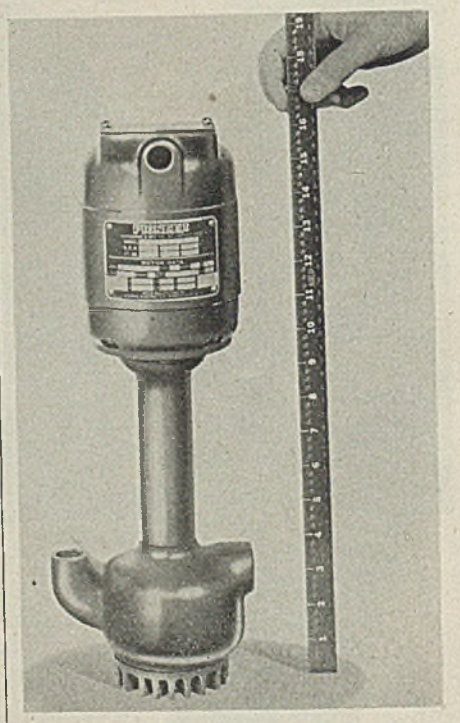
SOUTH BEND 22, INDIANA — LATHE BUILDERS FOR 37 YEARS

a 1-horsepower motor and a variable speed drive. Large view shows circular welding application, while spot welding and longitudinal seam welding setups are presented in top and bottom inserts, respectively.

Overall dimensions of the 100-kilovolt machine are: Height, 88 inches; length, 93 inches; width, 47 inches. Weight is 6200 pounds.

## Small-Sized Pump

Designed to meet the needs of operators of small machines such as hand mills, surface grinders, internal grinders, drill presses and so on, another small-sized seal-less pump is announced by Pioneer Pump & Mfg. Co., Detroit. This model MVA, described as a submerged type pump, is intended for machines having a coolant pump in their base or



for machines provided with separate coolant tanks. In the case of the latter, brackets and flanges are available for mounting pump on the edge, side or top.

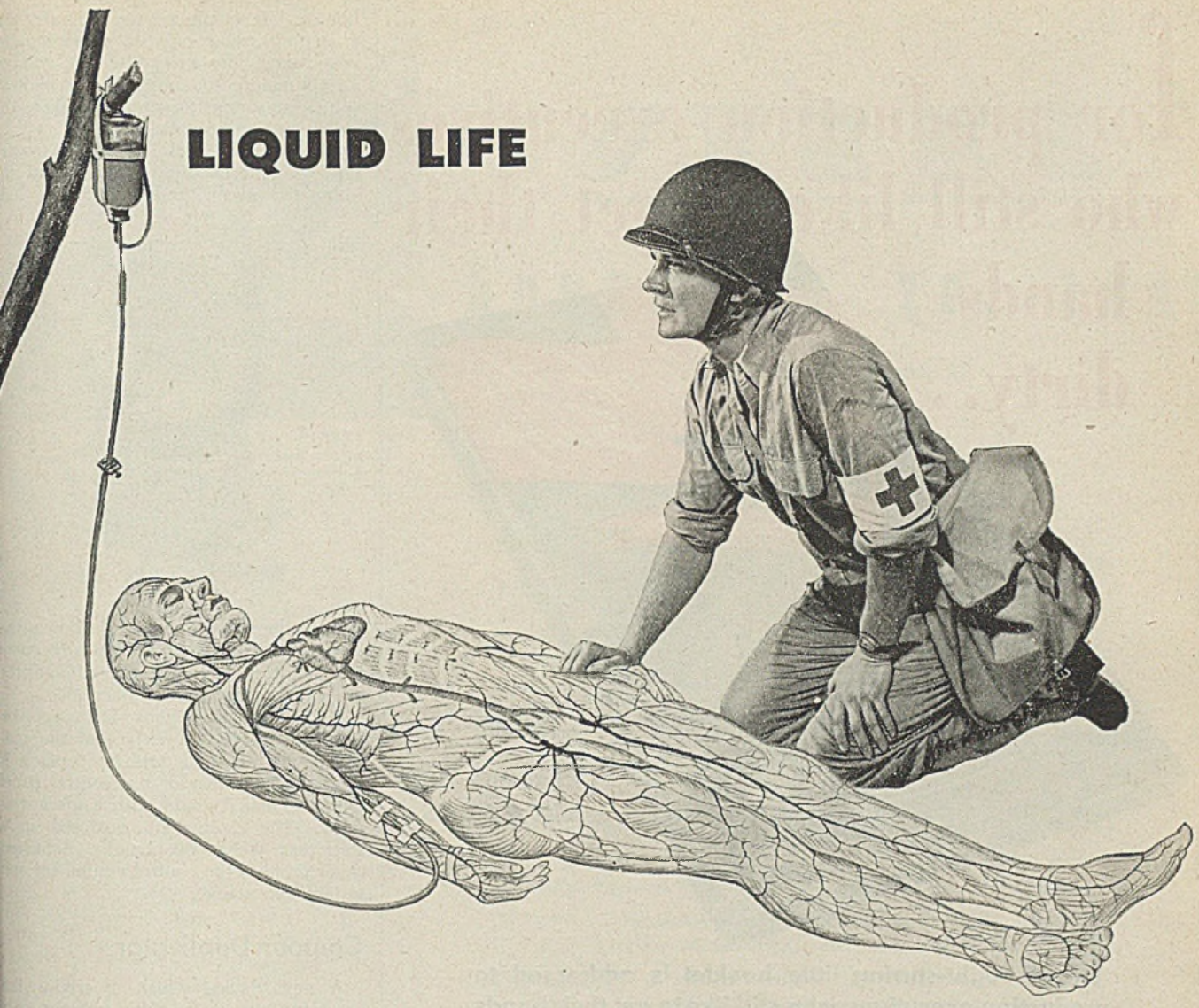
Chips or dirt that will pass through the grills located in the bottom of the pump will pass through the pump without injuring it.

## Portable Oil Tester

An approved 30,000-volt portable test set for the convenient and rapid testing of insulating liquids such as oil and Pyranol has been announced by General Electric Co., Schenectady, N. Y. The set, designed for indoor service, provides smoothly variable test voltage from 0 to 30,000 volts on single-phase, 115 or 230-volt, 25 or 60-cycle circuits.

The tester can be used in industrial plants, central stations, substations or wherever frequent oil testing is required, saving time and expense in checking the proper dielectric strength of insulating

# LIQUID LIFE



Not bullets, but *surgical shock*, has killed many a soldier in the wars of the past.

*Shock* is a breakdown of the blood circulatory system. Blood vessels contract. Circulation slows down, almost stops. If shock is too severe, death results.

Today, when a soldier is wounded, blood *plasma* is injected into his circulatory system. The plasma acts as a sort of pump primer . . . fills up the collapsed veins and arteries . . . starts the system working again. By thus counteracting shock, plasma saves lives and reduces suffering.

The whole blood you give at a Red Cross blood donor station goes through much processing before it gets to the front as plasma. At many points throughout the processing accurately-controlled *refrigeration* must be used.

To provide this refrigeration, General Electric has developed dependable refrigerating equipment that is more efficient, more compact and more flexible—to meet difficult war conditions.

This is only one of the many ways General Electric Refrigeration and Air Conditioning are helping to make a better world.

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*General Electric Company, Air Conditioning and Commercial Refrigeration Divisions, Section 4312, Bloomfield, New Jersey.*

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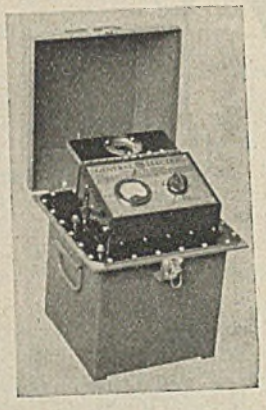
liquids. It combines in a single unit a step-up transformer, a potentiometer which gradually raises the test voltage, a voltmeter to measure breakdown values, an automatic circuit breaker, and an oil testing receptacle.

The control panel is inclined toward the operator, enabling him to read the voltmeter easily and accurately. As

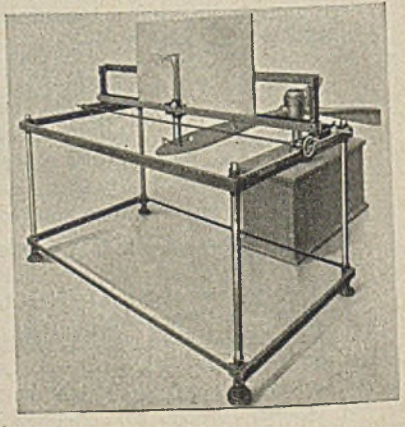


soon as the test sample breaks down, the low-voltage breaker automatically opens the circuit, preventing continuation of the arc and burning of the electrodes.

Complete instructions for operation are included on the surface of the control panel. The oil testing receptacle is located at the rear of the control panel under a hinged guard with a glass window. The equipment, enclosed in a steel case, weighs 80 pounds. A hinged cover protects the control equipment and testing receptacle.

## Contour Duplicator

A new device which ascertains the exact contour of irregular surfaces in a fraction of the time required by the use of wood templates was recently placed on the market by Inter-Lakes Engineering Co., 502 Transportation building, Detroit 26. Called the Dupligraph, it transfers on transparent paper



or directly on metal the exact contour of the object. Use of the device is particularly advantageous for obtaining concave readings in forming dies which cannot be checked frequently with ordinary templates. It also can be used to secure a true reading of a stamping, showing the amount of spring-back and warp.