STEEL

The Magazine of Metalworking and Metalproducing

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TECHNICAL

FEATURES

MARKETS

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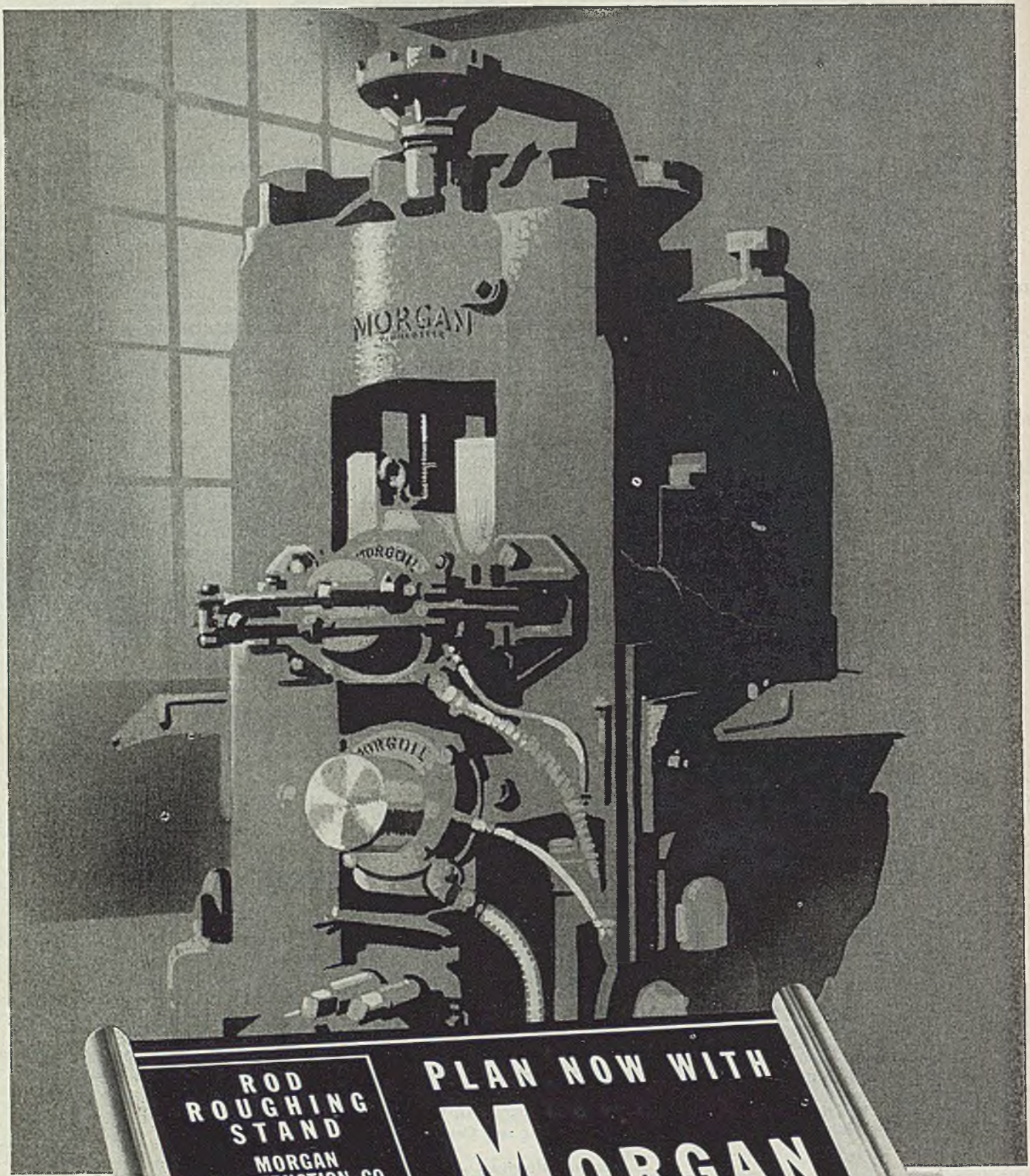
How Ford Makes Aluminum Stampings with Steel Dies
Why Welded Ship Plates Failed in Service
Duplicating Subzero "Heat" Treatment of Metals
Leaded Steels Machine 60 Per Cent Faster
Controlling Production by Statistical Methods



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STEEL
January 8, 1945

The Little Steel Farce

Handling of the Little Steel wage case by the various government agencies affords an excellent illustration of how artificially created bureaucratic confusion can be manipulated in order to make an unfair and unwarranted action appear to be fair and justifiable.

Almost from the beginning, it was apparent that the unions would win approval of a portion of their demands and that the government would go to great lengths to assure the public that the increases granted would not impair the Little Steel formula. In short, the government administration, early in the first act of this rollicking farce, was committed by the plot of the play to yield without seeming to yield, to be partial without seeming to be partial, and to deceive while giving solemn lip service to high ideals.

Thus, as the play progressed, the interest of the audience shifted from the amount of the increase—which could be assumed as a foregone conclusion—to the manner in which the authorities would explain their action. Playwriters and cast exploited the element of suspense right up to the last moment. Just before the final curtain, on the eve of the New Year's week-end, Director of Economic Stabilization Vinson revealed the denouement.

He announced that he approved the WLB ruling of Nov. 25 granting increases of about 8 cents an hour, amounting to more than $75 million in retroactive wage payments, and at the same time he reported that OPA soon will announce upward adjustments of some steel prices. The steel wage increases, he explained, will not increase steel prices because OPA had held that increases on certain steel products were "necessitated by law" to relieve hardship cases.

No one need lose sleep trying to figure out this curious logic. The fact is that by dragging out the farce month after month and injecting enough actors into the play to confuse the audience, the government administration has succeeded in doing what it thought it was committed to do.

While the curtain has been rung down on the play acting, the effect of the farce will be felt for some time. Millions of wage and salary earners whose incomes have been held down rigidly under tight interpretations of economic stabilization policy are wondering why they were discriminated against and why the government could find loopholes so easily for the steel unions.

Another play may follow the farce which has just ended. Its title may be "The Gripes of Wrath."

EVOLUTION IN SALES? For some time we have harbored a hunch that the next few years will witness an evolution in the merchandising of iron and steel products. The incentives for developing efficiency in sales and distribution have not been as strong as the incentives for developing efficiency in production, treatment and fabrication. Therefore, in our opinion, progress in marketing, pricing, sales and distribution has lagged behind engineering progress in production and use.

Some support for this assumption is found in current discussions on the postwar distribution of steel. Speaking at a meeting of the Philadelphia chapter of the American Steel Warehouse Association, Guy P. Bible of Horace T. Potts Co., predicted a narrowing of the margin between mill and warehouse prices in lots of five and ten tons of a size so that many more consumers will be able to use warehouse service in the postwar years than before.

This confirms a belief which seems to be com-

(OVER)

ing more prevalent among steel sellers. It stems from the conviction that in the future there may be a shift in the balance between large-tonnage and small-tonnage sales.

Incidentally in the Philadelphia area there are three steel warehouses established in 1815, 1828 and 1833, respectively. This is remarkable evidence of business stability. —p. 53

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HARD WINTER HURTS: Bad weather, which in recent weeks has handicapped Allied forces on the western front severely, now is aggravating war production in a large sector of the northeastern industrial area at home.

Deep snow, blizzards and sub-zero temperatures have caused absenteeism and tardiness to mount alarmingly in many plants. These conditions also have played havoc with the mining and shipment of coal, thereby cutting supplies to dangerously low levels at certain points and in a few instances causing the shut-down of coke ovens.

The abnormally severe weather also is interfering with the processing of scrap. This interruption comes at a most inopportune time because the demand for scrap is mounting and stocks of purchased and home scrap are lowest since September 1942.

Should such exceptionally adverse weather persist through several months, as it did in the war winter of 1917-18, industry would be forced to adopt drastic measures to avoid a dangerous drop in war production. —p. 56

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BELATED REASSURANCE: Evidence that the government is prepared to use sterner measures to intensify the war effort is appearing daily. War Mobilization and Reconversion Director Byrnes issued a report asking the President and the Congress to consider legislation on numerous measures intended to bolster war output and prepare for peace.

Some of Mr. Byrnes' measures seem rather remote from the present emergency, but disappointment over this fact is tempered by his emphasis upon really pressing problems, such as the seriousness of the manpower situation. His reference to the 4-F's has a note of belated realism. His appeal for laws to treat the "Petrillos and Averys alike" will be commended in many quarters. Timely also is his proposal that changes in the tax structure be drafted now "to encourage new enterprises and the expansion of existing enterprise."

The Byrnes' report reassures at a time when reassurance was over-due. —p. 52

TRUCKS IN THE WAR: "Motor Truck Facts," published by the Automobile Manufacturers Association, emphasizes the importance of motorized equipment in modern warfare. The automotive industry now is turning out 226 different types of military vehicles. These vehicles, and parts for them, are being manufactured at the rate of $2½ billion worth a year. This is 2½ times the value of all trucks and parts manufactured in 1941 which was the industry's peak peacetime production year.

Since the start of the war 2,240,000 motor trucks have been produced for the Army and Navy. On June 30, 1944, more than 4,744,000 trucks and 216,000 trailers were in civilian use in the United States. Normally farmers use 34 per cent of all motor trucks, but ODT records show that farmers hold 47 per cent of the certificates of war necessity for trucks.

These figures indicate how extensively we rely upon motor transport all the way from farm and factory to the battle front. They also help to explain why tires continue to be one of the most critical items on the war production program. —p. 65

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ELECTRONICS DOES IT: A new application of electronics insures uniformity in X-ray exposures. While the method was first used in medical radiography, it is well adapted to industrial X-ray analysis.

The central feature of the new development is a photoelectric timer, which operates on the principle of the exposure meter used by amateur photographers. X-ray radiation, passing through an object, strikes a fluorescent screen and is converted into visible radiation. A section of the luminous screen is scanned by a photoelectric tube which in effect measures the light leaving the screen. When enough light has left the screen for the desired film exposure, the photoelectric timer actuates a relay, opening the X-ray circuit and stopping the exposure.

This apparatus enables radiologists and technicians to obtain uniformly dense photo-fluorographic exposures automatically and rapidly. Under favorable conditions it permits an overall increase in operating efficiency of about 100 per cent.

—p. 98

E. L. Shaner

EDITOR-IN-CHIEF

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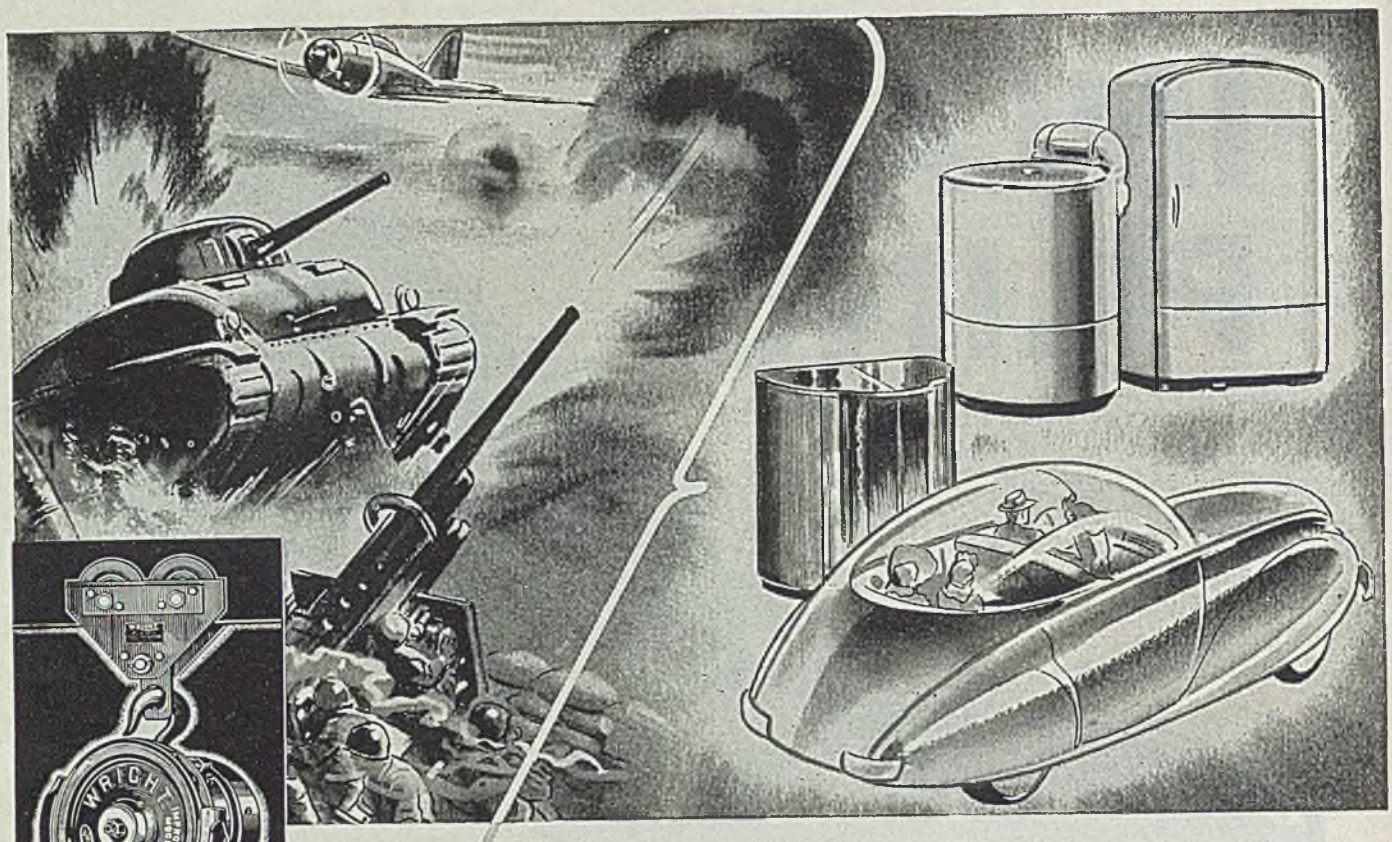

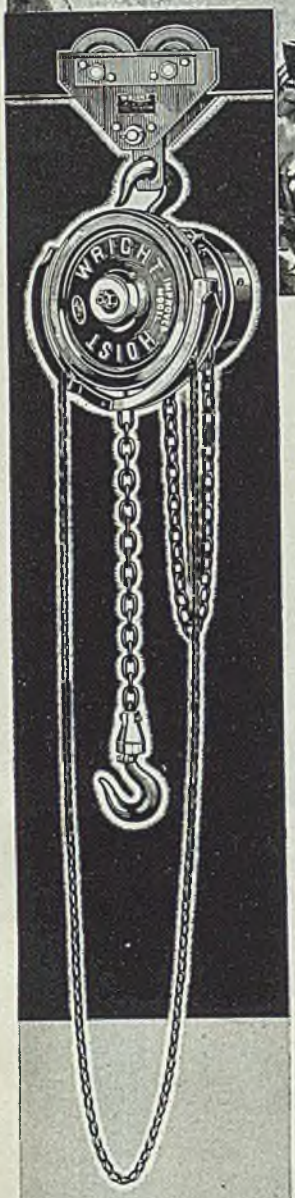

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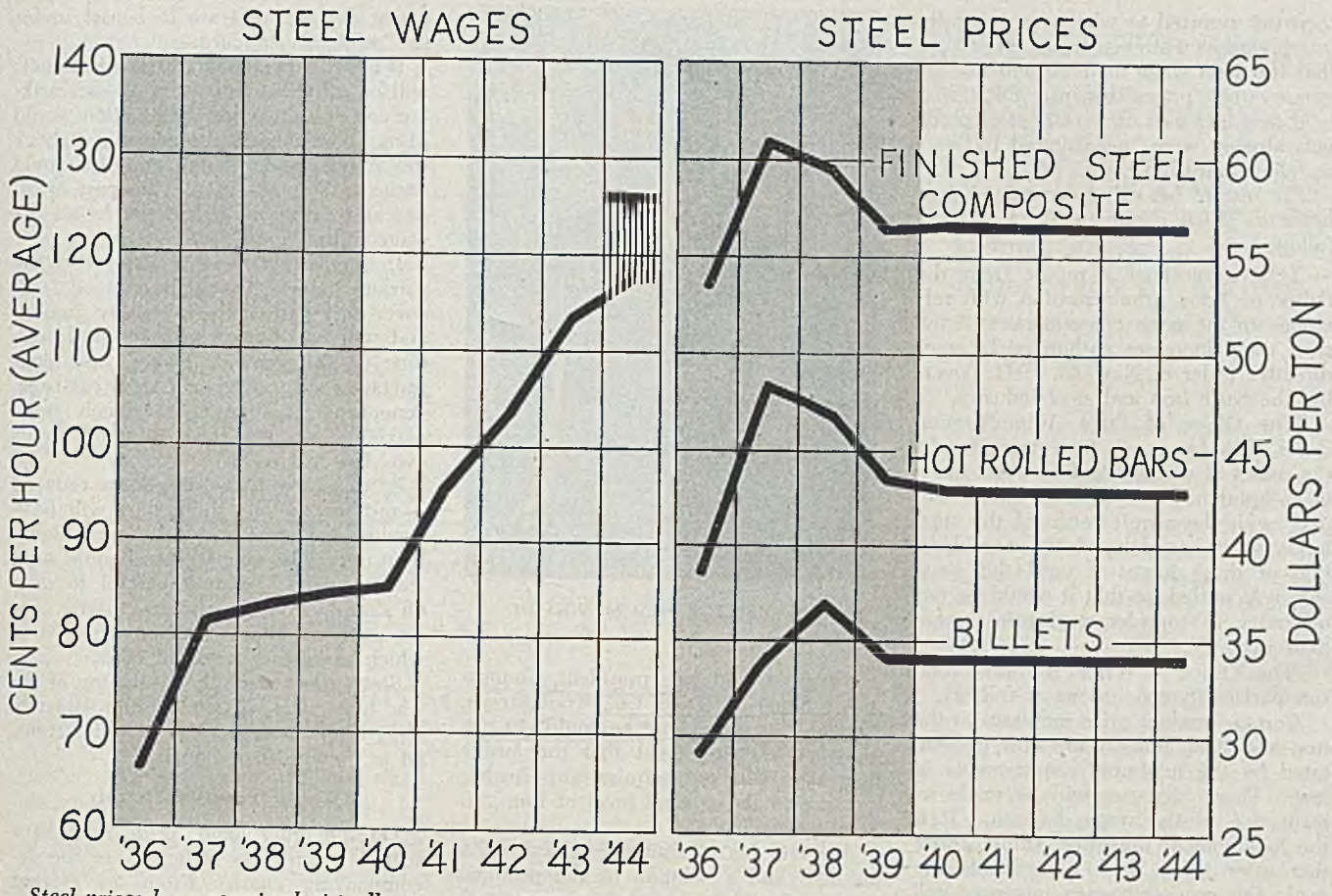


Steel prices have remained virtually constant at 1939 levels, and below those for 1937 and 1938, while the industry has had to absorb constantly increasing labor costs. Wage rates in above chart were compiled by the American Iron and Steel Institute. Vertical line patch in 1944 column represents retroactive increase as estimated by STEEL

Grant Pay Increase; Prices To Rise

Ceilings on some products expected to be lifted early next month, as director of economic stabilization approves higher wage rates ordered by War Labor Board. Ruling to cost steel producers millions in retroactive pay. Affects 400,000

UPWARD adjustments in the prices of some steel products are expected to be announced by the Office of Price Administration early in February.

The price control agency was given the go-ahead signal over the New Year week-end by Fred M. Vinson, director of economic stabilization, who at the same time approved the War Labor Board's ruling of Nov. 25 granting wage concessions to steelworkers. The wage concessions are estimated to average about 8 cents an hour, and will cost the steel industry $75 to $80 million or more annually. They will be retroactive to the dates of expiration of the last basic steel contracts, which vary from company to company, but generally extend back to around the beginning of 1944.

The WLB directive provided:

Premium pay of 4 cents an hour for the second shift and 6 cents an hour for the third shift.

Elimination of intraplant "inequities." This is to be worked out by collective bargaining and the increases are to be limited to an overall average of 5 cents an hour.

Dismissal pay in principle, details to be worked out in collective bargaining.

Liberalized vacation and holiday pay.

Maintenance of union membership and checkoff of dues.

The board rejected the union's demand for a straight increase of 17 cents an hour, recommended continued study of a guaranteed annual wage, rejected proposals for group insurance, a fund for employes on military duty, elimination of geographical differentials, and a learner's rate of no less than common laborer's pay.

The order affects 400,000 workers of 86 basic steel producers. However, similar increases are expected to be ordered for workers in some 600 other companies with which the union has contracts.

Negotiations over the millions of dollars of back pay and over the increases to correct "inequities" will be the next step in the steel wage case.

The exact amount of retroactive pay awarded the steelworkers is difficult to figure, due to uncertainty over what increases will be made in the various plants to correct "inequities". The War Labor Board in directing the increases made no effort to estimate the cost of the concessions. OPA, however, figures the added cost will be from $75 to $80 million annually. Other estimates run as high as $150 million.

Although the price increases to be granted next month may compensate for the wage increase in the future, the companies apparently will receive no compensation for the millions of dollars of back pay.

The retroactive pay may be figured as a part of 1944 expense for tax purposes if the negotiations for settlement are concluded before Feb. 15 or if the companies request and receive an extension in time for filing tax returns. Due to the year-end timing of the ruling, tax consultants believe the Internal Revenue Department will be lenient in granting extensions.

Judge Vinson in approving the wage

increases resorted to what was generally interpreted as a strange logic. He found that the steel wage increase will not increase steel prices because OPA had held that increases on certain steel products already were "necessitated by law" to relieve hardship cases.

The text of his ruling, contained in a letter to WLB chairman W. H. Davis, follows:

"I have received a report from the Office of Price Administration with reference to the price consequences of the steel wage increases authorized by your directive order of Nov. 25, 1944, covering the basic iron and steel industry.

"The Office of Price Administration states that for some time increases in the prices of certain steel products have, in its opinion, been required by law but that, with the acquiescence of the steel industry, it has delayed the consideration of these increases until the wage case was settled, so that it would be unnecessary to consider steel prices more than once.

"The Office of Price Administration summarizes its conclusions as follows:

'Certain product price increases in the iron and steel industry are now necessitated by the minimum requirements of law. These increases will be made irrespective of the wage decision. It is the judgment of the Price Administrator that after these price adjustments are made the proposed wage increases will not require any further net rise in the general level of iron and steel prices.'

"Accordingly, the wage increases required by your directive order may become effective."

Vinson's Statement Puzzling

Producers generally were puzzled by Judge Vinson's reasoning. They figured something like this: If, even before the wage increases, prices of steel products had to be raised to assure fair earnings or to cover out-of-pocket costs, as provided in the price stabilization act, then the wage increase itself would require a still further price rise. On the other hand, if the price rise was to be ordered in anticipation of the wage increase, then the wage increase necessarily was the cause of the price increase. In any event, the wage increase was considered inflationary and is expected to set a precedent for other major wage cases still before the WLB.

WLB spokesmen, however, persist that agency has no intention of abandoning the Little Steel wage formula. Neutral observers believe it will be extremely difficult for the board to deny shift differentials and other under-the-counter wage increases to the automotive, electrical, packing house, textile, aluminum, and railroad workers and coal miners when their cases come up for test. The general impression is that the out-and-out test of the Little Steel formula will come this spring when the contracts of John L. Lewis' United Mine Workers of America come up for renewal.

Walter E. Watson, chairman of the OPA General Steel Products Advisory Committee, and vice president, Youngstown Sheet & Tube Co., Youngstown, O., said last week that he could not understand the statement that the "wage increases will not require any further net rise in the general level of iron and steel prices."

OES DIRECTOR FRED M. VINSON

He said his committee will ask OPA to help find a solution of the problem created by the new wage increases.

"The statement by OPA and Director of Economic Stabilization Vinson that 'for some time increases in the prices of certain steel products have been required by law' is clear recognition of the position taken by our committee.

"With that question now settled, the industry is keenly interested in having the respective amounts of the price increases determined and made effective as soon as possible. We are working with OPA continuously to find the proper answer to the price question raised by past cost increases. We are also asking OPA to help find a solution for the effects of the new wage increases approved Dec. 30 on a retroactive basis."

OPA last week was reported to be undertaking a new cost survey of the entire steel industry. The results of the study will be used to determine specific dollars and cents prices to be allowed and the products involved.

An OPA official in explaining the "requirements of law" phrase in the Vinson and OPA statements said that the price stabilization act provided that prices shall be "generally fair and equitable." In interpreting that, he continued, the OPA uses two standards, "earnings" and "product."

The first deals with the earnings of a company or industry in relation to its record during a prewar base period, 1936-39.

Under the second, the price agency permits increases in prices to stimulate production of needed items when prices do not cover out-of-pocket costs.

The steel price increases now in process of development are to be set under its "product" standard.

It is not expected that the adjustments will be sufficient to pay for all steelmaking costs plus a profit; such action would bring about increases which might shock the public, and which certainly would excite further interest on the part of labor as to whether it had gotten all the wage traffic would bear.

It is regarded as more likely that the markups now being determined will cover only part of the necessary ground, and will be allowed to exist until such time as the present "sweet" war contracts are terminated or sharply cut back, generating a situation in which steelmaking again will have to stand on its own bottom.

At that time, unless wages are reduced —and few people think they will be— steelmaking costs should be even higher than under the new wage schedule since steel demand is almost certain to drop off sharply from the war level, with consequently smaller tonnage output over which to spread overhead costs.

Steel prices since the beginning of the war have been frozen at approximately 1939 levels, with some price relief granted to individual producers.

Wages Increased Sharply

On the other hand, wage rates have soared steadily, as indicated in the accompanying chart. From an average hourly rate of 86.6 cents in January, 1941, base month of the Little Steel formula, today's rates have risen to an estimated $1.26, including the retroactive increases. Weekly wages, of course, have increased even more sharply due to the longer work-week.

The steel wage increase is feared by many to set a precedent for other wage increases, to be followed by more price increases, and to be definitely inflationary. During the past year, according to the Department of Labor, price increases were held to 2 per cent for retail necessities and to 1½ per cent for wholesale prices.

Income payments to individuals, however, rose to an all-time high of $155 billion, compared with $142 billion in 1943 and $71 billion in 1939.

Pittsburgh Area Artillery Production Program Pushed

PITTSBURGH

Practically all facilities established for production of shell for 155-millimeter gun, 8-inch howitzer and gun, and 240-millimeter howitzer in the Pittsburgh district are now in operation, according to Col. R. C. Downie, district chief, Pittsburgh Ordnance District.

Production on these items is increasing each month, and in addition, increased quantities of additional gun and ammunition items will be required.

Early in December, mortars and medium artillery became highly critical. Commenting on the new procurement program, Colonel Downie indicated re-

quirements on 105 mm howitzer and its ammunition have been increasing and the program is today critical. Rates on ammunition in this size must be quadrupled before the end of 1945.

Heavy losses of trench mortars in battle have necessitated large increases in production of this item. The use of 90 mm antiaircraft guns as a tank weapon has put added strain on production facilities for these weapons, and current requirements mean a 100 per cent increase in present output.

Contracts for all these weapons and ammunition are now being placed in the Pittsburgh district, and additional facilities will be required to complete the program. According to Colonel Downie, new facilities are being established at Flannery Bolt Co., Bridgeville, Pa.; Continental Can Co., McKees Rocks, Pa.; Fletcher Enamel Co., Dunbar, W. Va.; Louis Marx & Co. Inc., McMechen, W. Va.; Railway & Industrial Engineering Co., Greensburg, Pa.; National Supply Co., Etna, Pa.; Oliver Iron & Steel Corp., West Pittsburgh, Pa.; and Pressed Steel Car Co., McKees Rocks, Pa.

Plans for setting up new facilities at several additional locations are now in process but have not yet been completed.

Present, Past and Pending

MIDWESTERN CEMENT MAKERS GRANTED PRICE INCREASE
WASHINGTON—Cement manufacturers in nine midwestern states were granted an increase, not to exceed 20 cents per barrel above previous maximum prices, by OPA last week.

BABCOCK RESIGNS GM POST TO HEAD AVIATION CORP.
DETROIT—Irving B. Babcock, president, General Motors Truck & Coach Division. Pontiac, Mich., and vice president, General Motors Corp., has resigned to become president of Aviation Corp. on Feb. 1, succeeding Victor Emanuel who becomes chairman of the board.

FEA TO PAY HIGHER PRICES FOR BOLIVIAN TIN
WASHINGTON—"General agreement" has been reached on a new arrangement between Foreign Economic Administration officials and Bolivia, increasing base price for tin 2 cents a pound to 62 cents but a contract has not yet been signed. Additional arrangements in connection with smelting costs will add another 1½ cents a pound.

AMERICAN BRIDGE MACHINE SHOP DAMAGED BY FIRE
CHICAGO—Fire last Wednesday did $250,000 damage to American Bridge Co.'s main machine shop in Gary, Ind.

CHICAGO HAS SHORTAGE OF 55,000 WAR WORKERS
CHICAGO—Shortage of 55,000 war workers was reported in this area by the War Manpower Commission as of Jan. 1.

FREIGHT RATE CUT ASKED ON CERTAIN COAL SHIPMENTS
WASHINGTON—Reductions ranging from 7 to 20 cents a ton in railroad rates on bituminous coal moving from the Pittsburgh and Freeport, Pa., districts to Youngstown, O., district were recommended last week to the Interstate Commerce Commission by Howard Hosmer, examiner. On ex-river shipments from Conway and Colona, Pa., he proposed a reduction of 10 and 20 cents, respectively.

1944 AIRPLANE OUTPUT FAILS TO MEET SCHEDULE
WASHINGTON—Aircraft plants turned out 6697 planes during December, bringing total for the year to 96,369 but failing to meet schedules set at first of the year by 12,631 planes, WPB Chairman Krug reported last week.

UNITED ENGINEERING ACQUIRES ADAMSON MACHINE
PITTSBURGH—United Engineering & Foundry Co. has acquired the Adamson Machine Co., Akron, O., which will be reorganized as the Adamson United Co. with K. C. Gardner as chairman and F. L. Dawes as president.

OLIN RETIRES AS PRESIDENT OF WESTERN CARTRIDGE
EAST ALTON, ILL.—Franklin W. Olin has retired as president of the Western Cartridge Co. group of industries now included in Olin Industries Inc., completing 52 years' active management of the business which he founded. He has been succeeded as president by his elder son, John M. Olin.

JONES & LAUGHLIN PURCHASES TALON TUBE PLANT
PITTSBURGH—Jones & Laughlin Steel Corp. has purchased from Talon Inc. the latter's electric welded tube plant at Oil City, Pa., to be known as the Electric Weld Tube Division of J. & L.

President's War Powers Renewed By Old Congress

Definite checkrein placed on these powers for first time in this war by provision for court review

ONE of the last acts of the old Congress was to vote an extension of the President's extraordinary war powers, as contained in the Second War Powers act, through 1945. For the first time in this war, however, Congress put a definite checkrein on these powers, through provision for a court review of certain agency acts.

This provision, contained under Title III of the act, states:

"The District Courts of the United States are hereby given exclusive jurisdiction to enjoin or set aside, in whole or in part, any order suspending any priority or allocation, or denying a stay of any such suspension, that may have been issued by any person, officer, or agency, acting or purporting to act hereunder, or under any other law or authority."

Originally the act provided for no court review of any rulings by a war agency. The only recourse was an appeal to the Office of War Mobilization. The amendment was described by Chairman Hatton Sumners (Dem., Tex.) of the House Judiciary Committee as a protection against "abusive and tyrannical actions."

Amendment Attacked

Some administration members in Congress attacked the amendment when it was offered, as a potential snarling device which could be invoked against any part of the war program, and in that light, a menace to war production.

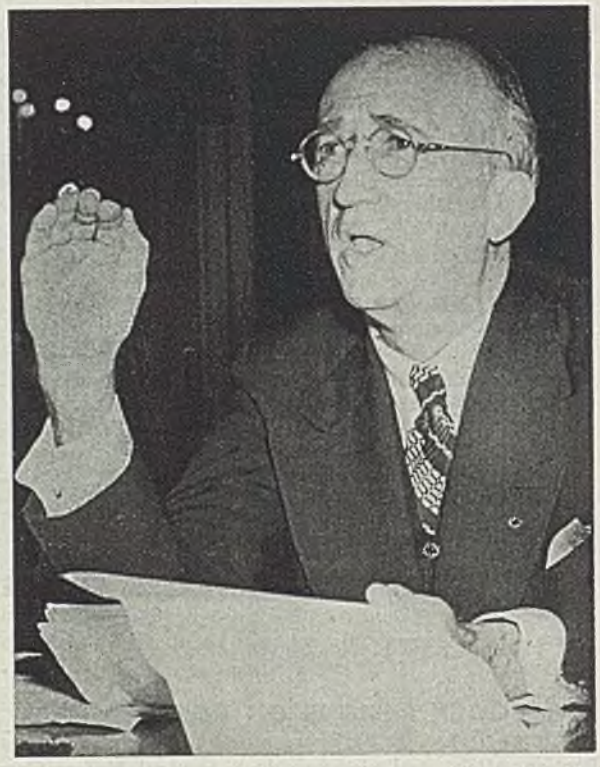
Sponsors of the amendment, however, contended that it actually applied to a limited part of the war program, in giving the courts the right to pass only on war production orders that had the effect of withdrawing an allocation of vital materials previously allocated.

Actually Title III, without the curbing amendment, was first sought by the attorney general as a clarification of the scope of the priorities law, and to provide legal machinery for its enforcement. He had complained that violations of priorities and allocations orders were widespread.

As it reads, the amendment vests criminal and civil jurisdiction for the enforcement of the priorities system in the district and territorial courts. As construed, however, and as written, this court authority may also be invoked by the private firm or party involved, to get a court review of the WPB or other war agency order, involved.

Byrnes Asks for Laws To Bolster War Production

War Mobilization and Reconversion Director, in report to President and the Congress, warns of tough year ahead. Urges legislation on numerous measures essential in prosecuting the war and preparing for peace



JAMES F. BYRNES . . . . *"We Cannot Be Complacent"*

CONSIDERATION of legislation on 14 measures essential to successful prosecution of the war and preparation for the peace to follow was asked of President Roosevelt and the Congress last week by War Mobilization and Reconversion Director James F. Byrnes.

The report reviews and summarizes accomplishments of the war effort so far, and singles out the problems which lie ahead, not only with respect to war production but in preparing the nation for the job of converting back to peacetime pursuits when the victory is won.

In his letter of transmittal Director Byrnes called attention to the need for additional legislation to tighten up the war production machine, at the same time advancing certain suggestions on reconversion policy. He placed chief emphasis on the problems concerning manpower, the utilization of 4-Fs is in essential work, and labor relations, but in addition he asked for Congressional action on the following points:

Further extension of the renegotiation act.

Extension of the stabilization act, directed at maintaining a stabilized economy through the war period.

Liberalization of the provisions of the unemployment-compensation law.

Legislation providing a greater construction backlog of public roads, flood control and reclamation programs.

Steps to assist financially in the reestablishment of small business enterprises discontinued as a result of the war or for the establishment of new enterprises of this type.

Measures to assure the continued operation of "the great merchant fleet we have built as a war measure."

Drafting now of changes in the tax structure "which will not materially reduce revenues but will greatly encourage new enterprises and the expansion of existing enterprise," to become effective at end of war in Europe.

Extension and liberalization of measures to assist home builders in financing housing construction at the end of the war, to provide employment.

Elimination of the ban in the Lanham act on the sale of temporary housing for residential purposes at low cost.

With respect to manpower he said Congress should consider legislation to strengthen the authority of the War Manpower Commission in diverting manpower from nonessential to essential occupations. He thought a national service act would be ideal but he said he was "realist enough" to know there was little chance for passage of such a law.

As one step in the effort to hold workers in essential production, Mr. Byrnes said steel production will be held to a predetermined amount to be established later by the War Production Board. In this he reasoned that if no steel is available there can be no expansion among nonessential industries using steel. This action, it was thought, could be taken as implying similar controls will be placed on other basic materials if such action is found necessary.

Director Byrnes also strongly advocated legislation to compel many of the nation's 4,000,000 4-Fs to enter war work. In this connection he singled out for attention the many athletes turned down for army service who have been able to perform satisfactorily in the various sports events.

Urges Stronger NWLB Powers

With respect to labor relations Director Byrnes said Congress should strengthen the authority of the National War Labor Board to enable it to enforce its decisions without resort to seizure. He said he believed Congress should draft a law "that will treat the Petrillos and the Averys alike," this being a reference to the contrasting actions taken by the government against James C. Petrillo, president of the American Federation of Musicians, and Sewell Avery, chairman of the board of directors of Montgomery Ward & Co.

Mr. Byrnes said he had thought for some time that the War Labor Board ought to be given full authority to enforce its decisions and one possible way of doing this, he said, would be for Congress to hold that WLB orders would have to be filed with a federal court and would become effective on the date of filing.

In the section of the report devoted to summarizing what had been done to mobilize American resources for war and what steps already have been taken looking toward an orderly transition to peace, Director Byrnes points out that production for war, good though it is, still is not enough; that serious shortages in schedules exist. And even meeting these present schedules is not enough since current production no longer feeds pipelines or goes into strategic reserves, but rather is going right into battle. Current requirements in critical items, he said, are virtually unlimited and as soon as a war plant meets its schedule it is a signal for an increase in that schedule.

The Byrnes report is jam-packed with data and charts covering all phases of the war effort and a discussion of the reconversion problem ahead. In addition to the subject of mobilization for war and preparing for the peace, the report deals specifically with such subjects as Economic Stabilization, Manpower, Agriculture, Foreign Economic Operations, Transportation, Shipping, Housing, Industrial Facilities, Surplus Property, Contract Termination, and Tax Relief.

In the section on industrial facilities

the director points out that since 1940 more than $20 billion have been invested in new or expanded plant, about three-fourths of which has been financed by the government. About $1 billion of construction work remains to be done. Government owned industrial facilities include: Aircraft $3,500,000,000; shipways $2,195,000,000; ordnance $5,159,000,000; iron and steel $1,352,000,000; nonferrous metals $1,200,000,000; chemicals $768 million; synthetic rubber $692 million; 100-octane gasoline $203 million; machinery and machine tools $803 million; other industrial plants $356 million. Not all of this capacity will be disposable, it actually being estimated that only about $10 billion of facilities are immediately or potentially usable for civilian production including nearly all of the aircraft and synthetic rubber capacity, most of the aluminum and magnesium and a good share of the steel and machine tools.

In the section on tax relief, Director Byrnes said wartime taxation should end with the war but that there can be no general revision of taxation until the war is over on all fronts. He said, however, there can be no intelligent planning to meet the problems of transition without giving consideration to the removal of tax impediments to reconversion and business expansion. Certain tax revisions which would not greatly reduce revenue but would materially aid business recovery and expansion, he said, include: Accelerated depreciation; immediate availability of postwar refund bonds; increasing the specific exemption for excess profits tax purposes from $10,000 to $25,000.

Commenting on the Byrnes report later in the week, President Roosevelt said he endorsed the report in principle but said details should be left to Congress to develop. He said he did not differ with any of the Byrnes' proposals and stated he favors those proposals which would aid small business by removal of tax law impediments to recovery and expansion, but said that actual details have yet to be developed.

Pieceworkers Covered by Wage-Hour Act, Court Holds

Pieceworkers are covered by the Wage-Hour act, the United States Supreme Court held last week.

"Neither the policy of the act nor the legislative history gives any real basis for excluding pieceworkers from the benefits of the statute," said an 8-to-1 decision, with Justice Owen J. Roberts dissenting. Its terms, the court said, "inform employers with definiteness and certainty that they are criminally liable for willful violations of the act," in relation to piece-rate employes.

"Piece-rate and incentive systems were widely prevalent at the time of the passage of this act and we cannot assume that Congress meant to discriminate against the many workers compensated under such systems," the court said.

Broadening of Steel Warehouse Service in Postwar Is Expected

ABILITY of the modern warehouse to serve is no longer confined to small lots which are uneconomical for the mills to produce, but is limited only by two factors: (1) Ability to make spot delivery of large quantities, and (2) the economic ability of the consumer to pay the warehouse price.

This view was recently expressed by Guy P. Bible, general manager, Horace T. Potts Co., Philadelphia, at a meeting of the Philadelphia chapter of the American Steel Warehouse Association.

"The probabilities are," he said, "that there will be a narrowing of the margin between the mill and warehouse price in lots of five and ten tons of a size, so that many more consumers will be able to use warehouse service in the postwar years than before.

"It is well for the mills to recognize this condition. They can sell steel but once, and while they should resist the encroachment of warehouses on mill business for direct shipment, they must recognize that within the limitations mentioned, no stop can be put on warehouse business."

He believed that the selling organizations of both mills and warehouses will recognize they are complementary parts of the whole project of the economic distribution of steel, and was confident that the warehouses appreciated "the excellent co-operation they had from the mills for many years."

Pointing out that small quantity items are not attractive to the mills, L. L. Caskey, Philadelphia district sales manager, Republic Steel Corp., a guest speaker, declared that consuming accounts regularly ordering mill quantities direct from the mill sometimes balk at purchasing such small quantity items from warehouses. He believed mill representatives can help considerably by striving to educate the consumer in this respect, by explaining the high operating cost of rolling small quantity items and by presenting various other reasons.

Providing some idea of what small quantity items mean to a mill, he referred, for instance, to bars. "Normally," he said "it costs about $90 to change sizes on a bar mill. If only one ton is rolled as a result of this change, then the extra cost to the mill is $90. If ten tons are rolled, the cost of the change remains the same but the per ton cost is considerably less. Therefore, the warehouse adds a great service both to the mill and to the consumers in eliminating changes to the mill as over a period of time constant mill changing would be bound to result in increased prices of all materials. Each then, mill and warehouse, have a well defined place and when either one attempts to take over the function of the other everyone loses, and the customer is usually poorly served."

He believed that the steel warehouses are going to play an especially important part in reconversion. "Many small manufacturers have been and are thinking of new postwar products; size and gage requirements will not be definitely known immediately, and many will not be in position to order mill quantities until requirements are definitely established."

Mr. Bible pointed out that three Philadelphia steel warehouses have been in existence a hundred years or more: Horace T. Potts Co., established in 1815; Morris Wheeler & Co. Inc., 1828; and W. F. Potts Son & Co. Inc., 1833.

J. J. Hill Jr., Hill, Chase & Co., presided as head of the Philadelphia chapter.

Eleven Months Pig Iron Output Above 1943 Period

Production of 4,904,011 net tons of pig iron and ferroalloys in November was lowest for any month in 1944, September and November being the only months to fall below 5 million tons. In November, 1943, output was 5,096,099 tons. Not since June, 1943, has so small a tonnage been made in any month, production in that period being 4,836,283 tons.

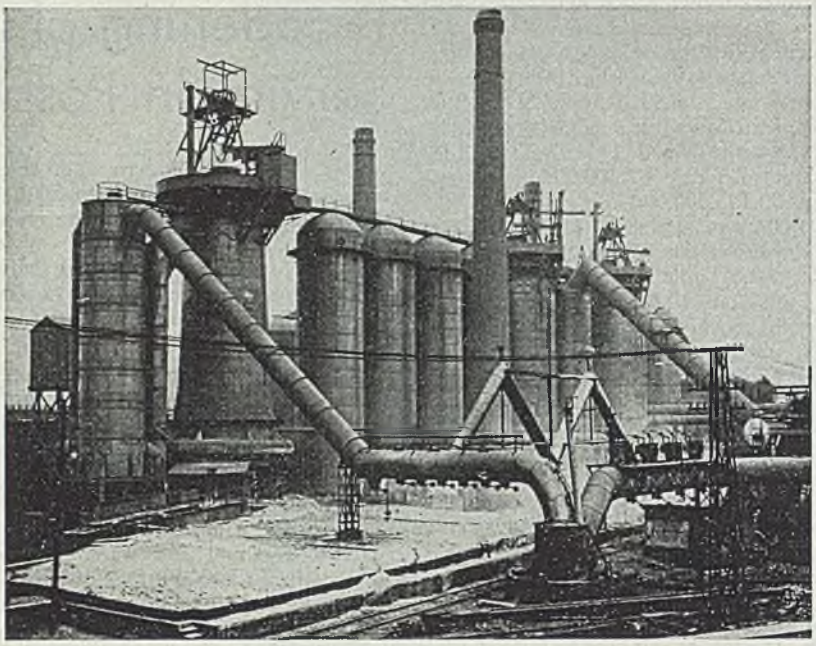
Total output for eleven months of 1944 was 56,940,719 tons, compared with 56,564,378 tons in the corresponding period in 1943. This indicates that total 1944 production will be only slightly greater than in the prior year. Details of production by various districts and percentages of operation are presented in the following compilation by American Iron and Steel Institute, New York.

	Pig iron	Ferro, spiegel	November	Total Year to date	Per cent capacity
Eastern	874,115	24 886	899,001	10,406 594	85.9
Pittsburgh-Youngstown	1,968 559	19,126	1,987,685	23 258,834	90.1
Cleveland-Detroit	509 216	.....	509 216	5,711,382	93.7
Chicago	1,012,128	.....	1,012,128	12,062,768	87.7
Southern	332,814	19,329	352,143	3 940,765	85.2
Western	143,838	.....	143,838	1,560,376	61.7
Total	4,840,670	63,341	4,904,011	56,940,719	87.6

American Iron and Steel Institute. During 1943 companies included above represented 99.5 per cent of total blast furnace production.

Britain's Industry Meets Test

Steel production during war betters prewar average through trade adjustments and utilization of low-grade ores



Three blast furnaces of the Cargo Fleet Iron Co. Ltd., Middlesbrough, England, are shown above. The iron is cast in open pig beds, one of which is shown in the foreground

LONDON

REMOVAL of the statistical blackout by the publication of a government white paper entitled "statistics relating to the war effort of the United Kingdom" has shown the tremendous effort which the nation at war and literally under fire from the enemy has made during the space of five years.

Prominent in the picture is the way in which Britain sacrificed her export trade in order to produce munitions. The number of persons employed in the engineering, metals and chemical industries at the beginning of the war was about the same as that attained at the end of the last war. Since 1939 these industries have been engaged almost entirely on the output of munitions and warlike stores, and at the same time, have increased their labor force from three to five millions in the five years.

One of the important problems has been to meet the demand of the munitions and other industries for essential raw materials and at the same time to economize in the use of imported raw materials and semifinished products. This has been particularly important in the case of the iron and steel industry which had previously relied on large imports of iron ore. To this end the home output of iron ore has been increased by more than one half since before the war. In spite of the fact that this has meant using low-grade home ore instead of high-grade imported ore, the output of pig iron has been maintained at a high level. The average for 1935 to 1938 was 7,350,000 tons. It touched the peak in 1940 at 8,205,000 tons and dropped in 1943 to 7,187,000 tons.

The total steel production has been consistently above the prewar average, notwithstanding the need to increase greatly the proportion of alloy and high-grade steels produced, so limiting the increase in imports which the activity of the munitions industries would otherwise have made necessary. Output of steel ingots and castings in 1935 to 1938 averaged 11,256,000 tons; since then it has been about the 13 million mark and for 1943 was 13,031,000 tons. Another substantial contribution to the domestic supply of steel has been made by a severe curtailment of exports of steel products.

In order to save shipping, salvage of many kinds of scrap and waste has been intensified and the collection of iron and steel scrap for steelmaking was one-third larger than before the war. Imports of steel and steelmaking materials as a whole were maintained in the first two years of the war to meet the expanding requirements of the munition industries, but by 1943 they had been cut to about three million tons below their prewar level.

Iron Ore Imports Reduced

The greatest economy in shipping was obtained by reducing imports of iron ore and scrap, while importing more finished and semifinished steel. Imports of pig iron rose from 354,000 tons in 1939 to 971,000 tons in 1941 and fell to 361,000 in 1943; only 5000 tons of scrap were imported in 1943 compared with 605,000 tons in 1939; 17,000 tons of steel ingots came in on the average in each year from 1935 to 1938; in 1943 Britain imported 499,000 tons. The big increase in importation of semifinished steel is shown by the fact that in 1939 the imports were 807,000 tons and in 1943 1,063,000 tons. Again in 1943 the imports of finished steel were 737,000 tons.

During the first two years of war it was necessary to keep up exports in order to pay for imports of food, raw materials, and munitions needed from abroad. Since 1941, however, the assistance from the United States, and Canada under lend-lease and mutual aid has reduced this necessity. Attempts have been made as far as possible to export goods which do not make great demands on manpower. The amounts of iron and steel manufactures, machinery and coal sent to overseas markets have been drastically cut. Iron and steel manufactures only reached the total of 134,000 tons as compared with 1,915,000 tons in 1938.

The announcement by Prime Minister Churchill that as from the beginning of 1945 iron and steel will be removed from the lend-lease arrangements has been welcomed by the steel industry. The point of most interest is the prospect of getting busy again on export trade. For a long time it has been next to impossible either to produce or plan for export. With the defeat of Germany, there will be a substantial curtailment of lend-lease imports, and some relaxation in the matter of manpower needed for munitions factories. At present there is some idle capacity in some branches of the industry, and although the labor position generally is tight in Britain, there are instances of men being paid off. The question of shipping is also another all-important problem. Another point may be the trade and tariff policy of America herself. But the promise made by Mr. Churchill is a strong incentive to producers to go ahead with plans for export. The vexed question of controls must loom largely in the picture. Controls will be necessary to determine what part of Britain's imports is to be consumed at home and what part devoted to manufacture for export. All these and many other problems indicate that the way of the exporter is still difficult, but the possibility of a revival may now be in sight.

New Zealand Plans Ten Year Construction Program

A ten-year plan for all state construction activity is being prepared by the Department of Works and Railways, New Zealand. The aim is to plan ahead all future jobs to be undertaken by the department.

Two British Tin Plate Producers Merge To Bolster Postwar Position

Major portion of Britain's tin plate output will be controlled by new organization formed by consolidation of Baldwins Ltd. with Richard Thomas & Co. Industry needs considerable modernization

MERGER of the two largest producers of tin plate in South Wales, recently announced, will mean the major portion of the tin plate output in Britain will be controlled by the new organization.

The two firms, Baldwins Ltd., and Richard Thomas & Co. Ltd., have agreed on terms of amalgamation, under which Richard Thomas & Co. Ltd. will acquire from Baldwins Ltd., as from Jan. 1, its fixed assets, including its steel, sheet and tin plate businesses, also its manufacture of aluminum sheets and sections, alloy steels, steel tanks, cisterns etc., and its colliery undertakings together with the goodwill attaching thereto, its stocks and work-in-progress and certain other assets including £300,000 in cash (subject to adjustment), all the fully-paid £1 ordinary shares held in Guest Keen Baldwins Iron & Steel Co. Ltd., and the 90,000 fully-paid £1 shares in the Elba Tinplate Co. Ltd., and all Baldwins' shareholdings in subsidiary and other companies except such of the latter as it has been mutually agreed that Baldwins shall retain.

Baldwins Will Retain Holdings

Baldwins will retain its holding of notes and preference shares in Guest Keen Baldwins Iron & Steel Co. Ltd., together with certain other investments of no trading value to the operating company and the bulk of its cash after ingathering the debts due to it and discharging its liabilities including taxation up to Dec. 31, 1944.

The consideration for the purchase is £5,666,668 to be satisfied by allotment by Richard Thomas & Co. Ltd., to Baldwins of 8,500,000 ordinary shares of 6s 8d each fully paid taken at the price of 13s 4d share—such shares to rank for proportionate dividend as from Jan. 1, 1945—and discharge by Richard Thomas & Co. Ltd., of certain liabilities of Baldwins totalling £124,375.

In a statement to its stockholders, Baldwins states that prior to the war the board had given serious thought to future methods of manufacture of tin plate and sheets, due to the introduction of the strip method of rolling. With the end of the war in sight further consideration has been given to methods, but on examination it has been found that they were not economical either in capital or operating costs and that larger operating units were necessary. Hence the decision to link with one or more operating companies. Further, in order to furnish modern strip material during the immediate postwar period it would be highly desirable to join with a concern now actually producing that material.

A large part of the tin plate trade, and the sheet trade has to be modernized and in the board's opinion the amalgamation will assist the trades as a whole and make possible further developments on reasonable terms and these should be of value to the nation.

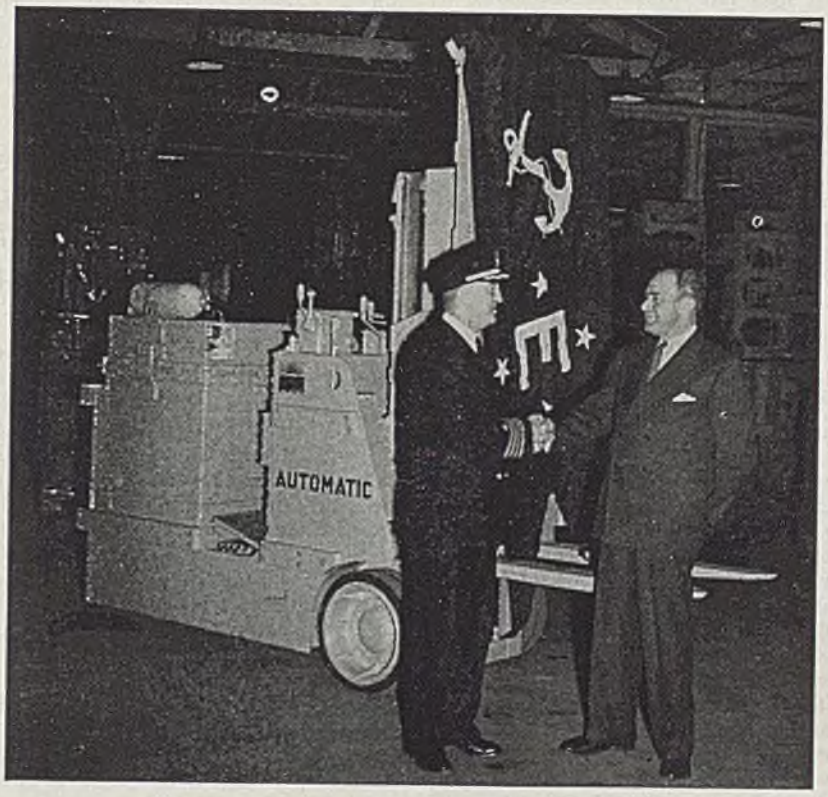
The board of Richard Thomas & Co. Ltd., states that from the national aspect the paramount advantage of the fusion is that it will accelerate materially the steps necessary to rebuild export trade, particularly in the tin plate industry. One of these steps is the extension of the continuous strip mill process, and this together with the general modernization of plant in Britain is urgent. These prospective developments, involving as they do operation by very large physical units, entail expenditure and administrative problems of a magnitude which demands the pooling of resources, information and technical knowledge, and the mass production character of modern plants also requires that new capacity should not materially outdistance foreseeable demand. The two companies will work in the closest collaboration, and the cash resources of both companies will be used to further mutually agreed programs of development.

Another advantage of the proposed fusion is that it will probably assist in the solution of the problem of redundancy, which has in the past been a hindrance to further modernization of plant.

In South Wales it is felt that this amalgamation is the forerunner of programs which will be put forward in the reorganization of the tin plate industry, and that plans for the erection of modern strip mill plant will be submitted at an early date.

Association Registered To Export Rail Equipment

The Steam Locomotive Export Association Inc. has filed papers under the export trade act (Webb-Pomerene law) with the Federal Trade Commission for exporting steam locomotives, tenders, accessories and parts. The association has offices at 30 Church street, New York, and in the Broad Street Station building, Philadelphia. The commission reports that 48 export trade associations are now registered with it under this law.



FOURTH SILVER STAR: Navy Department awarded fourth silver star Navy "E" to Automatic Transportation Co., Chicago division, Yale & Towne Mfg. Co. It was presented by Capt. James C. Byrnesk Jr., U. S. N., and accepted by Elmer E. Twyman, general manager of the company.

Heavy Snows, Cold Disrupt War Production in Northern Areas

Absenteeism mounts as workers are unable to obtain transportation. Mining and shipping of coal curtailed. Some coke ovens closed. Processing of scrap interrupted. Pig iron supplies grow tighter, due to weather and manpower shortage

HEAVY snowfalls in many sections, accompanied by severe cold, last week cut deeply into war production. Absenteeism and tardiness in war plants was higher; mining and shipping of coal was adversely affected; transportation was disrupted; processing of scrap in some yards was interrupted. Particularly affected were the Buffalo, Cleveland and Youngstown districts; lesser effects were experienced in other areas.

Adverse weather conditions not only have sharply curtailed coal mining operations, materially slowed transportation, but have forced a substantial delay in unloading the frozen coal from freight cars. Steel producers have an estimated average stock of 5 days' supply of by-product coke. In some localities a temporary shortage of gas for furnace operations in both steel plants and finishing mills also developed.

This situation resulted in the closing down of numerous coke ovens. The national steel rate last week was down a half point from the pre-holiday level, at 95.5 per cent of capacity.

A number of steel interests have requested the solid fuels administrator to allocate coal from the southern producers for blast furnace operations, and in a few other instances much reshuffling of interplant inventories has been necessary to maintain operations even at the lower levels. The same shifting of coal stocks, on a loan basis, has also taken place between steel companies.

Regulations Tighten Supply

Bituminous coal is now being distributed under regulations instituted last summer by the solid fuels administration, which limit Southern Appalachian bituminous coal for domestic use by one-tenth of last year's consumption. They also give coke, by-product and steel plants first call on the Southern Appalachian coals, provide that domestic heating needs be served next, and place the railroads and other industries in third place, leaving them to depend heavily upon alternative coals.

Steel producers are not only concerned about adequate coal supplies over the winter months, but point out that the unusually severe weather has sharply held up the processing of scrap through dealers' yards. The latest Bureau of Mines report as of Nov. 1, shows stocks of purchased and home scrap totaled 5,832,000 gross tons, the lowest level since September, 1942. Consumption of scrap during October rose to the highest level since last March, totaling 4,684,000 tons. At least one mill reports open hearth operations will have to be curtailed unless a marked improvement in incoming shipments of good open-hearth grades develops soon. Quantity of production scrap received from metalworking plants has also tended downward recently.

To assure an adequate supply of carbon steel scrap for production of war materials in electric furnace and acid open-hearth steel plants and iron and steel foundries, the War Production Board has issued an amendment to preference order M-24, restricting all basic open-hearth steel ingot producers from accepting further shipments of electric furnace and foundry steel scrap. Program changes for the military have either curtailed or eliminated the production of certain desirable types of steel scrap.

Some steel interests are fearful they may not be able to produce enough iron for the merchant trade unless the combined factors of severe winter weather and manpower supply improve. The West coast particularly is experiencing a pig iron shortage, as evidenced by the fact that some midwestern and eastern producers have been sounded out as to the feasibility of shipping iron to that locality. On a nation-wide basis there are 22 blast furnaces idle because of the lack of manpower or excessive high cost production; six additional furnaces are being relined. Consumers are estimated to have about 45 days' supply of pig iron, while producers' stocks vary between 15 and 30 days. Overall producers' inventories at around 650,000 tons represent a drop of about 100,000 tons in the past year.

Latest available figures show November pig iron output at 4,904,000 net tons, against the high last year of 5,434,000 recorded during March.

Steel producers are not concerned over the iron ore supply outlook. Although stocks are 5 million gross tons below a year ago, consumption is also less and stocks are expected to represent about 20 days' supply at the opening of navigation this spring.

More Extensive Use of Farm Machinery Urged

The Brazilian government has taken steps to promote wider use of farm machinery. The government's program includes the purchase of tractors, plows, harrows, threshers, and other implements which are loaned, sold, or rented to farmers throughout the country.

Luria Bros. Effect Management Changes

Herbert B. Luria sells interest in firm. Company, largest scrap broker and dealer in country, is headed by A. L. Luria

THE entire family stockholdings of Herbert B. Luria in Luria Bros. & Co. Inc., Philadelphia, have been sold to A. L. Luria, Atlantic City, N. J., it was announced last week. The largest broker and dealer in iron and steel scrap in the United States, the company has branch offices in Reading, Lebanon and Pittsburgh, Pa.; Boston, New York, Cleveland. Detroit, Chicago and Houston, Tex., and plants in Coatesville, Lebanon, Reading, Pittsburgh, and Detroit.

Following acquisition of the family holdings of Herbert B. Luria in the company, A. L. Luria, president, announced the retirement of Herbert B., William F. and David Luria, as officers and directors.

Joel Claster was named to succeed Herbert B. Luria as executive vice president. Robert B. Clymer, Reading, Pa., was named a director and vice president, and the following, each of whom has been associated with the company for more than 20 years, were named vice presidents: William J. Luria, Philadelphia; Joseph E. Jacobson and Amos Bowman, Pittsburgh; Herbert Biel, Chicago; George I. Stout, Philadelphia, and William H. Hundt, New York.

A. L. LURIA

H. L. Luria succeeds William F. Luria as treasurer, and William L. Forebaugh has been named secretary. Both are of Philadelphia.

Additional Manpower Required To Meet "Must" Steel Needs

WPB reports overall steel demand in first two quarters will hold at about 16 million tons but that manpower shortages and overtaxed facilities may put some products in critical group. Lead and tin supplies remain critical; copper and zinc, "comfortable"

ADDITIONAL manpower must be channeled to the steel industry if "must" requirements of the armed services are to be met for such steel products as shell steel, wire rope, communications wire and castings, officials of the War Production Board's Steel Division said last week.

Even a moderate increase in experienced manpower, they added, would enable the steel mills to meet all critical programs on schedule.

Overall steel demand in the first two quarters of 1945, based on claimant agency requirements, is expected to be unchanged from the fourth quarter 1944 estimate when carbon and alloy production of about 16 million tons balanced essential needs. However, manpower shortages and overtaxed facilities may put a number of steel products in the critical group.

WPB's report on the metals and minerals supply situation revealed further: With military needs soaring monthly and with exports to our allies increasing, the lead situation will become more severely critical in 1945; tin remains critical, with demand still exceeding available supplies; labor is the limiting production factor in aluminum fabricated products; magnesium presents no immediate supply problem; copper production and requirements are in balance; and the zinc position is "still comfortable."

The revised view of the war's probable duration is evidenced by the Army's stepped up demands for carbon shell steel extending throughout 1945. Shell steel production is expected to reach 400,000 tons monthly at the end of the year. A large part of the additional tonnage will be needed for 105 millimeter and higher caliber shells.

Steel mill schedules will be reshuffled somewhat to accommodate the ammunition program. Increases in shell billets and other types of steel for this program will cut into first quarter output of quality carbon bars, semifinished, rails and structural steel at some mills. Quality "hot topped" steel will be in increased demand for this program which may reduce supplies of quality steel available for the seamless pipe and tube mills.

Communication wire has been consumed on the western front at a rate far beyond calculated expectancy. With scheduled 1945 requirements of assault, field and tactical communication wire running 30 per cent over 1944, these products are expected to continue on the critical list throughout most of the year.

Production of wire rope and strand has shown improvement for three successive months and recently topped the previous 1944 peak production established in May. However, military demand for wire rope and strand is expected to keep these items on the critical list throughout 1945.

Recent critical tieups in malleable and gray iron castings have been eased by the Steel Division through moves to identify orders for urgent programs and through plans to aid foundries in unwinding production kinks.

The supplemental maritime shipbuilding program, when put into effect will hit the plate mills hardest during the second quarter of 1945. Increased landing mat demands, however, may bring about an overtaxed situation on many sheet and strip mills relatively early.

In addition, the "must" brass strip program which exceeds mill capacity by about 15 per cent may necessitate use of some steel rolling facilities for brass.

Aluminum and Magnesium: Despite accumulation of ample stocks of both aluminum and magnesium ingots in 1944, the most significant development in the light metals industry is the recent upswing in military demand for aluminum fabricated products. Aluminum fabrication dropped 25 per cent from the peak in March, 1944, to October, 1944. After this drastic decline in production, it will be difficult to reverse the trend in 1945 due to manpower shortages.

Shipments of all aluminum products, except ingot and powder, declined from a high of 203 million pounds in March, 1944, to 152 million pounds in October. Requirements for sheet have jumped about 50 per cent in the first quarter of 1945.

Production of primary aluminum ingots

(*Please turn to Page* 160)

POSTWAR PREVIEWS

STEEL PRICES— Advances on some products to be permitted by OPA following approval of wage increases. New prices not expected to be high enough to cover all steelmaking cost plus a profit under postwar operating conditions. See page 49.

FOR WAR AND PEACE— Consideration of numerous legislative measures to intensify the war effort and prepare the country for peace asked by James F. Byrnes, director of war mobilization and reconversion. See page 52.

WAREHOUSES— Steel distributors' service expected to be broadened after the war. See page 53.

GREAT BRITAIN— English steelmakers look forward to defeat of Germany when gradual revival of export trade may be started. See page 54.

CONTRACT TERMINATION— More financial aid sought for small companies with canceled contracts. Procurement officers concerned over manufacturers' delay in preparing inventories and filing claims. See page 58.

WESTERN STEEL— New mills, fabricating plants, foundries raise hopes of westerners for heavy manufacturing industry after the war. Market studies underway. See page 76.

DEEP FILLET WELDING— With predetermined angle, travel rate, and amperage, deep fillet welding offers new economies and increased speed for many production-line welding operations. Welding footage is increased two to three-fold, electrode consumption is reduced by two-thirds. See page 86.

CUTTING GEARS— Featuring almost completely automatic operation, a gear cutter having the speed of modern gear-finishing machines employs radially fed form-tooth blades to cut all teeth simultaneously. Rough and semifinish cutting on 60 to 100 or more gears per hour now possible. See page 112.

LAMINATING STEEL AND CUPRONICKEL— Process conserving nickel and copper for war also shows possibilities for peacetime applications. Super-clad products unusually resistant to vibration and corrosion. See page 114.

More Financial Aid for Small Firms With Canceled Contracts Sought

Procurement officers concerned over contractors' procrastination in preparing inventories and filing claims. Fast settlement necessary to assist other war production and also to shorten period needed for reconversion

CAREFUL inquiry has as yet failed to uncover the need for any amendments to the Contract Settlement act, states a report of the War Contracts Subcommittee, Senate Committee on Military Affairs, which wrote the bill jointly with the staff of the Senate Special Committee on Postwar Economic Policy and Planning.

"Supplemental legislation, however, is needed to provide more adequate financial assistance for small businessmen during the reconversion period," says the subcommittee. "The fundamental need of many small manufacturers with terminated war contracts will be reconversion loans, based upon a liberal appraisal of their future business prospects. Such loans would eliminate much of the accounting and verification problems involved in termination loans. In one transaction, they would meet all the reconversion needs of a small company, including, among others, interim financing on termination claims.

"At the present time, the Smaller War Plants Corp. is not authorized to make reconversion loans. Its authority is limited to loans for war and essential civilian production (Public Law 603, 77th Congress), termination loans (Public Law 395, 78th Congress), and surplus property loans (Public Law 457, 78th Congress). It is recommended, therefore, that the Smaller War Plants Corp. be authorized to make or guarantee reconversion loans to small business concerns for any type of civilian production."

Recommends Prompt Action

The report goes on to recommend that prompt action be taken by the 79th Congress to extend the life of the Smaller War Plants Corp., now due to expire June 30, 1945. "Delay in the extension of the corporation's life," it says, "would impede the development of an adequate organization to assist small businessmen with terminated contracts."

The report expresses some impatience with the progress so far made by the Office of Contract Settlement in setting up a "genuine" organization, and hopes that the men required to complete the organization will have been recruited within two months. The OCS, it says, has made much progress in promulgating policies and regulations; it now should concern itself with how its policies and regulations are being carried out by the various contracting agencies. The OCS, it says, must avoid an "ivory-tower" psychology which characterizes so many "policy-makers." Among other things, it must bring about "a very drastic improvement" in the current system of statistical reporting by the contracting agencies, which "in the case of some of the agencies, is little more than a temporary makeshift."

Vigorous action on the part of the OCS, says the report, is needed particularly to protect subcontractors. Congress set forth a variety of methods for dealing with subcontractors; so far, the report complains, the OCS and the contracting agencies have only begun to explore some of these methods. There also is still much to be done, it points out, in the termination departments of prime contractors.

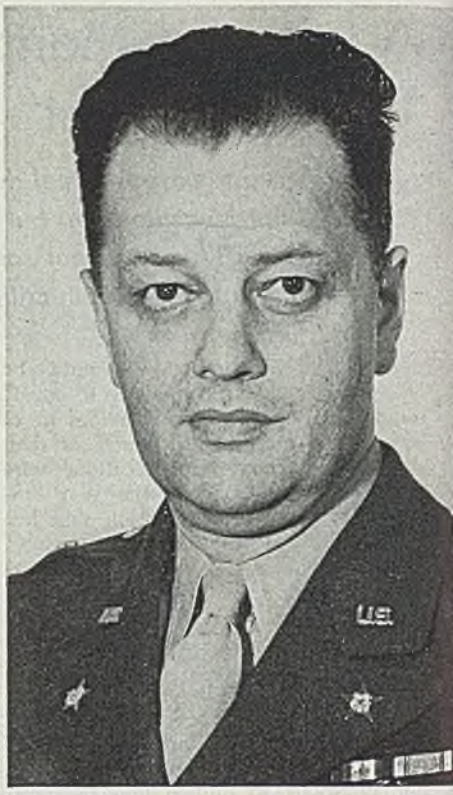
Termination Settlements Lag

Meanwhile, Army, Navy, Maritime Commission and Treasury procurement officials are concerned over the slowness with which terminated contracts are being settled. Most to blame, they contend, are the contractors themselves, who delay the preparation of inventories and the filing of claims.

Total terminations by the departments from Pearl Harbor through Oct. 31 amounted to $23 billion. This total included some $6 billion worth of cost-plus-a-fixed-fee contracts; of these contracts only $1 billion have been settled and the remaining $5 billion still are pending. The total included some $17 billion worth of fixed-price contracts, of which $9 billion have been settled and $8 billion still are pending. Many of these unsettled contracts have been pending since 1943.

This is an unfortunate situation, procurement officials say. Fast settlement is necessary for two reasons: First, fast settlement is necessary to assist war production. Since Pearl Harbor, they say, vast progress has been made in bettering our armament; this process, which will be continued as long as the war lasts, necessarily makes it necessary to terminate contracts and replace them with new ones on a large scale. In other words, effective prosecution of the war makes it necessary to clear plants of terminated contracts in order to make way for the new jobs ahead.

Second, the postwar reconversion period always looms ahead. The end of the war today is nowhere in sight; some day, however, there will be terminations on a wholesale scale, and the need for reconverting back to a civilian economy, at least on an appreciable scale, will become paramount. The contractor who does not co-operate in making it possible to



BRIG. GEN. D. N. HAUSEMAN
Director, Readjustment Division, Headquarters, Army Service Forces

reach prompt settlements at this time is storing up trouble for the reconversion period ahead, for the country, and for himself.

"The contractor who waits until the 11th hour is not going to be first," says Brig. Gen. D. N. Hauseman, director of the Readjustment Division, Army Service Forces. "He is going to be last; last in line, last to get paid, last to get his plant cleared and, therefore, last to get into peacetime production . . . He can avoid being last if he starts—today."

Another officer, who cannot be quoted, carries this thought a little further. "If more terminated contractors do not get their inventories together and their claims in," he says, "it looks as though we will have to begin to drive and heckle them. These terminated contracts must be settled, and promptly."

Despite all that has been said on the subject, procurement officers point out, not all prime contractors as yet have gotten themselves organized for termination settlements. Each prime should know how to process or make up his claims, how to process inventory and make up inventory schedules, know how to go out and dispose of material, and generally be expert in termination settlement procedure.

Not only are prime contractors slow about seeking settlements on their own account, but many of them are lax as to their responsibility in preparing their subcontractors for termination. In a recent survey, for example, the Army found that more than half the subcontractors in the Boston area were wholly unaware of

It is reported that . . . . . .

So tough is one new kind of glass that a searchlight lens made of it resists the heat of an 800 million candlepower lamp even though snow falls on the outside. *"Tuf-flex", Libby-Owens-Ford.*

get ready with CONE for tomorrow

Thermite (as used in incendiary bombs) has been applied to the demolition of metal structures. *McGraw-Hill Overseas Digest.*

get ready with CONE for tomorrow

A new magnetic floor sweeper for factories looks like a lawn mower and picks up nails, scrap, small parts, and tools. *Stearns Magnetic Mfg. Co., Milwaukee.*

get ready with CONE for tomorrow

One of our aircraft manufacturers has complete plans for fitting a new fuselage, with luxurious interior, to the wings and engines of war-time bombers. *Consolidated Vultee Aircraft Corporation.*

get ready with CONE for tomorrow

In a newly-designed twelve-story parking garage, a single attendant can put away or bring out any one of 110 automobiles by merely pushing a button. *Park-O-Mat Co., Los Angeles.*

get ready with CONE for tomorrow

Plans are well advanced for annual trade fairs, on the European plan, in several American cities. *Bureau of Foreign and Domestic Commerce, Washington, D. C.*

get ready with CONE for tomorrow

Two hundred police chiefs recently witnessed a demonstration of a tiny radio receiver about the size of a pack of playing cards. *Hytron Corporation, Salem, Mass.*

get ready with CONE for tomorrow

The "Axonograph" is a device that photographically produces an axonometric drawing directly from a blueprint. *Glenn L. Martin Co., Baltimore.*

One manufacturer of electric appliances is already displaying his post-war models in order to gauge public tastes and preferences. *Proctor Electric Co., Philadelphia.*

get ready with CONE for tomorrow

"Fly-it-yourself" service is being planned on a basis similar to that of the familiar rented automobile service. *R. S. Robie, Boston.*

get ready with CONE for tomorrow

A "slot-machine" mail box accepts payment, stamps a letter and holds it for collection. *"Mailomat", Pitney-Bowes, Stamford, Conn.*

get ready with CONE for tomorrow

A new molding plastic is non-organic and will stand heat to 420° centigrade. *Mycatex Corp., Clifton, N. J.*

A new chemical, when sprayed on the soil of gardens, is absorbed by the plant and kills many insects and fungi. By this means potato crops are said to have been increased as much as 40 bushels per acre. *Rohm and Haas Co.*

get ready with CONE for tomorrow

A prominent scientist states that he believes that a temperature of absolute zero (—273.1° C.) may soon be attained. *Prof. Peter Debye, Cornell Univ.*

get ready with CONE for tomorrow

The new space-saving square milk bottles are already in use by one dairy. *Sanitary Farm Dairies, Cedar Rapids, Iowa.*

get ready with CONE for tomorrow

An electric motor has been built that develops 30 horsepower and weighs only 57 pounds. *General Electric Co.*

get ready with CONE for tomorrow

Paper forms for poured concrete are being used. *Sonoco Products Co., Hartsville, S. C.*

the problems involved; they were ignorant of such important matters as to how to make out claims, how to submit them properly, and how to get them reviewed and settled with despatch.

Many prime contractors, it is found, are guilty of such violations as holding up payments to subcontractors until they themselves get their claims settled. A case is cited where a company with 100 terminations in 1943, valued at $36 million, still is keeping its subcontractors waiting for their money. Another prime has 12 claims over six months old, and under these claims 185 subcontractors have not yet been paid. Still another prime has 40 claims, aggregating $1 million, and continues to have 250 subcontractors with less-than-$10,000 claims unpaid despite the fact that he has been authorized to settle all claims coming to less than $10,000.

A new joint Army-Navy termination regulation known as "JTR" has one provision which, in the opinion of General Hauseman, makes it inexcusable for prime contractors to hold up payments to subcontractors. This is an instrument known as "delegation of authority." Under it, the prime contractor is given blanket power to settle subcontractors' claims, to make partial payments to subcontractors, to allow subcontractors to dispose of termination inventory. The "delegation of authority" device was arranged to permit prime contractors to deal with the subcontractors with despatch, and to enable them to act without the necessity of going back to the procurement agencies for decisions. It is of interest to note that so far only a few hundred prime contractors have availed themselves of this means of making settlements with subcontractors.

Explains "Delegation of Authority"

In view of the importance of this new "delegation of authority" provision, the following comments on it by Rear Adm. Harry L. Merring, deputy chief, Industrial Readjustment Branch, Office of Procurement and Material, of the Navy, should prove of help to many contractors and subcontractors.

"First, contractors can sell or retain any item of termination inventory at cost without getting approval from the contracting officer or the higher-tier contractor. Second, substantially similar articles in the contractor's termination inventory at any one location, having unit cost of more than $100, can be retained or sold by the contractor up to a total amount of $5000 or 20 per cent of the total inventory cost. Third, the contractor can approve finally the disposal of the termination inventory of a subcontractor, without approval from the contracting officer, in any case where the subcontractor's settlement proposal is less than $10,000.

"In this case, if you sell or retain property at less than cost, the price should be one you consider fair and reasonable. It should be such a price as you would approve if the government were not involved. Naturally this delegation does not extend to transactions between affiliates."

Under a delegation of authority, Admiral Merring goes on to explain, a war contractor "may settle finally the claims of his subcontractors within certain limitations; most contractors will be authorized to settle the claim of a subcontractor involving not more than $10,000 without deducting disposal credits. This is possible where all inventory is retained by the sub, is sold by the sub, or the prime, or is accepted by the government." Four-fifths of all subcontract settlements are expected to involve less than $10,000, he says, so that this arrangement offers great possibilities for speeding up settlements in general.

Furthermore, he points out, a war contractor may make a settlement with his sub involving a net amount after disposal credits of less than $1000, this to be final for purposes of settling the prime contract provided the sub retains or disposes of all termination inventory.

"JTR" makes provision for what is called a "Consolidated Termination Program" to handle the termination settlements of large contractors dealing with both the Army and Navy. In such cases one service alone will concern itself with all contracts, and its accounting reviews and inventory and other findings will be accepted, in general, by officers of both services. This procedure is expected to speed up settlements and place the least amount of work on the contractor.

Overall Settlement Plan

Another development under "JTR" is the "Company-Wide or Overall Settlement Plan." A single individual representing several contracting agencies is authorized to settle all of their claims arising in a selected plant or corporation, whether these claims arise from the termination of prime contracts of the government or of subcontracts placed by other war producers. This plan, also intended to speed up contract settlements, has raised some administrative and technical problems and is being explored experimentally with a few larger companies.

Of the 30,000 fixed price contracts settled before Nov. 1, 21,000 were settled without claims and 9000 with claims. The popularity of the "no-cost" type of settlement is expected to increase since the Treasury on Nov. 1 ruled that any costs incurred in connection with a terminated contract may be deducted for income tax purposes even though the offsetting asset be waived in the termination claim. Previously the Treasury had held that the terminated contractor had a claim for damage under the termination clause or under common law; it had held that such a claim was an asset to be accounted as income, and that if the contractor chose to give it away that was his tough luck or poor judgment.

Since then the renegotiation officers of the Price Adjustment Board have made a ruling that follows the Treasury ruling; for renegotiation purposes the contractor may include expenses incurred under the terminated contract even though he waives his claim. In the case of renegotiation, however, the contractor is required to waive his claim before signing of the final renegotiation agreement; he cannot waive his claim thereafter.

REAR ADM. HARRY L. MERRING
Deputy chief, Industrial Readjustment Branch, Office of Procurement and Material, Navy Department

The extent to which a contractor can take advantage of the "no-cost" type of agreement depends on the facts in his particular case—on what brackets a company is in, whether its business is renegotiable, how much profit it would have to surrender in the event of renegotiation, and other factors.

One big advantage in reaching a "no-cost" type of settlement, procurement officers say, is that it settles a terminated contract once and for all time. Another reason is that such a settlement frequently leaves in the hands of the contractor inventory materials which he can use to advantage. Another reason is that many of these terminated contracts involve small amounts, making it undesirable to spend time and money in preparing a claim. Another is that terminated contractors usually get new contracts and want to go to work on them without spending time in settling up old contracts. Still another is that unless the claim is substantial, the area in which profit remains after taxes have been paid is too small to bother about.

Many prime contractors are directing the Treasury ruling to the attention of their subcontractors, urging them to weigh the advantages that may result from agreement on a "no-cost" settlement. Procurement officers in calling on terminated contractors in the field in many cases are pointing out to the latter that if they do not care to file claims they have the option of settling on the "no-cost" basis.

"The 'no-cost' settlement," says Gen-

eral Hauseman, "is one of our brightest and newest tools. Why go through the countless maneuvers to collect a several-thousand-dollar termination claim and thus increase your income—and then at the end of the year have the government take it back in renegotiation and taxes?"

Another interesting provision of "JTR" provides for "advance planning and predetermination agreements." These agreements, says General Hauseman, "are simple and logical—and they work." If contractors generally wait until terminations reach a peak, he says, there will not be enough time and enough personnel to settle all claims "in a few minutes." Advance arrangements may be covered by formal agreements which automatically reduce the necessity for negotiations after termination.

To accelerate further the settlement of terminated contracts, the Army and Navy now are establishing joint Termination Co-ordinating Committees in all major war industry centers. Agencies such as the Reconstruction Finance Corp. and the Smaller War Plants Corp. will be represented on them as well. These committees will make for quick interchange of information among the agencies, so that the field representatives of all of them will be able to render maximum assistance to companies involved in terminations. For example, field representatives of SWPC should be in a better position to help small companies.

There is one feature of the termination settlement process on which the procurement agencies have a very definite philosophy. That is the provision under which the contractor, after 60 days, is to call on the government to clear his plant. On this point the philosophy is: "The Lord helps those that help themselves."

The government cannot do this job alone, says General Hauseman. The contractor, he points out, is more familiar with trade channels and sources of sale, and can dispose of a lot of his termination inventory if he puts his sales department to work.

"Storage isn't the answer," says General Hauseman. "We must move termination inventory so it will have some part in new production or have value as scrap."

This particular problem is one to which all the answers have not yet been found. "I believe," says General Hauseman, "that this job of clearing plants and disposing of property is going to require as meticulous an organization, as careful planning, and as much forthrightness as war procurement itself."

Detroit Steel Rolls Strip Up to 22 Inches Wide

In the advertisement of the Detroit Steel Corp., Detroit, appearing in the Jan. 1 issue of STEEL, page 29, the statement is made the company produces cold-rolled strip steel "in all gages up to 27 inches wide." This statement is in error, the company stating it should read, "all gages up to 22 inches wide."

BUILD OWN ARMS: Five of the first group of soldiers stationed at Ft. Sheridan, Ill., to be granted special furloughs to help increase production in Chicago war plants are shown as they look over blue prints of a job in the Clearing Machine Corp. plant. NEA photo

AWARDS

The Army-Navy "E" production award for excellence in manufacture of war materials has been won by the following firms:

Bunting Glider Co., Philadelphia.

Commercial Radio-Sound Corp., New York.

Consolidated Vultee Aircraft Corp., Stinson Division, Wayne, Mich.

Eastern Tool & Stamping Co., Saugus plant, Saugus, Mass.

General Excavator Co., Marion, O.

General Motors Corp., AC Spark Plug Division, Ionia plant, Ionia, Mich.

Goodyear Tire & Rubber Co., Goodyear Clearwater mill No. 3, Cartersville, Ga.

Lyon Metal Products Inc., Chicago Heights plant, Chicago Heights, Ill.

McNaught Metal Products Co. Inc., Chicago.

Noblitt-Sparks Industries Inc., Franklin Division, Franklin, Ind., and Greenwood Division, Greenwood, Ind.

Northern Metal Products Co., Chicago.

Pittsburgh Metallurgical Co. Inc., Charleston plant, Charleston, S. C.

Progress Mfg. Co., Oil Equipment Division, Arthur, Ill.

Reliable Electric Co., Chicago.

Sherrill Research Corp., Peru, Ind.

Thew Shovel Co., Lorain, O.

Utility Trailer Mfg. Co., Los Angeles.

Weatherhead Co., Columbia Products Division, Columbia City, Ind., "E" award.

West & Dodge Thread Gauge Co. Inc., South Boston, Mass., "E" award.

Westinghouse Electric & Mfg. Co., Lima, O., "E" award.

L. A. Young Spring & Wire Corp., Chicago, "E" award.

"Quick-Way" Truck Shovel Co., Denver.

The Reade Co., Lakehurst plant, Lakehurst, N. J.

Regal Electronics Corp., main plant, New York.

Robertshaw Thermostat Co., Youngwood plant, Youngwood, Pa.

Scandia Mfg. Co., North Arlington, N. J.

L. R. Teeple Co., Portland, Ore.

Thompson Products Inc., Toledo Steel Products Co., Toledo.

United States Slicing Machine Co., LaPorte, Ind.

Construction of 186 Ships Is Authorized by Byrnes

Immediate construction of 186 new cargo ships, including 24 Liberty ships for use for "a special military purpose" not yet disclosed, has been authorized by War Mobilization Director James F. Byrnes.

The Maritime Commission will issue contracts for the vessels, all of which are for delivery during the latter part of 1945.

Except for the slow Liberty ships, whose construction has been largely stopped in favor of the Victory models, the newly authorized construction will be cargo ships which have "a future commercial value." They include 20 tankers, each of 16,000 tons and of 141,000-barrel capacity; 102 "C" and Victory types that can accommodate some passengers, and 40 C-1 MAV-1 or small coastal vessels.

Russia Rebuilding Largest Farm Implement Plant

The Krasnaya Zvezda plant of Kirovograd, Ukraine, U.S.S.R., reported by the Soviet press to be the largest agricultural machinery plant in the Soviet Union, had 11 sections restored to operation by late last September.

Wider Distribution of War Contracts Planned by WPB

Government agencies would place orders for critical war goods with plants whose operations are being curtailed by cutbacks. Limited certificates of availability of employment may be issued to cover temporary layoffs

WIDER distribution of war contracts is being planned by the War Production Board in order to concentrate as much of the country's resources as possible on production of the most critically required war items. Substantial losses sustained on the western front since mid-December have re-emphasized the urgent need for many of the "top must" items, including small-arms and heavy artillery ammunition, artillery and gun carriages, aircraft, tanks and self-propelled guns, trucks and components, wire and wire rope. According to J. A. Krug, WPB chairman, the German offensive destroyed a lot of Allied equipment and caused a sizable increase in American production requirements.

A program is being formulated whereby contracts for critically needed arms and munitions items will be channeled into war plants being affected by cutbacks on equipment already amply stockpiled. According to WPB officials, the overall production curve will decline while the curve on the "top must" items will rise.

Recruits Labor for War Jobs

As contracts are completed on equipment now backlogged in sufficient quantities to allow curtailment of production, WPB will attempt to hold these organizations together rather than allow supervisory staffs and labor to disperse. However, in tight labor areas representatives of the War Manpower Commission will go into plants, where cutbacks have released workers, to recruit labor for nearby war jobs and make certain wherever possible that released employes do not accept work in nonessential industries.

Temporary curtailment of production and employment due to plant equipment changes and lags between the end of one contract and the start of a new one presents a special problem in holding working forces together. When such a situation arises, WPB officials are considering granting what would amount to limited certificates of availability of employment, allowing workers to go to other plants for perhaps 60 days, subject to recall at the end of the period.

WPB is developing a system of clearances so that in all local procurement areas there will be an exchange of information on contract termination between WPB and the armed services. Under this system, WPB would bring together manufacturers and the armed services to enable them to determine whether the available facilities can be converted to a new kind of production.

WPB is operating now on the theory that the war in Europe will go on indefinitely, according to Mr. Krug. He pointed out recently that new factories, costing $200 million, have to be built to supply demands for trench mortars and that the factories cannot go into production before next August. If the war ends before August, he added, a good deal of money would be lost, but if the war isn't over by then, "as it probably won't be," the new plants will save many American lives. He also revealed that this country's aircraft program was increased between 4 and 5 per cent during the last 10 days of 1944.

Electric Range Prices To Hold Close to Ceilings

Ceiling prices for household electric ranges will remain generally unchanged when programmed production increases get under way, officials of the Office of Price Administration told industry advisory committee members at a recent meeting. Seven manufacturers already have determined to produce at existing ceiling prices, namely, those of January, 1942, under maximum price regulation No. 64.

Some electric range manufacturers have been in limited production since 1943. Enough material will be available this year to make 140,000 ranges, about one-fourth of prewar annual output, but within this limit production will be authorized by the War Production Board only to the extent that range manufacturers will not interfere with war work.

WPB Revises Control Over Railroads' MRO Purchases

Railroad operators now are permitted to acquire some additional maintenance, repair and operating supplies under the quarterly dollar value quota rather than under the previous unit basis, the War Production Board has announced. An amendment to order P-142 also raises the automatic construction authorization for the laying of railroad tracks or the construction of necessary operating facilities (excluding tunnels, overpasses, underpasses and bridges) from $2500 to $10,000 (excluding cost of labor).

Tunnels, overpasses, underpasses and bridges will retain a $2500 maximum cost limit. Any project over this limit is subject to order L-41 and must be applied for under that order on form WPB-617.

Permission to acquire or use priority materials amounting to more than $10,000 for laying railroad tracks or constructing necessary operating facilities must be applied for on form WPB-617, even though these types of construction do not come under provisions of order L-41.

The effect of the quota amendment to order P-142 is to transfer items previously listed in section D of form WPB-2585 to the related group in section E of WPB-2585. In order to take care of the additional items now transferred to the dollar value quota of section E, the quota is raised from 110 per cent to 115 per cent. However, this change does not represent any increase in the overall quota.

Exceptions Are Itemized

Exceptions to this transfer of items to the dollar value quota are: Air brakes (AB), hand brakes (power), brake beams, couplers and coupler bodies, and track material of the following kinds: Frogs, crossings, switches, switch stands, rail anchors, rail braces, guard rails, guard rail clamps, rods, clip bolts, rail clips and nut locks.

Certain items, including steam injectors, mechanical lubricators, roller bearings (driving box, tender truck, and engine truck), stokers, superheaters and headers, and car bolster springs, are no longer under individual allocations each quarter, but are transferred to the dollar value quota along with the other section D items.

Lead Producers Urged To Requisition More Labor

Lead producers are being urged by the War Production Board to file requisitions for additional labor immediately with their local U. S. Employment Service offices of the Manpower Commission as another step in its plan to increase lead production and channel production into vital war programs.

Regional OPA Offices To Act on Price Applications

Regional offices of the Office of Price Administration have been granted authority to act on applications from sellers of services requesting simplification of the method of determining their ceiling prices. They, in turn, may delegate the same authority to OPA district offices, through which applications should be filed in the future. Sellers of a variety of services who price under the following six regulations may make application for permission to determine ceilings for all services under only one regulation: General Maximum Price Regulation and maximum price

regulations 134, 136, 165, 246, 251.

No authorization may be granted to apply the provisions of price regulation No. 251 to services subject to any of the other five regulations. In the case of suppliers subject to price regulation 134 or 136, the authority may be granted only by OPA's national office if the supplier's sales of services under either of these two regulations exceed $75,000 for the calendar year 1942 or for the fiscal year ending in 1942.

Appointments-Resignations

Edward R. Gay has resigned as assistant vice chairman for civilian requirements, War Production Board.

° ° °

Barclay J. Sickler has resigned as director, Power Division, Office of War Utilities, WPB. V. M. Marquis has been appointed to succeed him. Mr. Sickler is returning to his previous duties with Bonneville Power Administration at Portland, Oreg.

° ° °

Paul B. Valle, New Haven, Conn., and J. E. Moore, New York city, have been appointed deputy directors of the Power Division, Office of War Utilities, WPB.

° ° °

John L. Haynes has been appointed director, Construction Bureau, WPB, succeeding Arthur J. McComb who has been named deputy vice chairman for operations, WPB.

° ° °

Ray Ellis of New York city, formerly director of the Radio and Radar Division, WPB, has been recalled as acting director during the absence of L. J. Chatten, director, who is on sick leave.

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

L ORDERS

LAUNDRY EQUIPMENT: Manufacturers of any type of domestic laundry equipment now may apply for "spot authorization." Any laundry equipment, except ironing machines, that may be made under "spot authorization" may be sold only to fill military orders. Each manufacturer may have in inventory at any one time as many of any type of part intended for repair purposes as he sold in the second preceding quarter. (L-6)

The Veterans Administration has been accorded the same preference status as the Army and Navy in the purchase of commercial laundry equipment, commercial dry cleaning equipment and tailors' pressing equipment. Manufacturers who desire to produce more of this type of equipment and are not situated in the areas where priorities regulation No. 25 has been partially suspended may apply for permission under the order. (L-91)

BITS: Electricians' wood-boring bits, conforming to specifications as to styles and sizes, now may be manufactured in addition to the 21 types of wood-boring bits already permitted. Electricians' bits are included as type 15a in appendix A of schedule VIII of the hand tools simplification order. (L-157)

INDEX OF ORDER REVISIONS

Subject	Designations
Bits	L-157
Cans	M-81
Laundry Equipment	L-6, L-91
Lead	M-38
Price Regulations	
Machinery Equipment Rentals	GMPR

M ORDERS

LEAD: Most civilian uses for lead will be restricted to the annual rate of 60 per cent of the 1944 level through a complete revision of order M-38. Restrictions and availability of lead are defined in the revised order under three new lists. List A outlines all prohibited uses (with certain minor exceptions). List B classifies the end uses for storage batteries, cable covering, tetraethyl and ammunition for military use only, for which lead will be 100 per cent available. Lead will also be unrestricted for solders, bearing metals, brass and bronze. Under list C, which embraces the greater portion of civilian uses, lead is restricted in the first quarter of 1945 to 30 per cent of the amount used in the first half of 1944, or at 60 per cent annual rate. As of January, 1945, monthly reports on a revised form of WPB-95 will be required and a request for lead for February delivery from Metals Reserve Co. imports must be made on a special interim form. (M-38)

CANS: Restrictions on the use of metal for cans and closures for glass containers have been changed to permit use of steel. Packers now may use untinned steel, without quota restrictions. Manufacturers must supply military requirements and needs for the food pack before producing other types of cans. (M-81)

PRICE REGULATIONS

MACHINERY EQUIPMENT RENTALS: Ceilings have been established on a uniform basis for the prices that the Reconstruction Finance Corp. may charge when it rents machinery equipment. Charges that RFC can make when it rents any other type of equipment have been exempted from price control. The annual rental ceiling on machinery equipment will be 35 per cent of the cost of acquisition of the item by RFC. Articles for which rental charges will be exempt include transportation items, such as trucks, buses, trailers, tugboats, launches and barges; and miscellaneous equipment, such as desks, chairs, office fixtures and cafeteria equipment. The machinery items are all those, except transportation facilities or equipment, covered by the following regulations: No. 1 (second-hand machine tools), No. 67 (new machine tools), No. 134 (construction and road maintenance equipment rental prices and charges for operating and maintenance or repair and rebuilding services), No. 136 (machines and parts and machinery services), No. 375 (sales of used industrial sewing machines and rental rates for new and used industrial sewing machines). Where the equipment is not rented in place or on an installed basis, charges for installation may be added.

All rentals will be exempt from price control when made by RFC to (1) another government agency, or (2) a contractor for use in carrying out his prime contract with a government agency; and also in the case of (1) personal property when leased or rented together with a sale or lease of an interest in land or building in a single transaction, and (2) building installations, facilities, appurtenances and personal property attached to the land.

On items covered by price regulation No. 134, authority is granted for the determining of ceilings under that regulation if that action is preferred. A procedure is provided also for submitting applications for special maximum prices or exemptions where desired. (General Maximum Price Regulation)

Tin Restrictions Tightened; Use in Tin and Terne Plate Transferred from Steel Division

SALES of jewelry or similar products containing tin will be virtually prohibited after March 1, 1945, through an amendment to order M-43. This drastic action was taken by the War Production Board to smash the black market use of tin.

The amended order further stipulates no purchases of such products from manufacturers for resale is permitted. Previous restrictions were clarified to prohibit the use of tin in snap fasteners and other types of clothing fasteners. Previous rulings also stopped the use of tin coatings for all types of refrigerator trays and shelves.

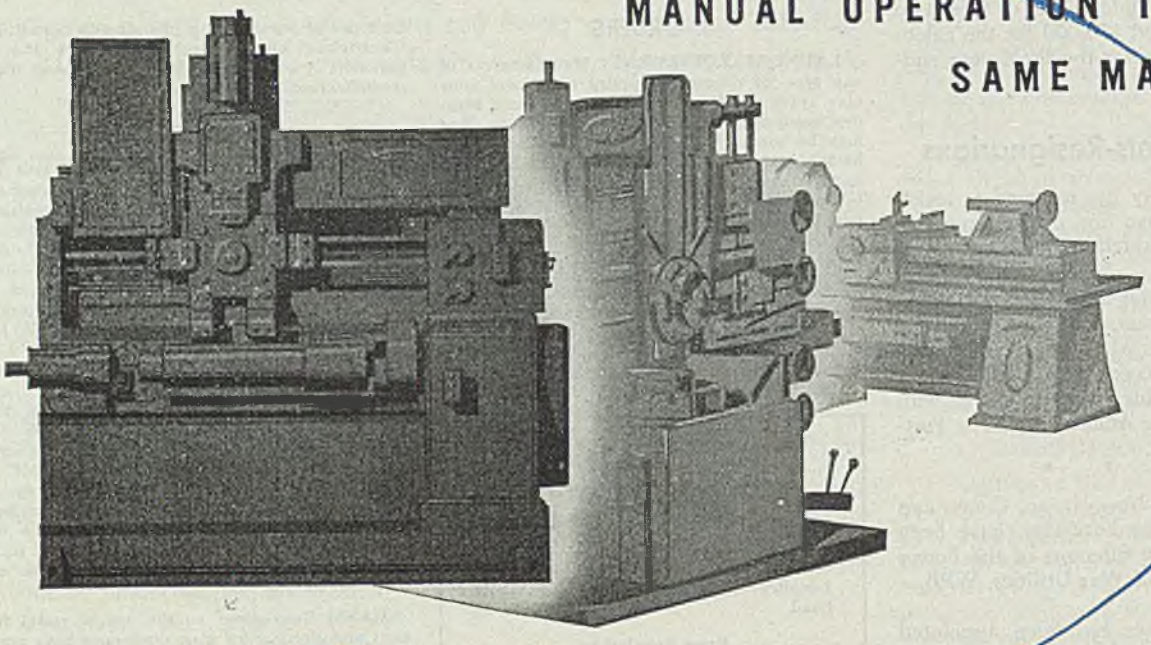
WPB spokesmen stated that this plan to control retail sales was established to help preserve the government's stockpile of tin which is rapidly decreasing because of lack of native tin production and because imports are equal to only about three quarters of our primary tin requirements.

To further co-ordinate operations, control of tin used in tin and terne plate, formerly vested in WPB's Steel Division, has been assumed by the Lead, Tin and Zinc Division through incorporating this function in schedule VI of M-43 while the steel order M-21-e was simultaneously revoked. Order M-43-b (solder for repair of gas meters) was also incorporated in the main order.

The amended M-43 order states that use of tin in designated articles on list A (which includes jewelry, novelties, souvenirs, trophies, etc.) has been prohibited since April 30, 1942. None of these articles now can be received from manufacturers for purposes of resale and none of these articles may be sold by retailers after March 1 unless the retailer files with WPB an inventory of all the articles covered under list A that are in his possession on that date.

Under the order's schedule III, which pertains to the use of babbitt metal, certificates now are required in the case of sales and receipts of both babbitt metal and bearings containing babbitt metal of more than 12 per cent tin.

NOW.... 100% AUTOMATICITY COMPLETE FLEXIBILITY... AND MANUAL OPERATION IN THE SAME MACHINE



This new production principle makes automatic control as versatile as manual control . . . and interchangeable with manual control

The Bullard "MAN-AU-TROL" principle of automaticity —as applied to a new Vertical Turret Lathe, for example —makes a manually-operated machine 100% automatic without taking away any of its multi-purpose powers . . . not even its manual operation.

You know the wide range of work a manually-operated machine can handle. With the Bullard "MAN-AU-TROL" applied to it, you can produce the same range of work faster . . . with a degree of repetitive accuracy such as only the elimination of human or cumulative error can effect.

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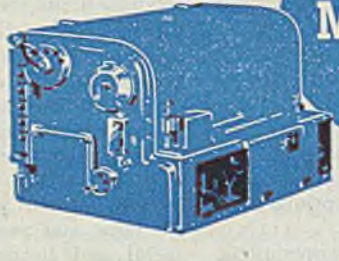
The automatic control that is as versatile as manual control



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By A. H. ALLEN Detroit Editor, STEEL

MIRRORS of MOTORDOM

War production schedules in automotive plants increased to meet heightened battle tempo in Europe and Pacific. Superfortress engines and parts, ammunition, heavy artillery tanks, heavy trucks and other critical items included on revised list

DETROIT

HEIGHTENED battle tempo in Europe has been accompanied by intensified schedules for output of a wide variety of war materiel produced in automotive plants, according to a recent survey rushed through by the Automotive Council of War Production. Included on the revised list are engines and parts for the B-29 Superfortress, ammunition, artillery, tanks, heavy trucks and some other critical items.

The survey, covering auto companies delivering better than $9 billion of war production annually, shows the shift in emphasis to types of equipment which have come into greater demand as the result of recent fighting on both the European front and in the Pacific. At the same time, it is revealed automotive producers hit their top stride on aircraft products in the latter half of 1944, deliveries in the period amounting to 25 per cent of all aircraft production in automotive industry since the start of the war effort. Tank output in the latter half of 1944 also rose, comprising 22 per cent of all tank deliveries since their inception. Some further detailed notes from individual companies:

In response to military demands, one automotive company doubled its output of 105-millimeter high-explosive shells in the half-year period; another received a 50 per cent increase in ammunition schedules; a third, which had been taken out of shell production entirely before the European invasion, has been asked in recent months to resume output of 105-millimeter shells.

Tank Schedules Boosted

A producer of light tanks, undertaking production of a new model, has been asked to increase schedules 377 per cent. A medium tank builder has increased output 27 per cent since June. Still another has received a 54 per cent boost in schedules.

One company, reporting a 23 per cent increase in truck production, notes future schedules call for 56 per cent higher output by May. Another states production of 6 x 6 trucks is up 61 per cent.

Intensification of the drive on Japan is reflected in B-29 schedules. Production of engines for this bomber is up 256 per cent to date, with 365 per cent increase called for by next April. Airframes and parts production for the Superfortress is up 80 per cent in one automotive plant, with schedules calling for a further rise to 160 per cent this year. Reversing a previous trend, production of B-24 Liberator bombers is now on the upgrade. Another automotive company, producing propellers, is currently boosting output to permit a 384 per cent rise in original schedules by next March. Glider output also has been lifted substantially.

Producers of guns report the following increases: 76-millimeter tank guns up 55 per cent; Bofors guns up 40 per cent; carbines up 43 per cent, gun mounts up 25 per cent.

Among the new products undertaken since the June 6 invasion are the following: Jet propulsion aircraft engines, rockets, rocket motors, robot bombs, three new types of radial aircraft engines, light tanks, medium tanks with heavier guns and armor, gun carriages, cradles and yokes for 155-millimeter guns, gun sights for trench mortars, four-bladed propellers for landing craft, five new sizes of heavy-caliber shells, and several other items still on the secret list.

Extent to which warfare has become motorized is revealed strikingly in the 1944 edition of *Motor Truck Facts*, biennial publication of the Automobile Manufacturers Association, just released. Revelation that 226 different types of military vehicles are now being made by the automotive industry is but one of the many indications of how completely war has become mobile in the 30 years since September, 1914, when Gen. Joseph Simon Gallieni, military governor of Paris, rounded up every available taxicab in the French capital to transport the city's endangered garrison troops to the front in time to halt the German army at the Marne.

Although historians date the use of the motor vehicle as a tool of war from that historic date, employment of the motor truck for such ends is commonly said to have had its large-scale beginning in March, 1916, when an advance column of the U. S. Army crossed the international line of Columbus, N. Mex., on a punitive expedition against Pancho Villa, followed by the first of the 74-truck trains participating in that campaign under General Pershing.

The truck manufacturing industry now is producing military vehicles and parts at the rate of $2½ billion worth a year, or 2½ times the total value of all trucks and parts manufactured in 1941, peak peacetime production year. Of these purely military vehicles, 38 per cent have been shipped to allied nations under lend-lease or direct purchase.

Since the start of the war, more than 2,240,000 motor trucks have been produced for the Army and Navy. Of this total, 877,000 are light trucks under 9000-pound gross vehicle weight; 578,000 are medium size, 9000-16,000 pounds; and 785,000 are over 16,000-pound gross vehicle weight.

On the domestic front, there were in operation on June 30, 1944, some 4,744,000 trucks and 216,000 trailers, only slightly under the all-time peak number. Farmers use 34 per cent of all motor trucks and hold 47 per cent of all truck certificates of war necessity issued by ODT. An estimated 98 per cent of products leaving farms move by truck.

Detroit Diesel Engine Division of General Motors is now set up to meet directly, with its own engineering, distribution and maintenance departments the needs of diesel engines for essential marine uses.

STUDY RESEARCH METHODS: Members of the Indian scientific mission who are studying research facilities in the United States pose for a picture while inspecting a shell at Battelle Memorial Institute, Columbus, O. Shown are, left to right: Sir Jnan Chandra Ghosh, director, Indian Institute of Sciences, and president, National Institute of Sciences of India; F. J. Coan, State Department; Sir Shanti Swarup Bhatnagar, director of scientific and industrial research for the government of India; Clyde Williams, director, Battelle Institute; Prof. J. N. Mukherji, University College of Science

Since the establishment of Detroit Diesel in 1938, that portion of the plant's output supplied to the marine field has been adapted and merchandised by Gray Marine Motor Co., a business relationship which was terminated Dec. 31, partly as the result of the Gray company being acquired by Continental Motors.

During the war, the use of light-weight two-cycle diesels in marine applications has been greatly expanded and GM developed the practice of using groups of such engines in combination to furnish higher horsepower. An example is in LCI boats in which two groups of four engines each are used to supply a total of 1800 horsepower.

Purchase of an industrial site for erection of a service parts building at Des Moines, Iowa, has been announced by the Ford Motor Co. Plans call for construction of a one-story modern parts depot of approximately 87,000 square feet of floor space. It will be one of several such depots contemplated by the company, costing around $700,000. Serviced by the new depot will be 182 dealers and 27 associate dealers.

Navy Department next June will take over operation of the naval ordnance plant at Center Line, Mich., near Detroit, which originally was operated by Hudson Motor Car Co., and later by Westinghouse Electric & Mfg. Co. The latter's contract will be completed in June, and the plant thereafter will be operated under civil service. The Navy has decided to retain the plant as a permanent shore station and efforts will be made to continue production after the war emergency passes. Plans for converting the employes to civil service have been made and are now being carried out. Capt. A. D. Mayer is commanding officer.

War products produced by the motor industry now cost taxpayers just two-thirds what they did three years ago, it has been revealed, as the result of manufacturing efficiencies, production short-cuts and volume output. A contract price index compiled by the War and Navy departments shows prices on five major categories of combat equipment dropped an average of 32.5 per cent during the 32-month period from January, 1942, to August, 1944, inclusive.

Price reductions range from a high of 55.8 per cent for guns to a low of 3.5 per cent for tanks and other combat vehicles. Aircraft components have been cut by 36.5 per cent, ammunition by 31 per cent. Net cash savings accruing over the period are estimated to approximate better than $3 billion. The figures on cost reductions do not take into account voluntary lump sum refunds by contractors or overall lump sum price reductions resulting from negotiation proceedings.

Postwar planning activity, assuming you can persuade anyone to talk about it in more than a whisper, is concentrated for the moment in the sales field. There has been a considerable shifting of sales personnel, lining up of new advertising agencies, meetings with dealer and distributor personnel, plus other preparatory work for the "gravy train" of automobile sales which is expected once production is resumed.

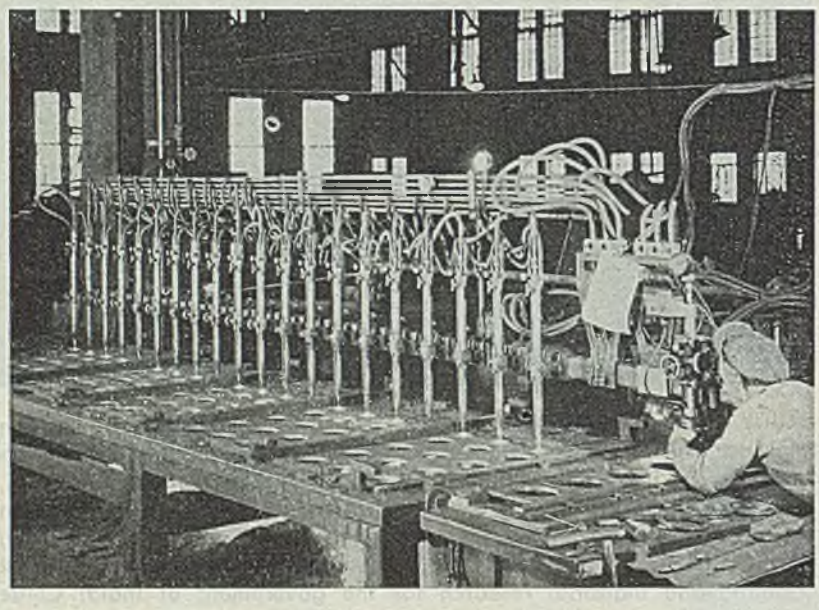
Chevrolet is asking its 7000 dealers to contribute their thinking on the problem of maintaining maximum sales effectiveness in the postwar era, by means of a comprehensive 18-page questionnaire developed in co-operation with the customer research staff of General Motors. Dealers are asked to survey their physical facilities and to note any changes which they have decided upon, to offer their predictions on the anticipated postwar service volume, to submit their ideas for more effective sales promotion, to estimate their goodwill position in their community, to evaluate the qualifications of salesmen, and to offer their suggestions for basic changes they would recommend in passenger cars and trucks.

Chevrolet's St. Louis plant has started production of 105-millimeter howitzer shells in buildings still under construction. December output is expected to be three times original estimates, and will reach several hundred thousand monthly within a few months.

Important gains in all three of Studemaker's major war materiel production items were reported for 1944. Wright cyclone engine output was up 22 per cent, heavy truck production up 20 per cent, and tracked personnel and cargo carriers up to 3½ times the level of 1943. Dollar sales reached $410 million or 14 per cent better than the preceding year.

The UAW-CIO has organized a fair practices committee to deal with the touchy problems of racial and other discrimination among its own membership. A seven-man committee will receive and investigate complaints of violations of the union's antidiscrimination policy, and will formulate and recommend policies aimed at effectuating the principles of fair practices between minority groups.

Commercial truck trailer program for 1945 has been set by the WPB at 22,232 units of all types, a reduction of 7295 from the authorized program for last year.



MASS PRODUCTION: Twenty torches in unique array, working in unison on an oxygraph at By-Products Steel Corp., division of Lukens Steel Co., Coatesville, Pa., speed flame-cutting of steel plates for vital war material

Tool and Die Men To Hear About War Requirements

New England tool and die shop executives will get first-hand information on revised war production requirements forced by recent European developments, at a dinner meeting in Hotel Bond, Hartford, Conn., Jan. 19. Sponsors of the meeting are the Bridgeport and Hartford chapters of the National Tool and Die Manufacturers Association.

A representative of the Ordnance Department, United States Army, will tell what the War Department expects from the New England tool and die industry in 1945.

$160 Million Ad Budget for Auto Industry Predicted

"Aggressive selling" of automobiles and trucks after the war will create an advertising expenditure of approximataely $160 million during the first year of unrestricted production, a 30 per cent increase over the record-breaking 1941 outlay.

That opinion was expressed in a talk before the Chicago Federated Advertising club by Joseph W. Frazer, chairman, Graham-Paige Motors Corp., Detroit.

HYDRAULIC BALANCE

CANCELS OUT BEARING LOADS

And Means MUCH LONGER PUMP LIFE

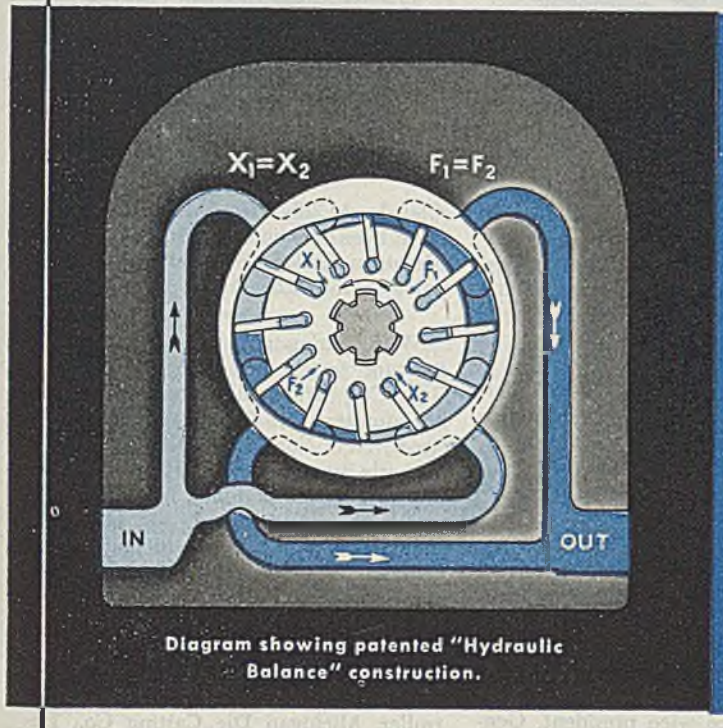
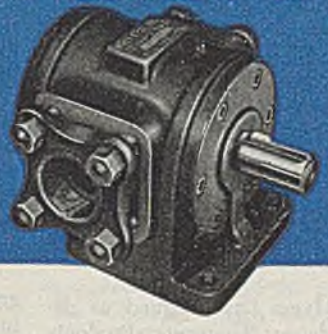


Diagram showing patented "Hydraulic Balance" construction.

VICKERS

Balanced

VANE TYPE PUMPS



As illustrated by the diagram above, equal and opposing pressure areas are provided on the outlet side and on the inlet side of Vickers Balanced Vane Type Pumps. The equal and opposing radial hydraulic thrust loads cancel each other . . . consequently there are *no* bearing loads resulting from pressure. The major cause for wear is thus completely eliminated and the result is much longer pump life. This "Hydraulic Balance" construction is exclusive with Vickers Vane Type Pumps; it also permits an unusual design compactness and is an important reason for the exceptionally high efficiency of these pumps.

Vickers Balanced Vane Type Pumps are available in single-stage for 1000 psi (see Bulletin 40-25a); two-stage for 2000 psi (see Bulletin 40-16) and also two-pressure, large-small volume (see Bulletin 38-14). Vickers Application Engineers will gladly discuss with you the many different types of hydraulic power and control circuits on which these pumps have improved machine performance. Write the office nearest you.

VICKERS *Incorporated* • 1480 OAKMAN BLVD. • DETROIT 32, MICHIGAN

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Representative of More than 5,000 Standardized Vickers Units for Every Hydraulic Power and Control Function

MEN of INDUSTRY

DR. C. G. SUITS

M. W. KELLOGG

W. S. KIRKPATRICK

C. G. Suits has been elected vice president in charge of the research laboratory, General Electric Co., Schenectady, N. Y. He succeeds **William D. Coolidge**, retired.

—o—

John C. Cairns has been named vice president in charge of operations, Stanley Works, New Britain, Conn., and he is succeeded as vice president in charge of the Hardware Division by **Patrick F. King. Rodman W. Chamberlain** has been appointed general sales manager of all hardware sales, and **W. Ronald Morse** has been made plant superintendent in charge of all hardware manufacturing.

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Emory Smith has been named to the Washington staff, International Division, B. F. Goodrich Co., Akron, O.

—o—

Harry D. Myers has resigned as director of purchases, Thompson Products Inc., Cleveland, and subsidiaries, to join Harry Ferguson Co., Detroit, in an executive capacity.

—o—

Ernest Menhall, previously secretary and treasurer, Highway Trailer Co., Edgerton, Wis., has been elected president, succeeding **P. J. E. Wood. Oliver H. Payne**, chairman, Liberty Aircraft Products Corp., Farmingdale, N. Y., has been elected chairman of Highway Trailer.

—o—

E. D. Spicer, vice president, General Electric Co., Schenectady, N. Y., in charge of apparatus manufacture, has become a member of the president's staff in charge of employe relations, making his headquarters in New York. **Roy C. Muir** becomes general manager, apparatus department, and **Earl O. Shreve** is in charge of customer relations. **William R. Burrows**, chairman of the labor relations committee, has retired.

—o—

Clarence E. Searle has been elected president, Worthington Pump & Machinery Corp., Harrison, N. J., succeeding **Harry C. Beaver**, who becomes vice chairman of the board and chairman of the management committee. **Hobart C. Ramsey** has been elected executive vice president; **Edwin J. Schwanhausser** becomes vice president in charge of sales, and **Leslie C. Ricketts**, manager of the corporation's Harrison works, has been elected a vice president.

—o—

M. W. Kellogg, president, M. W. Kellogg Co., New York, has been elected to the board of directors of Pullman Inc., concurrent with the acquisition by Pullman of the entire outstanding stock of the Kellogg Co.

—o—

Joe Hoefer has been named sales and service engineer for the Michigan territory by Udylite Corp., Detroit, and **Leonard Singer** has been appointed service engineer, New York territory.

—o—

David C. Prince, vice president, General Electric Co., Schenectady, N. Y., in charge of application engineering for the apparatus department, has been placed in charge of the general engineering laboratory. Activities of the laboratory will be broadened to include the requirements of the entire company.

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Ellis L. Spray, vice president and general manager, Westinghouse Electric Elevator Co., Jersey City, N. J., has been elected a director of First National Bank of Jersey City.

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Roger M. Wise has been appointed to the newly-created post of vice president in charge of engineering, Sylvania Electric Products Inc.

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Oscar N. Lindahl, vice president, Carnegie-Illinois Steel Corp., Pittsburgh, has been reappointed chairman of the Committee on Federal Taxation, Controllers Institute of America.

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James V. Carmichael, manager of the Georgia Division, Bell Aircraft Corp., Buffalo, has been elected vice president of the corporation.

—o—

Endicott Lovell, president, Calumet & Hecla Consolidated Copper Co., Boston, and **Charles J. Stakel**, general manager, Cleveland-Cliffs Iron Co., Cleveland, have been appointed to the board of the Michigan College of Mining and Technology, Houghton, Mich.

—o—

W. S. Kirkpatrick has been appointed assistant to the president of Flannery Bolt Co., Bridgeville, Pa., making his headquarters at 50 East Forty-second street, New York. Mr. Kirkpatrick was formerly associated with the management firm of Houston & Jolles, New York, and was vice president, A. O. G. Corp., Providence, R. I. Prior to that he was contract officer for the British Purchasing Commission, following several years in Europe on special assignment for International Telephone & Telegraph Corp.

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M. K. Layer, for several years controller, Michigan Die Casting Co., Detroit, has been named secretary-treasurer.

—o—

Paul M. Shoup, president, Southern Pacific railroad, has been re-elected president of the Merchants and Manufacturers Association, Los Angeles.

—o—

Ludwig E. Loos has been appointed manager of purchases, Vilter Mfg. Co., Milwaukee.

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Henry M. Pfahl, formerly associated with Carnegie-Illinois Steel Corp., Pittsburgh, as contact metallurgist, has joined Tate-Jones & Co. Inc., Leetsdale, Pa., as metallurgical engineer and assistant manager of sales.

—o—

J. E. Savacool, vice president and controller, Mack Trucks Inc., Long Island City, N. Y., has been elected a director of the company.

—o—

John Coolidge, president, Connecticut Manifold Co., Hartford, Conn., has been elected treasurer of the Manufacturers Association of Connecticut.

—o—

William O. Lippman has been named assistant to **George H. Bucher**, president, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., and will be in charge of manufacturing headquarters. Mr.

Lippman is succeeded as works manager at the company's East Springfield, Mass., plant by J. R. Weaver, but will continue as manager of the Ordnance Division at Canton, O.

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Russell T. Branch, formerly executive vice president, Stone & Webster Engineering Corp., New York, has been elected president, to succeed John R. Lotz, who becomes chairman.

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Cal Sivright, chairman, Oliver Corp., Chicago, has been granted a leave of absence for reasons of health. Company by-laws have been changed, establishing Alva W. Phelps, president, as chief executive. C. Frederick Cunningham was elected chairman of the executive committee to act as board chairman.

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Calhoun Norton, vice president, Arens Controls Inc., Chicago, has been elected president and general manager, succeeding Charles A. Arens, retired.

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Lieut. Col. Alden F. Erikson has returned to Wyckoff Steel Co., Pittsburgh, after 30 months in the United States Army, and he will resume his former position as district manager of sales for Wyckoff in the Boston office.

—o—

Thomas Arnold has resigned as machine tools controller, Department of Munitions and Supply, Canada. Mr. Arnold continues as president of Citadel Merchandising Co. Ltd., the Crown company created in 1942 to purchase, distribute and allocate machine tools and equipment.

—o—

R. E. Penny has been appointed Los Angeles branch manager, Crane Co., Chicago, succeeding D. D. Updergraff, who has resigned on the advice of his physician. L. R. Bauer has been named manager at Jacksonville, Fla., to succeed Mr. Penny; J. J. Murray succeeds Mr. Bauer as manager at New Haven, Conn.; O. F. Woodyard becomes manager at Memphis, Tenn., succeeding F. A. Duncan, who is retiring, and A. C. Gribble succeeds Mr. Woodyard as manager at Little Rock, Ark.

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Paul B. Sagar has been appointed field engineer, General Controls Co., Glendale, Calif. His headquarters will be at the Cleveland factory branch.

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J. F. McBride has been appointed sales manager of the Range Division, General Electric Co., Bridgeport, Conn.

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P. G. McAusland, for the past two years comptroller, Reliance Electric & Engineering Co., Cleveland, has been elected treasurer, succeeding H. M. Hitchcock, retired. Mr. McAusland will also continue as comptroller.

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Paul C. Sandmeyer has joined the stainless steel products sales department of Pittsburgh Steel Co., Pittsburgh. Previously he was manager of the Stainless Steel Division, Jessop Steel Co., Washington, Pa.

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A. J. Peterson has been appointed district sales manager, Apex Smelting Co., Chicago.

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Three appointments announced by Stewart-Warner Corp., Chicago, are: Arden LeFevre, vice president and director of engineering, Division No. 1; Fred R. Cross, advertising manager, and George W. Oehlsen Jr., assistant director of engineering, Division No. 1.

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Claude Leach Jr. has been appointed sales promotion manager for Bendix radios and radio-phonograph combinations according to announcement by the Bendix Radio Division of Bendix Aviation Corp., Baltimore.

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Harold W. Rehfeld, tire technician of the B. F. Goodrich Co., Akron, O., has been named expert consultant to the commanding general of the Army Service Forces in Europe.

—o—

Walter M. Annette, for 26 years manager of the New York branch office of Hercules Powder Co., Wilmington, Del., retired Dec. 31.

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Mackenzie Macintyre, production manager, Whitin Machine Works, Whitinsville, Mass., has become works manager, Indian Motorcycle Co., Springfield, Mass., succeeding Roland Sheriff, who is retiring after 36 years with the company.

—o—

Leonard Eger, development expert, Goodyear Tire & Rubber Co., Akron, O., has been appointed special V-belt representative for Goodyear in the Chicago district.

—o—

Fred W. Dixon Jr. has joined Cleveland Foundry Co., Cleveland, as sales manager. Previously he was sales manager, Gunite Foundries Corp., Rockford, Ill.

—o—

H. S. McPherson has been appointed midwestern sales manager, Mechanical Goods Division, United States Rubber Co., New York, and W. M. Ballew has been named southwestern sales manager.

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Col. Robert F. Carter, until recently executive officer to the chief of the subsistence division office of the quartermaster-general, Washington, has been assigned as director of procurement at the Chicago quartermaster depot, replacing Col. Bernard J. Finan, who has been transferred to Washington.

—o—

Del C. Wiseheart, for the past three years personnel manager, Ekco Products Co., Chicago, formerly Edward Katzinger Co., and for 13 years prior to that

PAUL J. WOLFERT

Who has been named assistant to H. T. Schwier, export manager, Blaw-Knox Co., Pittsburgh, as announced in STEEL, Dec. 25, p. 59.

E. PEERCE LAKE

Who has been made vice president and general manager of the Warren City Manufacturing subsidiary of Graham-Paige Motors Corp., Detroit, reported in STEEL, Dec. 25, p. 59.

J. H. NEAD

Who has been named manager of the newly-formed Metallurgical and Inspection Department, Inland Steel Co., Chicago, as mentioned in STEEL, Jan. 1, p. 346.

assistant personnel manager, Revere Copper & Brass Inc., Chicago, has been appointed personnel manager for the Oscar W. Hedstrom Corp., Chicago.

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Andrew E. Kuby, vice president and a founder in 1920 of Standard Steel & Wire Corp., Chicago, has been elected president and treasurer. **Eugene L. Rippel**, for the last eight years Chicago district manager, Greer Steel Co., Dover, O., and for 11 years prior to that affiliated with American Sheet & Tin Plate Co. in production, has been named vice president in charge of sales. **William A. Wade**, associated 18 years with Steel Sales Corp., Chicago, 15 years as general salesman and the last three years as assistant to vice president, also has been elected a vice president. **Elmer C. Lundahl**, with Standard Steel & Wire Corp. since its inception, has been made secretary, and will continue to devote his time to office and warehouse management. All officers have been elected directors.

GEORGE E. RITTENHOUSE

Who has been appointed sales manager, A. R. Purdy Co. Inc., New York, as mentioned in STEEL, Dec. 25, p. 59.

—o—

Frederick C. Teuteberg has been named treasurer of the United States Steel Supply Co., Chicago. He succeeds **Gage H. Avery**, treasurer and director of the company, who has retired after 44 years' association with this United States Steel Corp. subsidiary.

—o—

Frank N. Townsend has been appointed by the Stackpole Carbon Co., St. Marys, Pa., export manager for its Electronic Components Division with offices in New York.

—o—

Elwood M. Davis has been made assistant to the vice president in charge of sales by Pitney-Bowes Postage Meter Co., Stamford, Conn. He was formerly eastern sales manager.

OBITUARIES . . .

Arthur L. Parker, 60, founder, president and general manager of Parker Appliance Co., Cleveland, died Jan. 1. His inventive genius carried him from his first job as an experimental engineer with the Willard Storage Battery Co. 25 years ago to a top-ranking industrial leader in Cleveland. The company which he founded in 1924 is a leading manufacturer of hydraulic fittings, valves, and machine tools.

—o—

Thomas W. Bacchus, 82, retired vice president and director of Hercules Powder Co., Wilmington, Del., died in that city Dec. 30 after 47 years of distinguished service in the explosives industry.

—o—

Ogdon Minton, 59, inventor of Minton vacuum dryer used in the manufacture of paper pulp, owner of Minton Vacuum Dryer Co., and consulting engineer with Birds Eye laboratories of General Foods Corp., Hoboken, N. J., died Dec. 26 in New York.

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William Knight, 64, nationally known engineer specializing in aeronautics, and technical adviser to the American general staff in Paris in World War I, died Dec. 26 in New York.

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Horton L. Howard, 43, superintendent, Howard Brass & Copper Co., Milwaukee, died there Dec. 23.

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Bernard J. Ley, 60, president, Peoria Metal Specialties Co., Peoria, Ill., died there Dec. 24.

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Don R. Marsh, 63, factory manager, Buffalo Forge Co., Buffalo, died there Dec. 21.

—o—

W. W. Jamison, 83, who played a prominent part in coal development near Greensburg, Pa., and who was associated with the Jamison Coal Co., died at Greensburg, Dec. 31.

—o—

Edmund W. Neumeister, 69, vice president and director, Cherry-Burrell Corp., Milwaukee, died Dec. 25 in that city. Mr. Neumeister was one of the organizers of the Cherry-Burrell Corp. and of its predecessor, Milwaukee Dairy Supply Mfg. Co.

—o—

Frank Capp, 50, for the past 16 years civil engineer, Portland Cement Association, Chicago, died Dec. 22 in that city.

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Harry W. Broady, 66, inventor and mechanical engineer and consultant with Brush Development Co., Cleveland, died Jan. 2 at Irvington, N. J.

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John A. Mathews Jr., 36, office manager at Philadephia for Crucible Steel Co. of America, died Dec. 26 in that city.

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Ernest Heden, 66, head of Gotaverken shipyard in Gothenburg, Sweden since 1938, died Dec. 27.

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George W. Lowe, 70, retired secretary of Nordberg Mfg. Co., Milwaukee, died Dec. 28.

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Samuel Phillips, 71, retired operator of Phillips Iron & Metal Co., Manitowoc, Wis., died Dec. 29 in that city.

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Edward H. Dreyer, 61, retired operator of the Universal Welding School, Milwaukee, died Dec. 29.

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Joseph Miotke, 64, president and treasurer, Joseph Miotke Tool & Die Co., Milwaukee, died Dec. 17 in that city.

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Emory E. Peter, 70, chairman and founder, Chicago Tube & Iron Co., Chicago, died Dec. 29, in Sarasota, Fla. He went there three years ago for his health but continued active in the company which he helped to found in 1914.

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Thomas A. Scott, 82, president, Scott Viner Co., Columbus, O., died there recently.

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J. D. Stevens, 51, manager of aluminum pigment sales, Aluminum Co. of America, Pittsburgh, died recently in New Kensington, Pa.

—o—

Jesse H. Van Alstyne, 72, president, Otis Elevator Co., New York, died there Dec. 25. Mr. Van Alstyne, who became president of Otis 20 years ago, started with the company in 1899.

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Charles Foster Loughead, 63, who retired in 1934 as president, American Transformer Co., Newark, N. J., died Dec. 23 in East Orange, N. J. He was a former vice president of Standard Tool Co., Cleveland.

—o—

Harold M. Prescott, 58, an assistant vice president, American Telephone & Telegraph Co., New York, died Dec. 26 in Pelham Manor, N. Y.

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Harold Wylie, 59, vice president in charge of sales and a director of the Nash Engineering Co., South Norwalk, Conn., died there Dec. 26.

—o—

Henry Chappell, 67, associated with the old Grasselli Chemical Co., Cleveland, which is now part of E. I. du Pont de Nemours & Co. Inc., Wilmington, Del., died Dec. 27 in Cleveland. Mr. Chappell had retired in 1942.

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Morris Seren, 57, president, Seren Tool Works, Chicago, died Dec. 29.

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Corydon T. Purdy, 85, a pioneer in the development of modern steel skyscrapers and founder and former president of Purdy & Henderson, New York, died recently in Melbourne, Fla.

Plans Completed For Meeting of Scrap Institute

Convention at Cincinnati Jan. 10 and 11 will consist of forum on termination scrap and surplus property disposal

PLANS for the annual meeting of the Institute of Scrap Iron and Steel Inc. to be held Jan. 10 and 11 at the Netherland Plaza hotel, Cincinnati, have been completed.

This year the convention will consist of a forum on termination scrap and surplus property disposal. The forum will constitute the entire proceedings of the two-day meeting except for election of directors-at-large.

A feature will be an exhibit by the Reconstruction Finance Corp. and the Metals Reserve Co. of typical material to be offered as a result of termination of war contracts and disposal of surplus property. At the forum will be representatives of the Army, Navy, and other governmental agencies interested in marketing of scrap, both from contract terminations and disposal of surplus property. Opportunities will be provided individual dealers to obtain detailed information about marketing procedure.

Continuing strength in the recently revived activity in the scrap market is expected to add interest and importance to the two-day meeting. Despite the drop in the market last fall, iron and steel scrap consumption in 1944 was practically at an all-time high, approximately 54,876,000 gross tons, so close to the 55,045,000 gross tons melted in 1943 that it will require final figures to determine which year was the higher.

The Cincinnati chapter of the institute will be host to visiting scrap dealers on the night of Jan. 10, and the annual dinner of the institute will be held on Jan. 11. Charles R. Hook, president of American Rolling Mill Co., Middletown, O., will be principal speaker at the banquet, and Murray Seasongood, former mayor of Cincinnati, prominent attorney, and chairman of the Cincinnati City Planning Commission, will be toastmaster. David J. Joseph of the D. J. Joseph Co., Cincinnati, is chairman of the banquet committee.

BIRTHDAY: Rustless Iron & Steel Corp. celebrated its 20th anniversary Dec. 27 by stepping up production of stainless steel by 22 per cent over the highest daily average attained in November. Shown at a cake-cutting ceremony are, left to right: Rear Adm. C. H. Woodward, chief of the incentive department of the Navy; C. L. Kingsbury, vice president and general manager; Dorothy Williams, employe whose birth date most nearly coincides with that of the company

MEETINGS . . .

Jan. 8-12, Society of Automotive Engineers Inc.: Annual meeting, Book-Cadillac hotel, Detroit. A. C. Warner, 29 W. 39th street, New York, is secretary and general manager.

Jan. 10-11, Institute of Scrap Iron and Steel Inc.: Annual meeting, Netherland Plaza hotel, Cincinnati, President and executive secretary is E. C. Barringer, 1120 Connecticut avenue, N.W., Washington 6.

Jan. 11-12, American Management Association: Marketing conference, Waldorf-Astoria hotel, New York. Association headquarters, 330 W. 42nd street, New York.

Jan. 22-24, American Society of Heating and Ventilating Engineers: Fifty-first annual meeting, Hotel Statler, Boston. A. V. Hutchinson, 51 Madison avenue, New York, is secretary.

Jan. 22-26, American Institute of Electrical Engineers: Winter technical meeting, Engineering Societies building, New York. National secretary is H. H. Henline, 33 W. 39th street, New York 18.

Jan. 24-26, National Screw Machine Products Association: Annual meeting, Milwaukee. Executive secretary is Orrin B. Werntz, 13210 Shaker Square, Cleveland 20.

Jan. 30-Feb. 1, Institute of the Aeronautical Sciences Inc.: Thirteenth annual meeting, New York. Robert R. Dexter is secretary, 30 Rockefeller Plaza, New York.

Feb. 14-16, American Management Association: Personnel conference, Palmer House, Chicago. Association headquarters, 330 W. 42nd street, New York.

Feb. 26 to March 2, American Society of Testing Materials: Committee week, Hotel William Penn, Pittsburgh. Robert J. Painter is assistant to the secretary, 260 S. Broad street, Philadelphia 2.

Feb. 28, American Society for Testing Materials: Spring meeting, Hotel William Penn, Pittsburgh.

Firm Organized To Make Steel Castings Equipment

Organization of Gyrocast Sales & Engineering Co. has been effected at Youngstown, O., to engineer and sell equipment for making steel castings by centrifugal processes under patents held by Jack Trantin Jr.

Mr. Trantin is president of the Youngstown Alloy Casting Corp. Youngstown Alloy wished some time ago to install the "spinning" method of producing castings but was unable to buy the necessary equipment.

Alliance, O., Plants Start 3000th Mile of War Tubing

Production of their three-thousandth mile of welded invasion tubing used to pipe oil and other necessary fuels to the war front has been started at Alliance, O., by two plants of Babcock & Wilcox Co.

The two mills have produced a substantial portion of the country's total output of four-inch (outside diameter) tubes for invasion pipelines. A single welding unit in one plant produces between 10 and 12 miles of the tubing daily, and capacity production is between 20 and 25 miles a day.

New Aluminum Alloy Made By Reynolds Metals Co.

A new aluminum alloy has been developed by the Reynolds Metals Co., Richmond, Va., and is now being manufactured for use in fighter planes, jeep wheels and other implements of war, Paul P. Zeigler, chief metallurgist of the company, announced recently. Known as R-303, the alloy is made of aluminum, magnesium and zinc. It is said to be free from susceptibility to corrosion and stress cracking and its tensile strength in extruded shapes has run in tests as high as 90,000 pounds per square inch.

WING TIPS

North American Aviation awarded fixed price contract for production of C-82 "Packet" cargo planes, about twice the size of currently standard transports. Range will be in excess of 3500 miles. Will be built at NAA's Dallas plant

SUBMITTING the lowest offer in the first competitive bidding held by the Army Air Forces since 1940, North American Aviation Inc. has been awarded a fixed price contract for production of the C-82 "Packet" cargo plane, designed by Fairchild Engine & Airplane Corp.

North American's Dallas plant will do most of the manufacturing and all of the assembly of this new cargo plane. The extent of subcontracting will depend upon the ability of other plants to produce the parts required on schedules and at prices comparable to those which could be accomplished by North American in its Dallas plant.

The C-82 is powered by two Pratt & Whitney 18-cylinder R-2800-34 engines, with a takeoff horsepower of 2100 each. Takeoff distance is described by the Army Air Technical Service Command as very short for this type of airplane. Its range is listed as in excess of 3500 miles.

The C-82 is in the 50,000-pound class, about twice the size of currently standard transport aircraft. Engines are mounted at forward ends of booms. Wings are of gull design. Landing gear is of the tricycle type. Wing span is 106 feet.

The fuselage is suspended beneath the cantilever wing. Center wing section includes the engine nacelles, which form the forward portions of the twin tail booms. It passes through the extreme top portion of the fuselage at the point of maximum depth a few feet behind the flight deck.

From each side of the fuselage, the center section slopes downward to the points where the outer panels are attached to it. Both the center section and the outer wing panels are of two spar construction using ribs of alclad sheet. The outer panels are reinforced both top and bottom by a corrugation skin beneath the flat alclad covering; while the corrugation under the center section skin is used only on the lower side.

Details of Construction

Two aluminum ailerons, fabric covered, are used on each outer panel. The twin tail booms supporting the empennage are of metal monocoque construction. The horizontal stabilizer is of conventional alclad frame and covering, as are the vertical fins. Rudders and elevators are alclad frames with fabric covering. Two tabs are used in the elevator and one in each rudder. Two slotted wing flaps are used on both sides of the wing from the ailerons inboard to the fuselage, one inboard and one outboard of the engine nacelles.

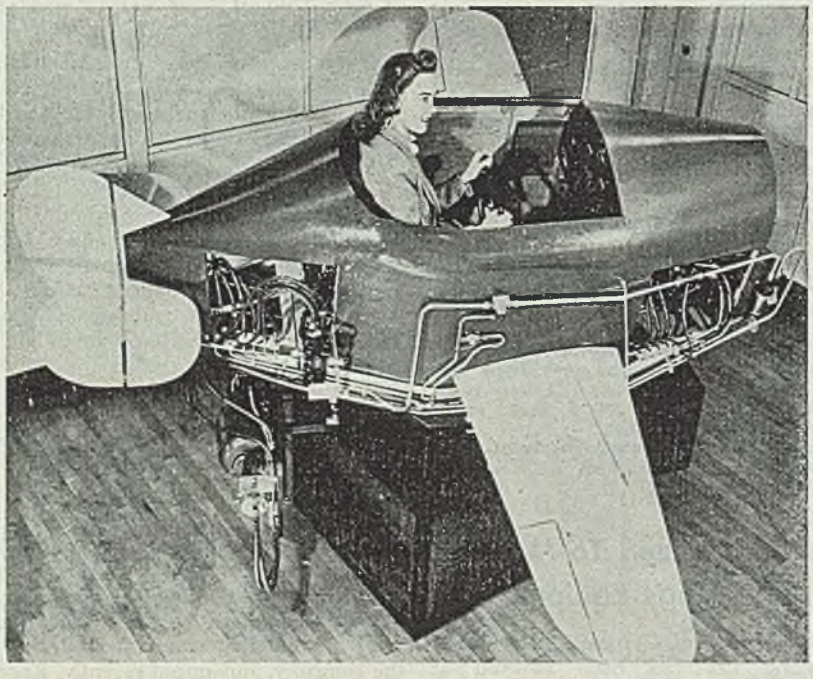
Fuselage is of monocoque construction with alclad sheet and formed longitudinal stringers mounted on fabricated alclad frames. Seven longitudinal beams take the floor and tie-down loads in the main cargo area beneath the plywood cargo floor.

The tricycle landing gear uses single wheels at all three points. The main wheels retract into the underside of the engine nacelles and the nose wheel is concealed within the nose section forward of the cargo space. Total vertical travel of the main wheels is 9½ feet.

Electric, instead of hydraulic, mechanisms are used for operation of all power-actuated devices, except brakes, throughout the airplane with emergency hand operation mechanisms also provided.

Loading doors are provided at the after-end of the fuselage. When on the ground, the bottom of the fuselage is the height of a truck platform to make for easy loading and unloading of cargo. Loading ramps are part of the equipment of the airplane.

At present, the Texas Division of NAA, including operations soon to be discontinued at Waco, has approximately 20,000 workers. On the basis of existing contracts and schedules for the Texas Division it is anticipated the working force will continue to be reduced gradually through March, 1945, to a total of about 16,000. The working force will level off at that point for several months, and then be increased gradually to a total of approximately 20,000 by November, 1945.



ROBOT PILOT SUPERIOR: General Electric Co. aviation engineers hooked up an automatic pilot on a Link trainer to demonstrate the robot can hold a plane to its course and correct deviations better than a human pilot. The automatic pilot is used widely on Navy torpedo bombers. Above, the device is being tested by a GE worker

Direct Contractor Contact Basis of ATSC Adjustments

Direct contact with every prime contractor holding Army Air Forces contracts in excess of $10,000 has now been made with the completion of the first step of the advanced planning program designed to assist contractors to "fast, fair and final" settlement of contract adjustment claims, Air Technical Service Command headquarters, Wright Field, O., announces.

Officials point out that only if contractors and their subcontractors are completely familiar with the important part they must play in the adjustment of war contracts, can adaptation to the changing requirements of a fluid warfare be adequately and promptly met.

The contractor training program has been stepped up each month since activation on July 1, 1944 of the Readjustment Division, ATSC, which is charged with the adjustment and settlement of Army Air Forces contracts, and the clearance from contractor's plants of termination inventory. With the initial phase completed, emphasis now will be laid upon extending the program of contractor education and training through

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THUNDERBOLT AMPHIBIAN: Although P-47 Thunderbolts still are coming off the lines at full speed at the plants of the Republic Aviation Corp., engineering thought is being given to postwar flying. Above is shown a tentatively designed Thunderbolt amphibian just before taking off on a test flight. At its present stage of development, the craft is an all-metal high-wing ship, powered by a 175-horsepower engine, will accommodate four passengers and is intended to sell for less than $4000

prime contractors to their various tiers of subcontractors.

According to Col. E. W. Rawlings, chief, Readjustment Division, this is to be accomplished in complete co-operation with the prime contractors. "We feel that through the activity of our contractor training section we have now pretty well covered the prime contractors," Colonel Rawlings said. "General meetings and forums have been held throughout the country during the past six months. We have had more than 150 such meetings, which have been attended by a total of more than 22,000 contractor personnel. Throughout the entire decentralized organization of the ATSC, personnel of contractor training sections have been visiting prime contractors, and discussing with them all the specific questions relating to contract settlement and plant clearance."

"We are now concentrating on working with these prime contractors in order that they may extend the necessary training and information to their subcontractors," Colonel Rawlings continued. "Generally speaking, the prime contractors appreciate that the training of their subs must be in large part their own responsibility, and are ready to co-operate with our efforts to assist them in this extension of training."

At a recent meeting of contractor training personnel, held at ATSC headquarters, the latest plans for subcontractor training were outlined. "At the present time our reports indicate that approximately 700 of our prime contractors have begun at least some form of subcontractor training," Colonel Rawlings said. "We shall continue our efforts to co-operate with the prime contractors along these lines, as we appreciate the importance of answering as many questions in advance as possible. We must do everything we can to avoid delay in adjustment of war contracts, especially at this time when changes in strategical requirements make production flexibility of such paramount importance."

A complete training kit has been developed for the use of prime contractors in their subcontractor training program. Among other items there are included a manual for subcontractors, summarizing subcontractor rights and responsibilities; an organizational chart for a suggested termination setup; an explanation of the use of standard forms, comprising an easy-to-follow hypothetical termination claim, and demonstrating proper execution of the standard forms universally used to present claims; and, a comprehensive statement on interim finance planning, including a breakdown of methods of obtaining financing pending settlement.

Pliofilm Protects Replacement Parts

Just as Goodyear Tire & Rubber Co.'s pliofilm enabled a saving of 75 hours per warplane engine in preparing it for shipment or storage, then preparing it for use, pliofilm likewise is speeding the replacement of warplane "run-in" engine cylinders and piston assemblies.

"Run-in" replacement cylinders for warplane engines are being shipped to battlefronts from at least one manufacturing plant with the same moisture protection as the engines themselves. This means that when a warplane lands with a damaged or worn cylinder which needs to be replaced, the airplane is ready for service again, in a shorter time than would be the case with cylinders protected from moisture by grease or other methods.

Ford Motor Co. at Kansas City, Kans., is using the same method for moisture protection of spare airplane engine cylinders as is used for shipment and storage of the engines into which they fit. Before a cylinder is heat-sealed in its pliofilm container, part of the air inside is exhausted by vacuum. Bags of silica gel, a desiccant inside the package, absorb whatever moisture remains. In addition, each "run-in" cylinder package includes an indicator card visible through the pliofilm to show at a glance when moisture inside the package has risen beyond the danger point.

As with the larger packages for engines, the pliofilm replacement or spare cylinder package can be opened quickly and easily for replacement of the silica gel, then resealed again.

Outlines Prospects for Postwar Air Transport

Prospects for air transportation in small towns as well as large cities were outlined by Hall L. Hibbard, vice president and chief engineer of the Lockheed Aircraft Corp., recently in an address to the California Aviation Congress.

Mr. Hibbard pointed out that new regulations of the Civil Aeronautics Authority present a basis for overall planning in air transportation which, used as a design yardstick, will greatly influence both airplane performance and airport facilities.

"Typical airplanes of current and future air transportation fall into three classifications," Mr. Hibbard stated. "The small twin engine feeder type, the medium-sized four-engine transcontinental type and a large four-engine transoceanic type. It is with the performance of these general types in mind that airports must be designed."

The Lockheed executive said that, although airport requirements are based on typical present day aircraft designs, constant improvement will greatly affect future planning.

Among improvements in advanced stages of development that will affect landing and take-off requirements are the reversible pitch propeller, several methods of assisted take-off and the practical jet propulsion engine.

Electrons To Regulate Airplane Temperatures

Postwar air travelers will depend upon tiny coils of wire and electron tubes to keep warm while roaring through the substratosphere, according to the Minneapolis-Honeywell Regulator Co.

The coils, like fingers reaching ahead of the plane, will anticipate temperature requirements and deliver more or less heat even before passengers realize what's going on in the outside air, it was said.

Completely automatic, the device has been in test service on several airlines and combat use on Army transport ships for some time.

The new control system is a package unit weighing slightly under eight pounds and is designed to hold automatically any cabin temperature selected, usually 70 degrees.

West Awaits Decision on Future of War-Born Metalworking Capacity

New steel mills, score of fabricating works, foundries and machinery plants raise hopes of westerners for industrial structure firmly established on heavy manufactures. Many market studies are underway

By ROBERT BOTTORFF
Editorial Correspondent

SAN FRANCISCO

WESTERN industry is hopeful the new year will be one of decision; one that will decide the most important of this area's reconversion problems: What is the future of the West's war-born steelmaking and metalworking capacity?

For most of the last 50 years the Far West has had before it the vision of an industrial structure firmly established on heavy manufactures which would bring freedom from the burden of heavy freight rates, high costs and prices, and which would permit an advantageous competitive basis with eastern industry.

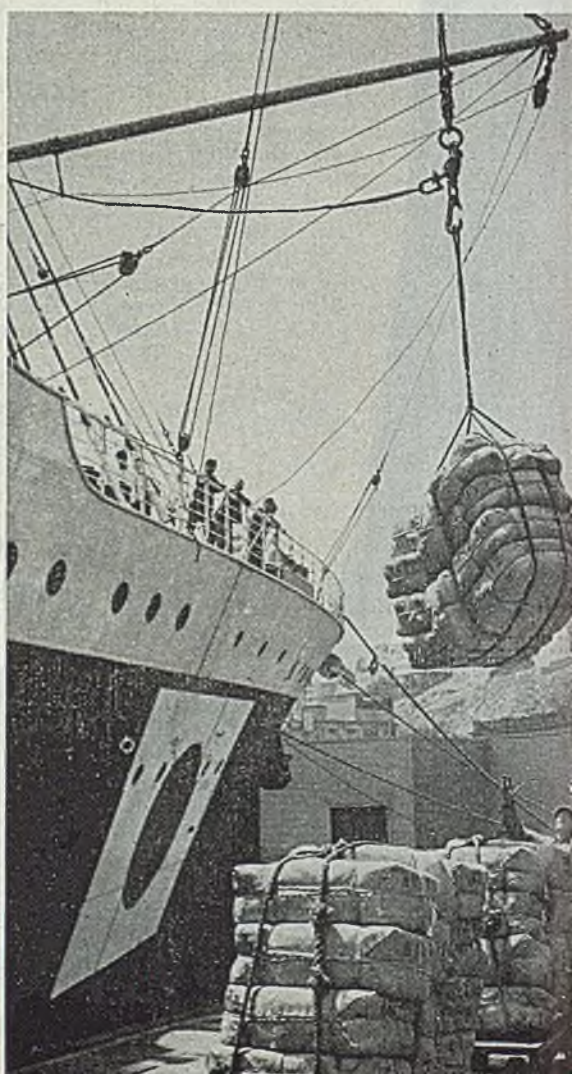
For the first time in that half century, the emergency requirements of war promise to turn the vision into reality. When the fighting stops and peacetime production resumes, the West will have in its backyard two large, fully integrated steel plants available and capable of transforming its vast natural resources into goods for home consumption.

Moreover, when the war ends, the West will have scores of newly built or expanded fabricating works, foundries and machinery plants. Each hopes it can obtain freight rates which will allow favorable profit margins on home-produced products in competition with those made on the East Coast or Midwest.

Those are the hopes and the framework. But to start the wheels turning one major thing is needed—new markets.

If Henry Kaiser's Fontana, Calif., steel mill and the Geneva steel works in Utah are to be kept producing at anywhere near capacity in peacetime, postwar consumption outlets must be found. Some interests forecast a big export market for western-made steel; and undoubtedly offshore shipments will be sizable. But the industry's bread-and-butter markets will be at home, chiefly in the Coast states. During the war years the rich fare of military orders has nourished steel fabricators into sufficiently robust stature for them to branch out into hitherto untried civilian products when reconversion comes. But there will be few willing to risk capital unless they have assurance of active and continuing markets for their goods. Nor is any private hard-headed corporation or group of industrialists likely to take over operation of Geneva Steel from the government unless they are assured of making enough steel to produce profits. The whole problem of new markets, on a thumbnail, is the key to the complex postwar western steel outlook.

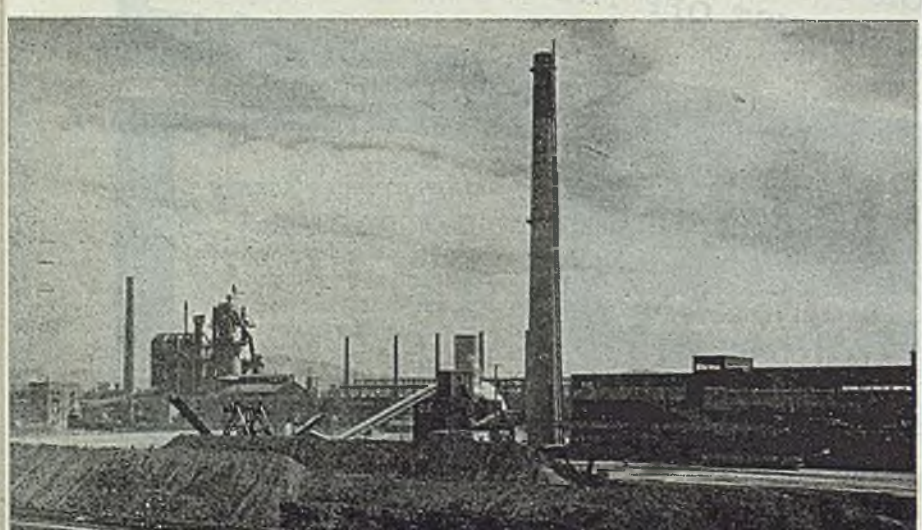
But planners haven't been idle; search for the markets has been active and var-

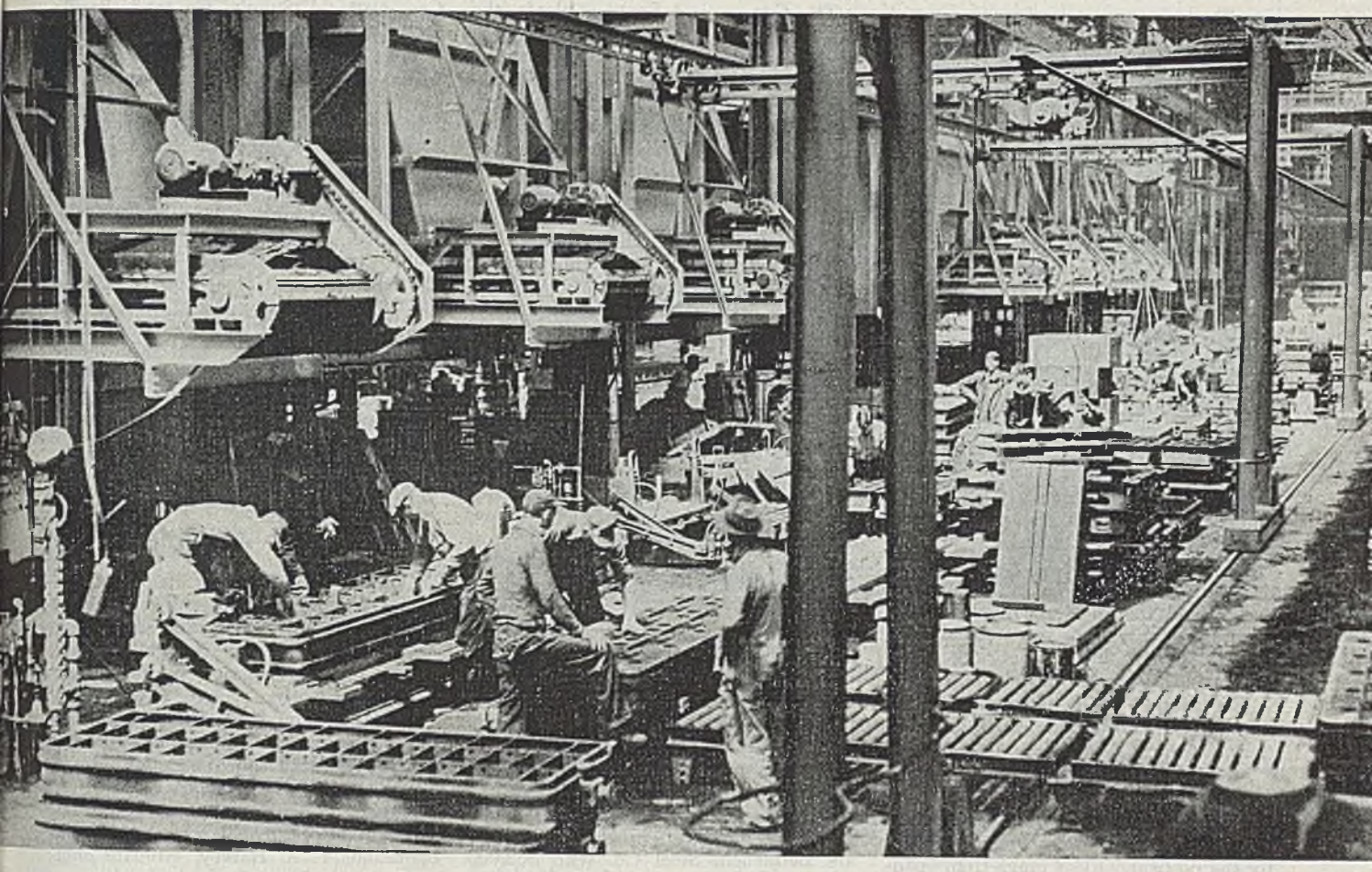


Pacific Car & Foundry Co.'s $3 million foundry at Seattle is said to be one of the most modern and complete in the United States. It is capable of pouring any type of steel, its only limitation being the size of casting. An interior view is shown at upper right

Exports are expected to provide an outlet for part of the West Coast's expanded industrial capacity. San Francisco, a major port before the war, right, is expected to be even busier in the postwar period. NEA photo

Below, ore conditioning yard at Kaiser's Fontana plant is shown in the foreground. In the background may be seen blast furnace, open hearths and rolling mills





ied. Hundreds of ideas have been discussed, covering in one way or another nearly everything that can be made from steel—from autos to refrigeration to tin plate. There are only a few, however, which appear to be practical.

One of the more promising is the field of steel tubular products. Of all prewar steel consumption west of the Rockies, 10 per cent to 15 per cent was in steel pipe and other tubular items, and year after year the oil fields of southern California provide one of the nation's major outlets for steel pipe. Despite this, only a single cold-drawn tubular plant is operated west of Colorado, the war-built Pacific Tube Co. mill in Los Angeles. Only one facility also exists in the Far West for production of cast iron pipe, of which western prewar use ran to 120,000 tons a year. On the other hand, the war has tremendously increased western pig iron production facilities.

Building new pipe-producing facilities is expensive, however, and the capital required may block moves into the field. B. F. Fairless, United States Steel Corp. president, estimates "it will cost $40,000,000 to really go into the pipe business on the West Coast."

Probably the most natural western market for steel, and the one most likely to be exploited, is that of thin strip for tin plate. California alone has a score of plants making tin cans and the 11 western states consume a third of all United States tin plate. All the strip for this product is "imported" from the East. New packaging developments lead tin container makers to believe postwar demand will be greater than ever, even though shortages during wartime have created substitute materials. On the other hand, capacity of tin plate mills throughout the country has been expanding steadily, rising about a million and a half tons during the last year. This trend, of course, raises the question of whether a further increase in capacity is an economic necessity.

Hints have come from United States Steel Corp. executives that the corporation may install a postwar continuous strip mill on the West Coast for rolling tin plate, sheets and other flat products. Cost of such a development, which would be made a part of the Columbia Steel Co. setup, is indicated at around $10,000,000. Columbia, at its Pittsburg, Calif., plant, now has a small, hot-rolled tin plate mill for rolling plate from tin bars. Because of the tin shortage it has been closed for two years, but even in prewar it supplied less than 10 per cent of Coast and Hawaiian tin plate needs.

More enthusiastic promoters of the West from time to time pop up with forecasts of western-built autos after the war. This is unlikely. Major auto companies before the war made several surveys of possibilities and found an integrated production process would not be economically feasible. However, further expansion of assembly plants on the Coast is probable, both in the San Francisco and Los Angeles areas.

Literally dozens of lighter products made from steel have been surveyed, including such household items as refrigerators, ranges and electrical equipment. The railroad equipment field also has been eyed and possibilities of tapping the big western markets for farm equipment, logging machines, earth-moving vehicles and marine engines are believed to be good.

There are, as well, a number of entirely new ventures. These include production of electric welded chain, all of which now is shipped into this area from the east, screws, and light steel housing. Wire cloth manufacturers are confident enough of the future that they are expanding productive capacity at present. Southern California's aircraft plants, hugely expanded in wartime, may partially be converted to new projects, such as Consolidated Vultee's experimental buses. This same trend also is being blue-printed by some assembly-line shipyards.

Running nearly neck and neck with the problem of finding new markets is the problem of shipping rate differentials. As a matter of fact, some authorities see this as the most important postwar trouble spot.

Prices for finished steel on the West Coast always have been based on the eastern seaboard base price plus the approximate $11 a ton intercoastal water

rate. During war years, rail tariffs on steel have ranged to $22 a net ton. Because of this handicap, most Coast fabricators have been at a competitive disadvantage because makers of nationally distributed goods have been able to ship finished products to the West to sell at prices lower than western companies could offer.

Until a few months ago, freight rates on shipments of finished steel to the West Coast from the Geneva plant were $12 a ton. Two major railroads then cut to $8 a ton for the duration and six months thereafter. But, West Coast processors say, if they are to compete with intercoastal water shipments after the war, and at the same time have an incentive to expand at a profit, the Geneva rate must be cut to $5 a ton or under.

Another troublesome factor in the western steel picture is largely compounded of political uncertainties and sectional rivalries. Many well placed interests would like to see the West snip its ties to eastern aprons and end once and for all the so-called dominance of the East over western resources and industries. Others, more practically minded, believe that such a move is impossible without huge additional local capital, plus markets to maintain profitable operations.

Geneva Steel Plant Future

Disposal of the Geneva steel installation is the focus of immediate worries for the postwar. Ideas range from "padlocking it until the next war" to formation of western groups to buy and operate the plant. Those who favor "decentralization" of industry want control in western hands. They fear the government will sell out the plant to an eastern corporation or corporations, which will dismantle the works, and ship it east "to stifle western competition." Still others believe it possible that the government through subsidies will keep the plant operating as a sort of postwar WPA project. Final decision, of course, will be made by the government. Some negotiations already have been carried on, but if any decisions have been made they have not yet been made public.

Henry Kaiser plans to operate his Fontana mill in the postwar period. The plant was built with the aid of Reconstruction Finance Corp. funds and it is understood that the loan has been and is being amortized. Mr. Kaiser also has indicated he may be a prospective buyer of the Geneva plant.

There are many who are none-too-optimistic for the future of western-made steel. As an argument they point out that prewar consumption of ship plates was only 200,000 tons a year and western demand for all finished steel was 2,400,000 tons. Finished steel capacity now is 3,500,000 tons in the Far West, of which 1,025,000 tons is in ship plates. On this basis there is an excess capacity of large proportions. The West, to meet war needs, now is consuming about 6,700,000 tons of all finished steel, of which 3,000,000 tons are plates.

The Geneva and Fontana plants, the two biggest fully integrated factors in the western steel picture, together have a capacity for producig nearly 2,000,000 tons of the total western open hearth capacity of 3,200,000 tons. Western electric furnace capacity accounts for another 300,000 tons annually.

Geneva is one of the world's most modern steel plants. All raw materials are obtained from a 250-mile radius. Fontana, although smaller, is equally modern. Its supply problem is a little more difficult; iron ore and limestone are nearby, but coking coal most be imported from Utah and Oklahoma.

If Geneva is operated after the war, conversion to peacetime products is feasible and a number of varied markets could be served. Production of hot-rolled strip could be accomplished by addition of a slab squeezer, two extra finishing stands and two strip coilers. New facilities for making cold-rolled strip could be added either at Geneva or on the Coast. Electric furnaces could be installed in connection with the open hearths to turn out stainless and alloy steels. The plant has in operation a 26-inch structural mill, a 45-inch slabbing and blooming mill, a 132-inch continuous plate mill and complementary facilities. Rolling mills at Fontana include a 110-inch plate mill, a 28-inch structural mill and a 21-14 inch merchant mill.

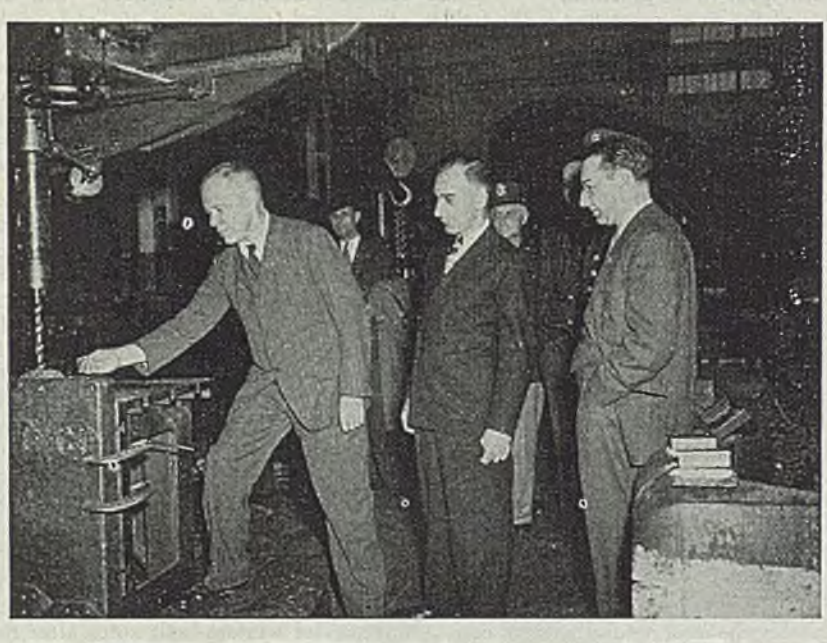
In addition to Geneva and Fontana, other steel producers on the West Coast are Bethlehem Steel Co. with 562,000 tons annual capacity, Columbia Steel Co. with 576,400 tons, and Judson Steel Co. with 86,720. Electric steel furnaces with 299,700 tons of capacity are operated by Isaacson Iron Works, Northwest Steel Rolling Mills Inc., Oregon Electric Steel Co., National Supply Co. and Pacific States Steel Co.

Most affected by the decision on the future of the producing plants are a score of fabricating companies, not including foundries. They are such companies as Western Pipe & Steel Co., Consolidated Steel Corp., Joshua Hendy Iron Works, Iron Fireman Mfg. Co., Norris Stamping & Mfg. Co., Axelson Mfg. Co., Rheem Mfg. Co., Byron Jackson Co., Pacific Tube Co., Pacific Car & Foundry Co., Willamette Iron & Steel Co., Yuba Mfg. Co., United States Spring & Bumper Co., Soule Steel Co., Hall Scott Motor Co., Isaacson Iron Works and Kenworthy Motor Truck Co. There are many others, but these are the primary factors. All of them are important cogs in the West Coast war production effort.

American Engineering Co. Consolidates Activities

Consolidation of all of its varied engineering functions into one engineering department has been effected by the American Engineering Co., Philadelphia, Allison L. Bayles, vice president, announced recently.

H. E. Preston has been elected vice president in charge of engineering. His supervisory staff now includes H. F. Lawrence, chief engineer; Prof. E. L. Midgette, director of research and design; J. E. Beck, manager of erection and operation; T. A. Harvey, estimate engineer; P. N. Oberholtzer, hydraulics engineer; C. A. Boecker, materials handling engineer; C. V. Koons and R. C. Lamond, marine engineers; F. L. Hemings, manager of design; and R. W. Reid, test engineer.



ASKS MAXIMUM PRODUCTION: Under Secretary of War Robert P. Patterson is shown visiting the plant of the Cross Co., Detroit, one of two where lathes for turning heavy shells are built. Mr. Patterson's tour was designed to increase production in the area's war plants

Budd Co. Ships First Load of Shells to Army

Pennsylvania firm has largest contract ever awarded to one concern to produce heavy gun shells for Army

FIRST carload of 600 8-inch shells made at Budd Field, Bustleton, Pa., has been shipped to an Army arsenal for loading, according to Edward G. Budd Jr., executive vice president, Edward G. Budd Mfg. Co. The Budd company has the largest Army contract for manufacture of heavy gun shells ever given one firm.

Green light for production of the first shells at the Budd Field plant was given after a shipment of "pilot" shells passed all tests at the Aberdeen Proving Grounds. Shipments will be increased as rapidly as necessary new equipment is installed.

Shipment of the first shells marks completion of the first stage of converting the plant into the largest single factory given over to production of large caliber shells in the United States. The conversion job started immediately after the contract was awarded.

Although the Army Ordnance Department had set high priority and urgency orders for the necessary tools and machines to make heavy shells, the scarcity of equipment in this country made it necessary to bring some of the machines from England for the Budd Field plant.

"Two shiploads of special machines for shellmaking have already arrived," Mr. Budd said. "Others are on the way. Some of our tools came from Canada; others, from widely scattered parts of the United States.

"We had to convert many foreign tools and machines to fit into our assembly lines. Some machines received from England show signs of hard use and had to be rebuilt. Some were taken from bombed-out factories and arrived with mortar and brick debris inside. Others were taken from actual operating lines. All these machines had to be changed over from 50-cycle to 60-cycle electrical operations, and many had to be rebuilt for the size shells we are making."

As soon as the Budd company obtained the contract, it started converting the Bustleton plant to build the shells required. Hundreds of men and women have been engaged in taking out jigs, fixtures and machines used for manufacture of the "Conestoga" stainless steel cargo plane for which the plant originally was built, and clearing the floor for new equipment.

PLAN VETERANS' REINSTATEMENT: Borg-Warner Corp.'s plan for reinstatement of its employes now in service was outlined to the National Association of Personnel Directors at a meeting in Chicago. Speakers included, left to right: Roland W. Barlow, director of employe relations for the company; Lieut. (j.g.) Mary Dudley, Navy nurse; and Lieut. Comm. Carl R. Brick, civil readjustment officer in the ninth naval district

BRIEFS . . .

Graham-Paige Motors Corp. at its Warren, O., plant has completed its first "sled-borne" diesel power plants to supply emergency current in occupied countries.

—o—

Jones & Laughlin Steel Corp., Pittsburgh, has been praised by the United States Navy for its production of wire and wire rope at its Aliquippa and Muncy, Pa., works.

—o—

Weirton Steel Co., Weirton, W. Va., has made a $250,000 contribution to start a fund for a community center building in the Weirton-Hollidays Cove district.

—o—

Addressograph - Multigraph Corp., Cleveland, has published a pamphlet explaining to manufacturers simplified ways of handling war contract termination paper work.

—o—

Pet Milk Co., St. Louis, has purchased the equipment and leased the real estate and plant of the Phelps Can Co., New Philadelphia, O., and will begin production of cans for evaporated milk about Feb. 15.

—o—

Hill, Hubbell & Co. Division, General Paint Corp., San Francisco, will build at Girard, O., a plant to prepare steel pipe with protective coatings and to wrap pipe.

General Motors Corp., Detroit, paid more than $18,800,000 in extra compensation in 1944 to more than 242,000 of its factory employes who were eligible to receive pay in lieu of vacation, H. W. Anderson, vice president in charge of personnel, announces.

—o—

Air Express Division of Railway Express Agency, New York, reports a 27.4 per cent increase in air express shipments handled at New York's La Guardia field in November, 1944 over the same period in 1943.

—o—

Monsanto Chemical Co., St. Louis, has developed a new process to waterproof Santocel, an insulating material which weighs only three pounds per cubic foot.

—o—

Lewis-Shepard Products Inc., Watertown, Mass., has issued a new general catalog of its materials handling equipment.

—o—

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has developed a small, portable mechanical device called the Vibrograph to quickly record vibrations.

—o—

National Lead Co., New York, has acquired the foundry and other assets of the W. A. Hardy & Sons Co., Fitchburg, Mass., brass founders for 94 years.

Industrial Production Pace Little Changed

INDUSTRIAL output throughout most of December was maintained at about the same level prevailing during the previous five months. Activity in the durable goods industries, particularly machinery, transportation equipment, and lumber, continued to be limited in part by manpower shortages.

Production of durable goods declined slightly in November, while output of other manufactured goods, especially war supplies, increased somewhat further and mineral production was maintained in large volume, the latest official production index figures of the Federal Reserve Board show. Activity at explosive and small-arms ammunition plants increased during the past two months, reflecting enlarged war production schedules.

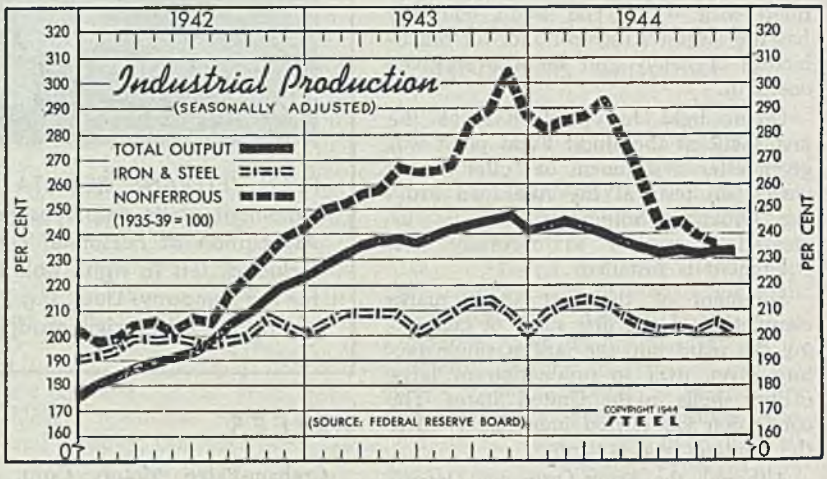
The board's seasonally adjusted production index held unchanged at 232 in November and little variation from this level is likely to be reported for December. In November, 1943, the index stood at 247.

EMPLOYMENT — Downward trend in manufacturing employment continued throughout November, but an early estimate for December indicates a leveling off at about 1.6 million less than a year ago, and there is a strong possibility that overall factory employment may soon tend slightly upward reflecting renewed emphasis on war production and the revised selective service policy of drafting those above the 26 year age group who are physically fit and not employed in essential war jobs.

Reflecting greater utilization of manpower and improved production efficiency, employment in the transportation equipment industries declined about one-fifth during the past year, but total output of aircraft, ships, and combat and motor vehicles has declined a much smaller amount.

MACHINE TOOLS—To obtain maximum employment of machine tools in war production, Jesse H. Jones, Secretary of Commerce, has asked all Defense Plant Corp. lessees to make a spot inventory to determine the machine tools which can be diverted immediately to production of ammunition and other vitally needed war supplies. Latest figures available show that the value of shipments of unrated machine tool orders was $1.4 million during November. However, a decline in such shipments must be expected with the step-up of war requirements causing absorption of the production facilities now utilized in filling orders for the unrated type of tools. At the close of November the machine tool industry's overall order backlog amounted to $233.8 million, or equivalent to 6.4 months' output at the November rate.

Foundry equipment sales declined sharply in November to an index figure of 369.5, which represented the lowest level recorded since September, 1943. In October the index stood at 526.5.



Federal Reserve Board's Production Indexes

(1935-39 = 100)

	Total Production		Iron, Steel		Nonferrous	
	1944	1943	1944	1943	1944	1943
January	242	227	208	204	281	250
February	244	232	212	208	285	252
March	242	235	214	210	286	256
April	239	237	213	209	292	257
May	237	238	210	208	279	266
June	235	236	204	201	264	264
July	231	240	202	204	243	256
August	232	242	203	210	245	264
September	231	244	202	214	239	277
October	232	247	206	215	236	286
November	232	247	201	209	...	304
December	...	241	...	200	...	286
Average	...	239	...	207	...	270

FIGURES THIS WEEK

INDUSTRY	Latest Period*	Prior Week	Month Ago	Year Ago
Steel Ingot Output (per cent of capacity)	92.5	96.0	96.5	91.5
Electric Power Distributed (million kilowatt hours)	4,400†	4,617	4,397	4,337
Bituminous Coal Production (daily av.—1000 tons)	1,796	1,668	1,991	1,646
Petroleum Production (daily av.—1000 bbls.)	4,600†	4,729	4,727	4,358
Construction Volume (ENR—unit $1,000,000)	$23.2	$20.2	$8.8	$28.2
Automobile and Truck Output (Ward's—number units)	20,005	21,100	20,900	15,220

*Dates on request.

TRADE				
Freight Carloadings (unit—1000 cars)	700†	762	839	644
Business Failures (Dun & Bradstreet, number)	15	33	17	21
Money in Circulation (in millions of dollars)‡	$25,335	$25,280	$24,674	$20,428
Department Store Sales (change from like week a year ago)‡	+17%	+23%	+11%	−4%

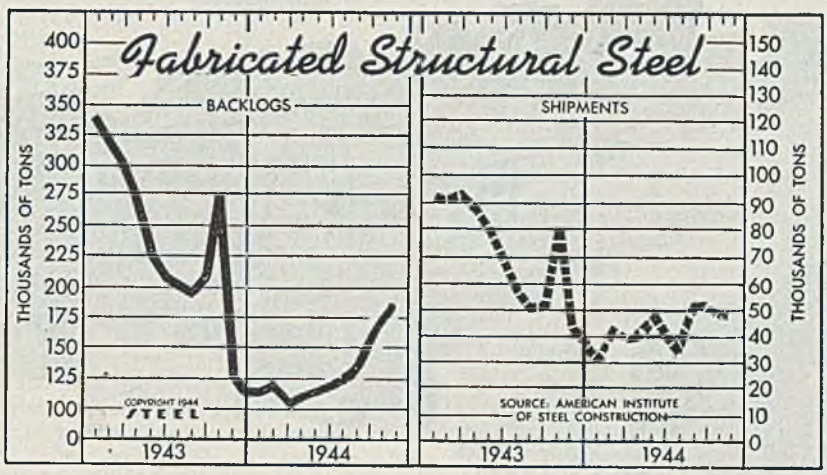
†Preliminary. ‡Federal Reserve Board.

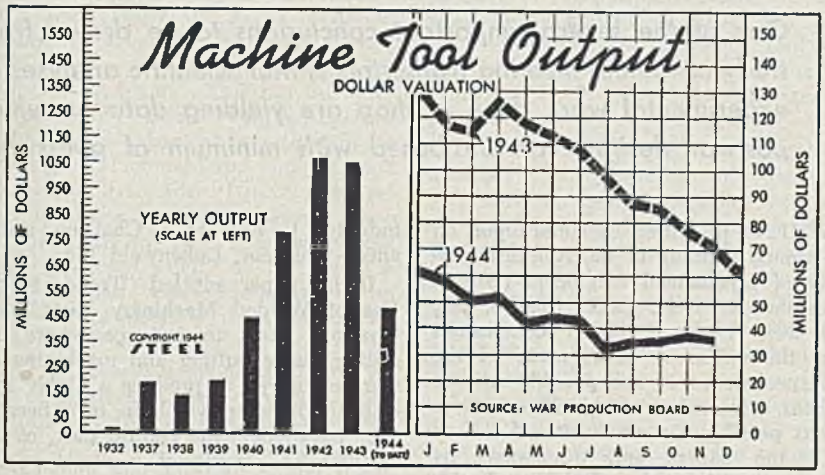
Fabricated Structural Steel

(1000 tons)

	Shipments			Backlogs		
	1944	1943	1942	1944	1943	1942
Jan.	34.0	91.9	167.8	113.1	339.1	704.4
Feb.	41.7	90.8	164.6	117.6	321.0	706.7
Mar.	40.0	94.0	191.3	106.3	299.8	777.7
Apr.	42.2	86.6	187.2	111.2	272.5	772.4
May	48.0	78.9	184.2	116.3	220.6	843.8
June	40.1	68.4	182.7	122.7	207.1	869.3
July	40.3	56.8	189.9	125.4	201.8	808.6
Aug.	51.2	50.2	173.9	130.4	195.6	783 5
Sept.	51.5	51.8	169.8	151.1	208.1	716.0
Oct.	48.5	80.1	152.9	174.4	274.0	617.7
Nov.	47.4	42.7	130.4	184.2	134.6	566 6
Dec.	...	39.6	145.3	....	113.0	523.5

Source: American Institute of Steel Construction. Figures for 1943 to date cover members' reports only; for other years they are estimates for the entire industry.





Machine Tool Output

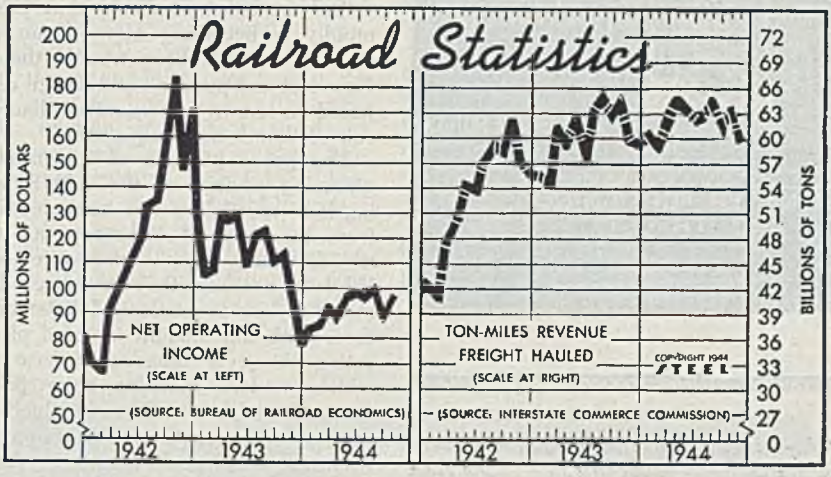
(000 omitted)

	1944	1943	1942
Jan.	$56,363	$117.384	$ 83,547
Feb.	50,127	114,594	84,432
Mar.	51,907	123.445	98,358
Apr.	41,370	118 024	103,364
May	41,819	113.859	107,297
June	41,471	108.736	111,090
July	32,753	97.428	113,596
Aug.	35,177	87,405	117,342
Sept.	35,876	85,842	119,883
Oct.	37,516	78,300	130,008
Nov.	36,803	71,811	120,871
Dec.	.....	60,861	131,960

Year	
1942	1,821,862
1941	812,462
1940	450,000
1939	210,000

Statistics of Class I Railroads

	Net Operating Income			Ton-Miles Revenue Freight		
	1944	1943	1942	1944	1943	1942
	(millions)			(billions)		
Jan.	$82.8	$105.3	$66.8	60.5	55.1	43.0
Feb.	84.5	105.8	64.4	59.3	54.4	40.8
Mar.	92.5	129.7	90.6	63.0	61.2	48.3
Apr.	87.7	128.7	101.6	60.4	59.1	50.0
May	98.5	129.5	109.7	64.0	62.1	54.2
June	99.8	109.0	118.7	62.0	58.0	53.9
July	98.6	127.8	133.6	62.8	63.7	57.0
Aug.	101.4	132.3	135.9	64.5	65.1	58.6
Sept.	89.1	110.3	155.1	61.0	62.5	58.2
Oct.	97.3	113.1	184.8	63.5	65.0	62.2
Nov.	....	96.4	149.0	59.4	59.6	57.0
Dec.	....	76.9	174.4	....	59.4	55.0
Avg.	....	$113.5	$122.9	..	60.5	53.2



FINANCE

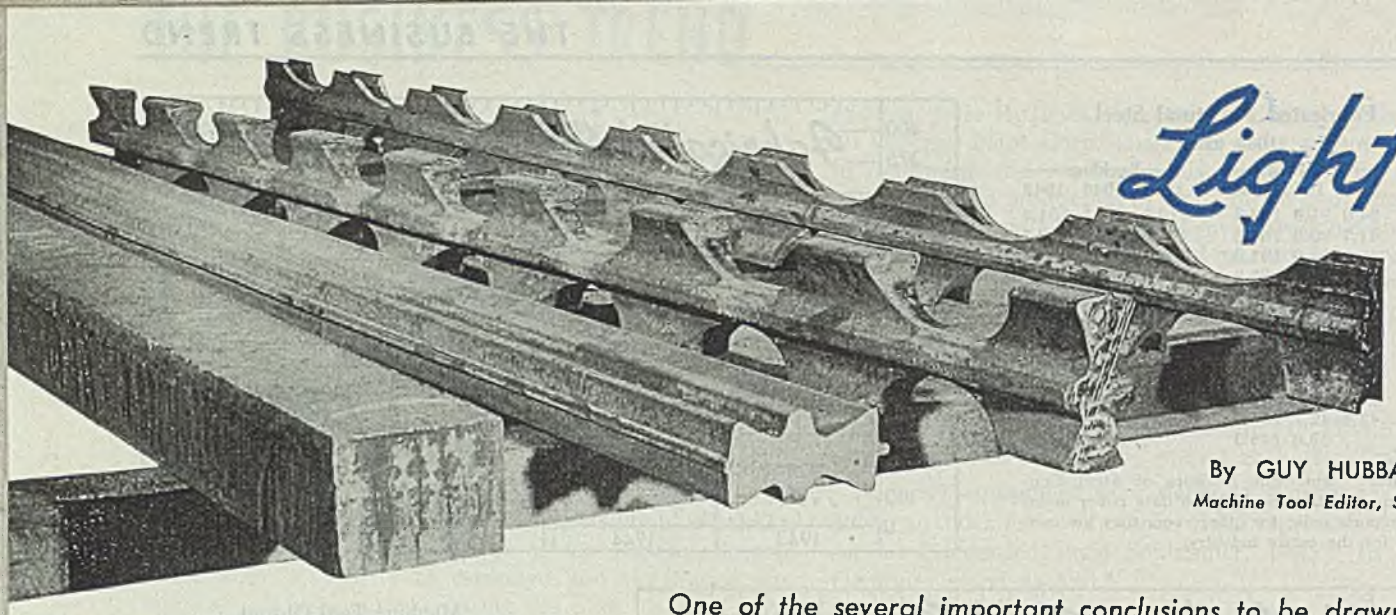
	Latest Period*	Prior Week	Month Ago	Year Ago
Bank Clearings (Dun & Bradstreet—millions)	$9,816	$12,517	$9,229	$8,619
Federal Gross Debt (billions)	$231.7	$231.4	$210.5	$169.8
Bond Volume, NYSE (millions)	$45.5	$61.8	$36.0	$47.4
Stocks Sales, NYSE (thousands)	6,722	6,508	3,570	4,703
Loans and Investments (millions)†	$59.9	$59.5	$53.9	$50.0
United States Government Obligations Held (millions)†	$43,786	$43,551	$39,656	$36,169

†Member banks, Federal Reserve System.

PRICES

STEEL's composite finished steel price average	$56.73	$56.73	$56.73	$56.73
All commodities‡	104.6	104.4	104.1	102.9
Industrial Raw Materials‡	115.4	115.1	114.1	112.2
Manufactured Products‡	101.3	101.3	101.2	100.4

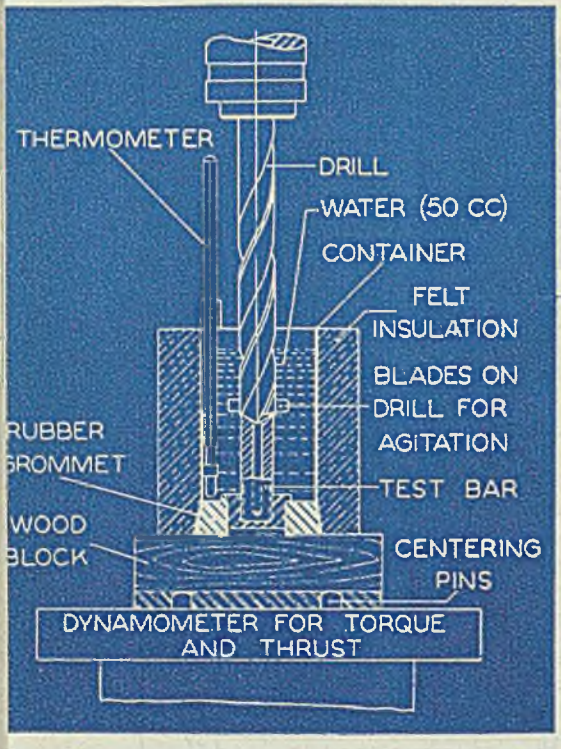
‡Bureau of Labor's Index, 1926 = 100.

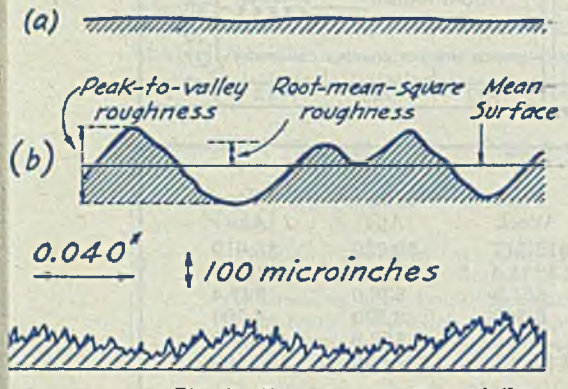


Light o

By GUY HUBBARD
Machine Tool Editor, STEEL

One of the several important conclusions to be drawn from study of annual meeting transcripts is that scientific analyses of experimental work done in shop are yielding data on which postwar designs can be based with minimum of guesswork





WHEN I presented a general report on the annual meeting of the American Society of Mechanical Engineers (STEEL, December 4, 1944, pages 82, 83, 202 and 204) I drew certain conclusions from the testimony of as many of the 278 speakers as it was possible for me to hear at as many of the 73 events as it was possible for me to attend.

Of the papers and discussions by many authorities on metalworking, I said: —"All tended to indicate that this art rapidly is becoming more of an exact science than has been true in the past. Now tool and machine tool design can be based on known factors rather than upon rule-of-thumb and empiricism."

The prime purpose of this brief engineering review of the ASME meeting is to spotlight a few examples drawn from the mass of testimony on which my foregoing conclusions were based. While of necessity they have been drawn more or less at random, I have chosen them with the thought in mind of indicating the ever broadening base upon which modern machine shop practice rests. Also to show manner in which techniques, at first considered as competitive, eventually become cooperative.

Without further ado, let us take a look at some cases wherein several techniques have co-operated to bring about an end-product which costs less, or is easier to build, or is of superior quality than that which could be turned out by employing any one single technique. For the examples which I have "drawn out of the hat" in this instance, I am indebted to Edward J. Charlton, assistant-to-president, Lukenweld Inc.

In his paper entitled "Trends in the Use of Welded Machinery Parts," Mr. Charlton cited an instance where hot rolling, flame cutting and machining all were employed to produce a highly specialized member which in turn became the "backbone," the central part, of the familiar "X" frame of a diesel engine used on submarines.

The interesting evolution of this "backbone" is shown by Fig. 1 at the upper lefthand corner of this two-page spread. At the left is the initial billet of hot rolled steel. Next to it is the special shape rolled from this billet. Then comes this shape as modified by multiple-torch flame cutting. Finally, at the extreme right, is the member as machined to its final dimensions, ready to be welded in as the central part of the fabricated frame of an engine. Mr. Charlton believes in making use of special shapes comparable to this wherever they will result in a better product, even though the structure could be all-welded, or expedients involving standard rolled sections might be possible.

Another interesting case of "co-operation" which he cited was between drop forging and welding. This is presented as Fig. 4 at the lower righthand corner of this spread. Here the drop forged parts shown in the foreground have been flash welded into the unit in the background—this in turn being welded in as a component of a much larger structure. Design freedom in shaping for minimum weight and maximum predictability are among advantages attained. Steel castings also are used similarly.

Mr. Charlton pointed out that this sort of thing has opened up a market in the welding industry for hundreds of tons of forgings and castings. Generally they are used in components of such size or such nature as would be prohibitive or impossible as single-piece forg-

Fig. 1—Top of page—From billet to "backbone." Rolling, flame cutting and machining co-operate to produce shape used as key member of welded "X" frame

Fig. 2 (Center, above)—Calorimeter and dynamometer setup employed by Schmidt, Gilbert and Boston for exact determination of forces involved in drilling

Fig. 3—Directly above—Topographical methods applied to study of surface finish, "a" being in equal magnification vertically and horizontally; "b" magnified 25 times as much vertically; and at bottom, vertical is 125 times horizontal

Metalworking Trends Is Shed by ASME Papers

ings or castings or not very dependable.

The manner in which machine shop practice is being reduced to an exact science was demonstrated during the ASME meeting by so many examples that again I must "draw one out of the hat." This time I find myself considering a joint paper by A. O. Schmidt, Kearney & Trecker Corp., and Messrs. O. W. Boston and W. W. Gilbert, University of Michigan. This has the rather formidable title, "Thermal-Balance Method and Mechanical Investigation for Evaluating Machinability," but it isn't as tough as it sounds. I have great respect for these gentlemen because—one and all—they are able scientists whose feet are planted solidly on the machine shop floor and whose heads are in no clouds except possibly those caused by the smoke from cutting oil.

This in no way is intended to be a review or abstract of their paper on determination of drilling and similar forces and results thereof. The complete paper demands and deserves careful study. I merely want to give some idea as to how these able investigators tackle such problems. Therefore, I present as Fig. 2, at the lefthand center of this spread, a diagram showing their dynamometer mounted calorimetric apparatus setup to register torque and thrust simultaneously. This was in a weight fed, Delta drill press, the calorimeter being located on top of the dynamometer by two centering pins, various metal test bars being threaded at their lower ends and screwed into a holder.

On the basis of careful tests on nine Dowmetal alloys, free turning brass, low carbon and high carbon steel, complete and careful tabulations, based on ten tests in each case, are set forth in the paper. These experiments, reminiscent of those of Joule in determining the mechanical equivalent of heat, are destined—I believe—to influence tool design in a manner comparable to that of Joule's work in connection with power plant design.

Exact specification of the degree or quality of surface finish of machined parts now ranks in importance with exact specification of dimensions. While at the moment surface finish is coming in for special attention in connection with aircraft engine parts and other war work of high precision, it is destined to be of equal importance throughout industry after the war.

Surface finishing—its specification and its practical evaluation and gaging—now is occupying the attention of scientists as well as shop men. Along this front, the laboratory today is very close to the shop. L. P. Tarasov, research laboratories, Norton Co., brought this condition of things vividly to the fore at the ASME meeting through his discussion of the relation of surface roughness readings to actual surface profile. It is from his presentation that I have borrowed the three diagrams which appear in this article as Fig. 3, lower left.

Mr. Tarasov's studies have emphasized the desirability of relating profilometer readings to the actual "peak-to-valley" distances such as are measured by a micrometer. Using taper sections of a variety of abrasive finished steel surfaces, approximate multiplying factors have been determined. These factors are about 4½ for cylindrical ground work; 6 to 7 for other finished abrasive finishes; and as high as 10 for loose abrasive lapped surfaces. The paper lists all this in great detail.

Fig. 3 shows how scientists now deal with surfaces finished to microinches (millionths) the way topographers deal with mountain ranges. Diagram "a" represents a typical work profile magnified equally both horizontally and vertically. In diagram "b" this same section has been magnified 25 times vertically, but same as in "a" horizontally. Then in the lower diagram, vertical magnification is 125 times greater than horizontally. In this case roughness can be seen superimposed on waviness, the latter comprising gradual curvature of wave length greater than 0.040-inch. These diagrams also serve to visualize something of the nomenclature now being applied to evaluation of surface quality.

To sum it up, Mr. Tarasov does a practical and effective job of showing how roughness measurements can be converted into "linear microinches" which readily can be visualized and handled in the same way as any other linear dimensions. I recommend that tool engineers and other production men get this paper and study it, because it deals with problems which they are going to run

(*Please turn to Page* 137)

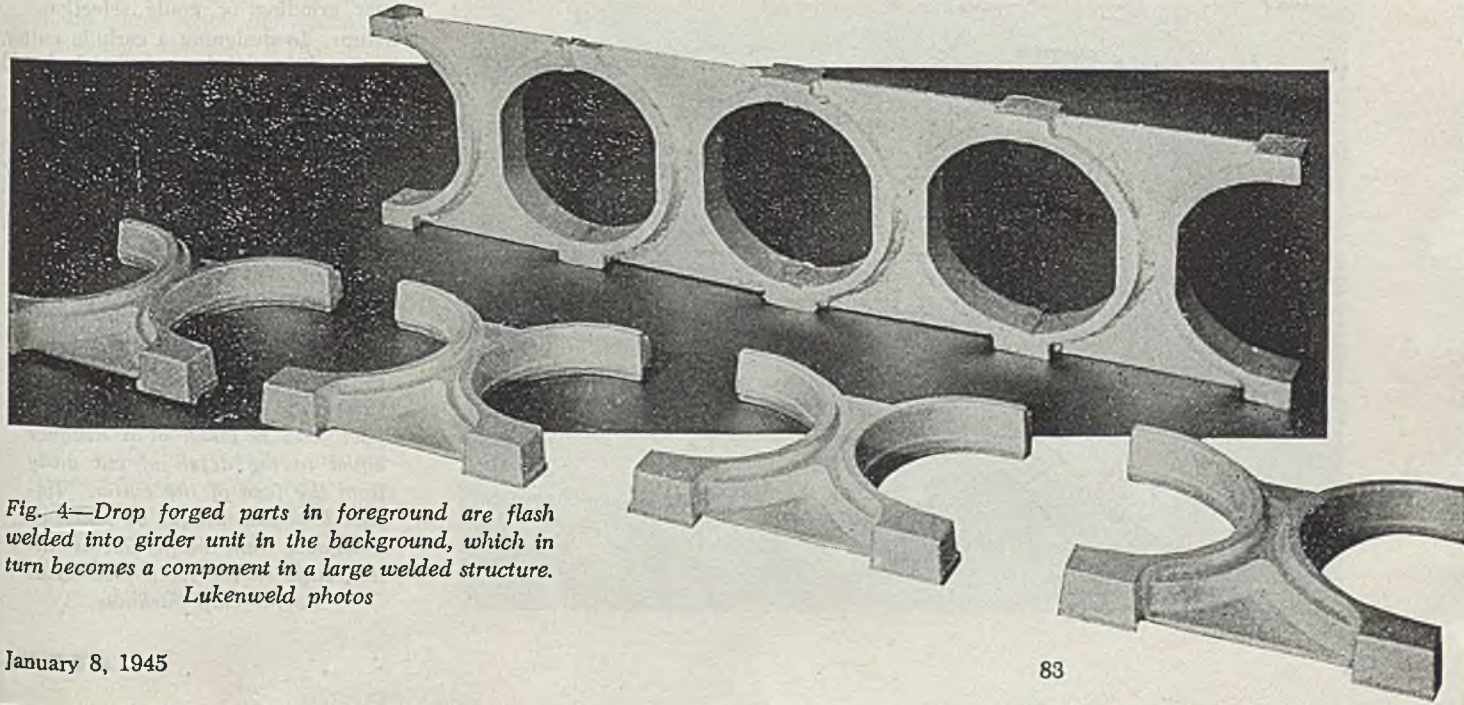


Fig. 4—Drop forged parts in foreground are flash welded into girder unit in the background, which in turn becomes a component in a large welded structure.
Lukenweld photos

Selecting Carbides FOR MILLING

"Wrong" grade correctly used often will provide better results than "right" grade improperly handled. Five types provide optimum performance and cutter life for most milling operations

By FRED W. LUCHT
Development Engineer
Carboloy Co. Inc., Detroit

WHEN starting a new milling operation with carbides—or when changing over from high speed steel cutters to carbide tipped cutters—one of the problems which inevitably arises is that of selecting the proper grade of carbide from among the many available.

Through the years since the introduction of carbides, much has been learned about what constitutes good milling practice with such tools. This, in turn, has resulted in the realization that many of the variables encountered in milling performance are traceable more to other factors than to incorrect grade selection. With increased knowledge as to factors that contribute to good results, grade selection has become greatly simplified over what it was even a few years ago.

Today, a total of five grades of carbides—as may be seen from the chart—are sufficient to give optimum performance and cutter life over virtually the entire range of milling jobs, provided that the basic requirements as to good milling practice with carbides have been observed. It is interesting to note in this connection that the "wrong" grade—if correctly *used*—may often give better over-all results than the "right" grade if the latter is incorrectly employed.

Thus, if correct principles as to cutter sharpening, etc., are not adhered to, then proper grade selection will help but little in assuring success of the operation.

Grinding: Among the factors which can make or break any carbide milling application is cutter sharpening. Here, both correct equipment and correct techniques must be used. The best grade of carbide can be ruined through the formation of heat checks, if the operator tries to remove too much carbide at a single pass of the wheel. In general, carbide removal per wheel pass should not exceed 0.0004-inch for rough grinding, and 0.00015-inch for finish grinding. On the other hand, enough carbide must be removed from a worn cutter tip to get down to good, solid metal again.

If there is any question as to how much of the carbide metal should be removed, a quick, accurate answer can be obtained by looking at the ground surfaces through a magnifving glass of 20 or more magnifications. If insufficient stock has been removed, fine, hair-like lines will appear on the surface of the carbide. These lines will cross the cutting edges at several points.

Unless sufficient stock is removed in the sharpening process, cutter life will be materially shortened since these hair-like lines afford excellent starting points for start of cutting edge breakdown.

Diamond wheels should be used for sharpening carbide cutters, and the wheel should not be allowed to contact the steel in the cutter. Steel loads a diamond wheel. This tends to cause overheating and resultant grinding checks in the carbide.

Cutter Design: Even the most perfect grinding practice, however, will not offset incorrect cutter design. When milling steels or tough and hard cast irons, for instance, double negative angles should be used in most cases.

A series of tests conducted in Carboloy Co.'s engineering laboratory has revealed that longest cutter life is obtained with around 10 degrees negative axial rake and 10 degrees negative radial rake. The indications are that these angles may be best for the harder steels, whereas 5 degrees positive radial rake angles can be used for soft steels.

Furthermore, if there is not enough chip room provided in the cutter, then the chip may heat up and get sticky. Many an edge failure of the carbide tip is due to sticky chips being pulled through a second time rather than improper grinding or grade selection.

Setup: In designing a carbide cutter, setup conditions of the specific job should always be taken into consideration, particularly as they affect rake angles. The objective of using negative rake angles, of course, is to keep the chip load away

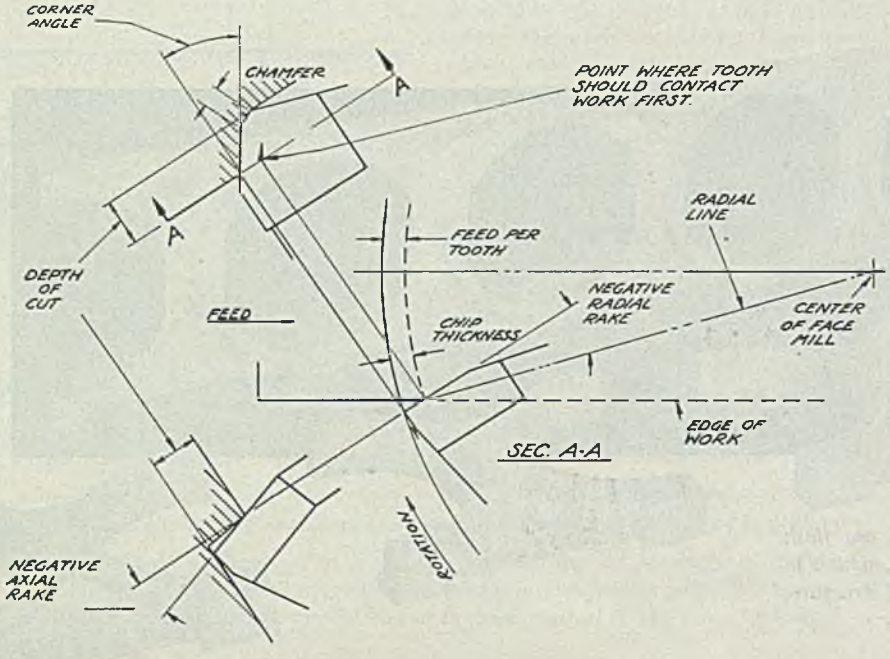


Fig. 1—In designing carbide cutters, setup conditions of the specific job should be taken into consideration, especially as they affect rake angles. The axial rake angle, as shown in the diagram, should be sufficiently large so that the impact load is taken at a distance equal to the depth of cut away from the face of the cutter. Impact load also should be taken at a distance from the peripheral cutting edge on the tooth face equal to the chip thickness

from the cutting edge and the nose. The axial rake angle should be sufficiently large so that the impact load is taken at a distance equal to the depth of cut away from the face of the cutter (see Fig. 1). The impact load also should be taken at a distance from the peripheral cutting edge on the tooth face equal to the chip thickness (see Fig. 1).

It is entirely possible, however, to put negative angles on the cutter itself and yet—due to setup conditions—have the load come on the cutting edge or nose as the tool enters the cut. The best practice to date is to check the cutter setup and make sure that the actual effective angle between the cutter and work is in line with the desired rake angles.

To shift the impact load away from the cutting edge on the periphery of the tooth to a distance from the periphery equal to the chip thickness, the work can be moved at right angles to the direction of the feed.

In face milling it is usually desirable, for the same reason, to design the cutter with a bevel or a corner angle so that the initial impact load will be taken at some distance from the nose or chamfer when the cutter tooth has to enter the work with a large radius or draft angle on the corner. This bevel or corner angle has been known to go as high as 15, 35 and even to 45 degrees to meet the desired conditions.

Feeds and Speeds: The selection of the proper feeds and speeds is a long subject in itself. There is, however, one point which might be emphasized as having an important bearing on the proper performance of the carbide grade selected. Sufficient feed per tooth should be provided so as to avoid concentration of chip load near the cutting edge. Feed per tooth when milling steels should preferably be kept between 0.008 and 0.012-inch.

Best cutter life is usually experienced when the cutting edge approaches the cut with a thick chip. The chip thickness is at its maximum, and equal to the feed per tooth, when the edge of the work where the cutting edge enters it is at the cutter center line parallel with the direction of feed. If the work is moved in either direction at right angles to the direction of feed, the chip thickness will gradually decrease.

Carbides give the longest life if the speed is varied with the hardness of the steel being milled. A steel having a brinell hardness of 110 seems to be milled best at a speed of about 750 surface feet per minute. Heat-treated alloy steels having a hardness as high as 400 brinell will mill best at a reduced speed of about 360 surface feet per minute. At too high speeds, carbide wear increases. At lower speeds a built-up edge is formed, resulting in poorer finish and reduced cutter life.

Vibration and Chatter: Use of flywheels on milling machines — about which a great deal has been said and written lately—is sound practice and has two definite advantages, particularly when milling at high speeds.

In the first place, a flywheel damps out

(*Please turn to Page* 126)

CHART FOR SELECTING THE CORRECT CARBIDE GRADES FOR MILLING

Materials	Job	Job Characteristics	Required Qualities In Carbides	Suggested Composition of Carbides
Steels	Rough Milling	All	Cratering resistance Toughness Wear resistance Edge strength	Tungsten-Titanium-Tantalum Carbide (Grade No. 78B or equivalent)
	Finish Milling	Heavier Feeds Or Cuts	Wear resistance Cratering resistance Toughness Edge strength	Tungsten-Titanium-Tantalum Carbide (Grade 78B or 78 or equivalent. 78 harder; 78B tougher)
		Lighter Feeds Or Cuts	Same as above; even more abrasion resistance and edge strength	Straight Tungsten Carbide (Grade No. 883 or equivalent)
Plain Cast and Malleable Irons	Rough And Finish Milling	Rough Castings	Toughness Wear resistance Cratering resistance	Straight Tungsten Carbide relatively coarse grained (Grade No. 44A or equivalent)
		Smoother Castings; Finishing Cuts, etc.	Abrasion resistance Toughness Cratering resistance	Straight Tungsten Carbide finer grained than No. 44A (Grade No. 883 or equivalent)
Steel Types of Cast and Malleable Irons or Irons with Hard Sections	Rough And Finish Milling	All	Cratering resistance Abrasion resistance Toughness	Tungsten-Titanium-Tantalum Carbide (Grade No. 78 or 78B or equivalent for those irons most nearly approaching steel in character) Straight Tungsten Carbide (Grade No. 883 or equivalent, when higher abrasion resistance is required)
Aluminum Alloys	Rough And Finish Milling	General Milling	Abrasion resistance Toughness Wear resistance Ability to take a keen edge	Straight Tungsten Carbide (Grade No. 883 or equivalent)
		Form Milling	Same as above Must also resist formation of a built-up edge	Tungsten - Tantalum Carbide (Predominantly Tungsten Grade No. 907 or equivalent)
Magnesium Zinc Alloys Brass Bronze Plastics Fiber, etc.	Milling	All	Abrasion resistance Wear resistance Toughness	Straight Tungsten Carbide (Grade No. 883 or equivalent)

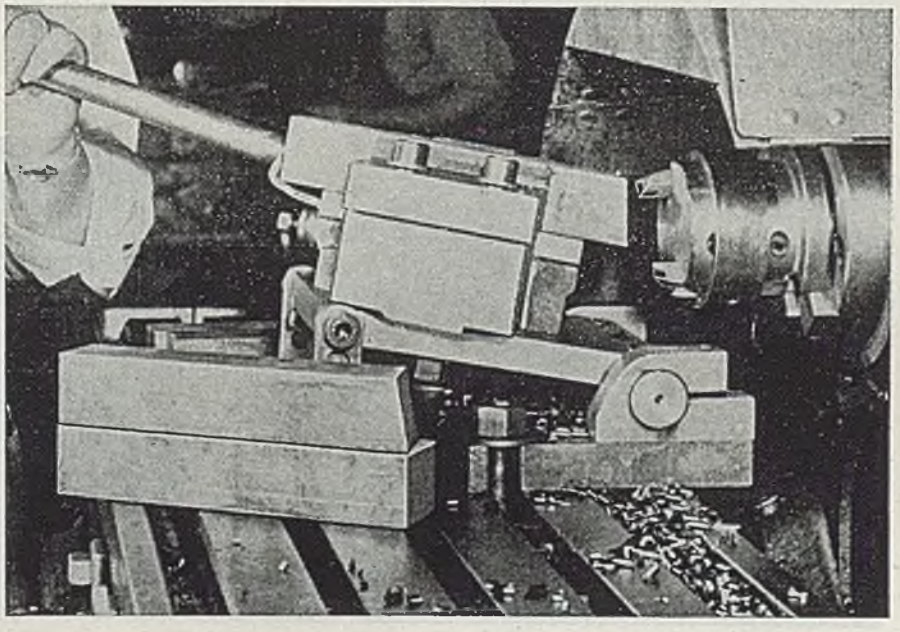
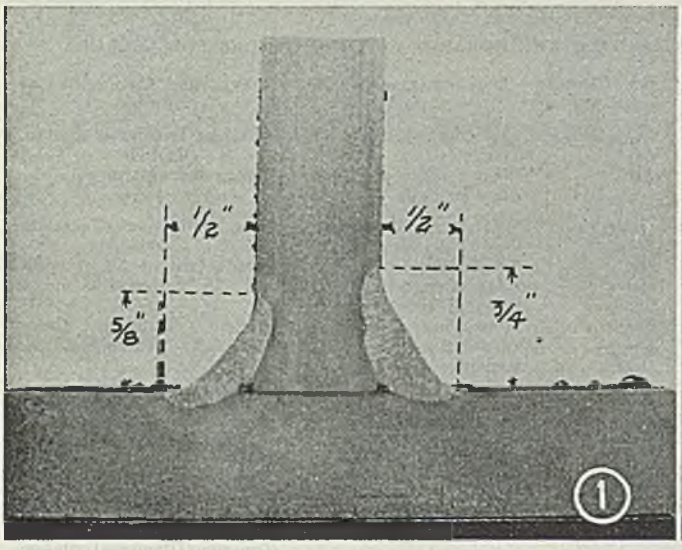
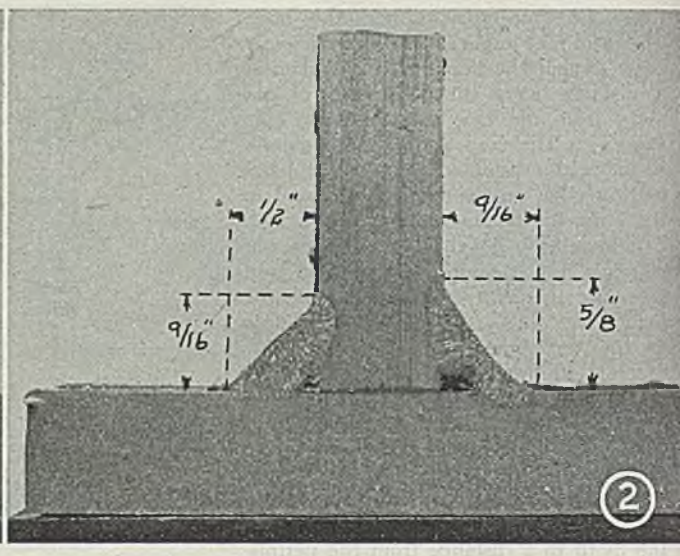


Fig. 2—Setup for milling SAE-1095 steel shanks for carbide-tipped tools. Milling cutter itself was made by mounting two reground "triple" carbide-tipped tool bits in a circular cutter body. This 2½-inch cutter operates at 635 surface feet per minute with feed of 0.008-inch per tooth





DEEP FILLET WELDING

● ● increases welding footage two to three-fold

● ● ● ● affords savings in electrode consumption of about one-third

● ● ● ● ● ● employs predetermined angle, travel rate and amperage

DEEP FILLET procedure for fillet welding increases welding footage from two to three times that of conventional fillets and affords a saving of about one-third in electrode consumption.

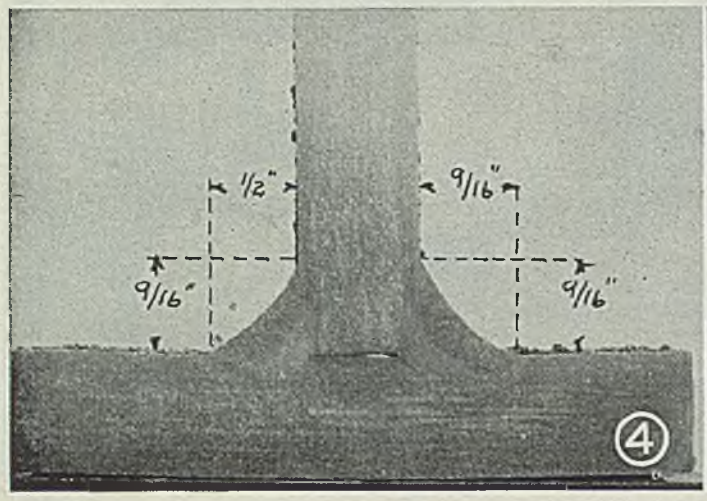
The main differences in these two are that the conventional fillet is one in which an arc is held, the electrode being away from the plate and stiffener; whereas in the deep fillet procedure, a fillet is made by dragging the electrode at a predetermined angle, travel rate and amperage, with the electrode in direct contact both with plate and stiffener.

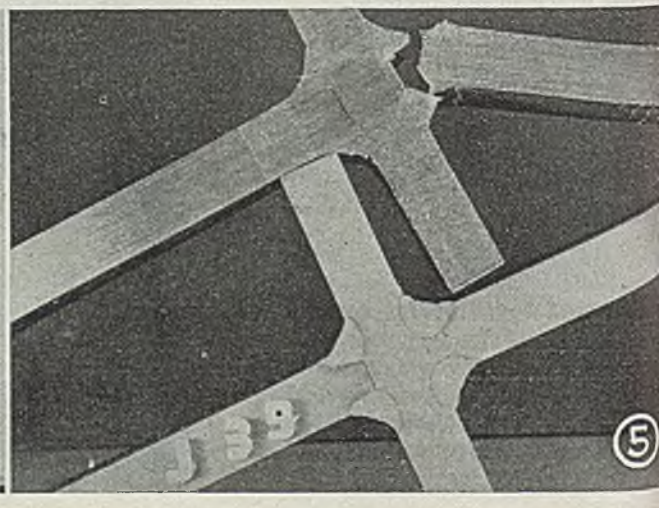
Fillet welds have been commonly accepted by supervisory personnel and inspectors on the basis of general appearance and weld gage measurement, the latter usually being done by measuring the leg length. Fillet welds are expected by designers to withstand certain loads without failure, therefore the prime basis of acceptance of a fillet weld should be the strength developed by the weld.

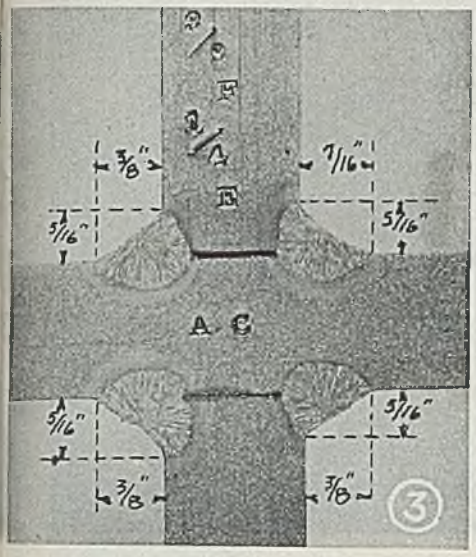
A cross section of a production weld made flat or positioned is shown in Fig. 1. For a ½-inch fillet weld, the designer would expect a minimum load of 36,000 pounds per lineal inch of two fillets before failure. Actual test of weld indicated it to have about the strength of a ¼-inch weld, or 21,200 pounds.

Fig. 2 shows a similar weld that failed at 24,295 pounds with the approximate strength of a 5/16-inch weld. The 2-pass fillet in Fig. 4 corresponds closely in appearance and leg measurements, yet this weld withstood a load of 40,250 pounds before failure.

Fig. 3 shows a deep fillet weld, drawing size ⅜-inch, made with a ¼-inch electrode, using alternating current. The leg sizes on the horizontal member are ⅜-inch minimum, and on the vertical member 1/16 less than ⅜-inch. The weld was made horizontal or nonpositioned. The actual strengths produced in this weld were 34,820 pounds per lineal inch of the two fillets, with a mini-







By R. V. ANDERSON
General Welding Engineer
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TABLE I

Fig. No.	Fillet Drawing Size inches	Electrode Size inches	Minimum Desired Strength Per Lineal Inch of 2 Fillets AC pounds	Minimum Desired Strength Per Lineal Inch of 2 Fillets DC pounds	Average Actual Strength Produced Per Lineal Inch of 2 Fillets AC pounds	Average Actual Strength Produced Per Lineal Inch of 2 Fillets DC pounds
8	5/16	5/16	15,500	15,500	18,528	17,024
9	1/4	3/16	20,500	20,500	24,720	22,625
10	5/16	5/32	25,000	25,000	30,110	27,590
11	5/16	1/4	25,000	25,000	29,890	27,472
12	3/8	5/32	29,000	29,000	34,618	31,770
13	3/8	1/4	29,000	29,000	34,924	31,980
14	7/16	1/4	32,500	32,500	38,782	35,670

TABLE II

PROCEDURE FOR DEEP FILLET TECHNIQUE DOWNHAND POSITION USING AWS E-6020-30 HEAVY, ALL-MINERAL COATED ELECTRODES

Drawing Fillet Size Inches	Electrode Size Inches	Recommended Travel Speed Flat	Recommended Travel Speed Horizontal	Electrode Burn-Off Rate Inches Per Minute	Full Rod Burn-Off with 2-Inch Stub Minutes and Seconds 14" Electrode	Full Rod Burn-Off with 2-Inch Stub Minutes and Seconds 18" Electrode
5/16	5/16	12	10	11½	1:02	1:23
1/4	5/16	12	10	13	0:56	1:14
5/16	5/32	12	10	13	0:56	1:14
5/16	1/4	12	10	10	1:12	1:36
3/8	5/32	12	10	14	0:51	1:08
3/8	1/4	12	10	11½	1:02	1:23
7/16	1/4	12	10	12½	0:57	1:16
1/2	1/4	12	10	14	0:51	1:08
1/2	5/16	12	10	12	1:00	1:20

TABLE III

COMPARISON BY MEASUREMENT OF WELD DEPOSITED

Design Fillet Size	Electrode Size	Electrode Length	Electrode Burn-off Rate	(See °)
		HORIZONTAL POSITION		
5/16	5/16	18	11½	14
5/16	5/16	14	11½	10½
1/4	5/16	18	13	12
1/4	5/16	14	13	9
5/16	5/32	18	13	12
5/16	1/4	18	10	16
3/8	5/32	18	14	11½
3/8	1/4	18	11½	14
7/16	1/4	18	12½	12¾
1/2	1/4	18	14	11½
1/2	5/16	18	12	13¼
		FLAT POSITION		
5/16	5/16	18	11½	16¾
5/16	5/16	14	11½	12½
1/4	5/16	18	13	15
1/4	5/16	14	13	12
5/16	5/32	18	13	15
5/16	1/4	18	10	19
3/8	5/32	18	14	13¾
3/8	1/4	18	11½	16¾
7/16	1/4	18	12½	15¼
1/2	1/4	18	14	13¾
1/2	5/16	18	12	16

°Inches of weld deposited with proper current and recommended speed leaving 2-inch stub.

TABLE IV

AMPERES REQUIRED TO ACHIEVE DESIGNATED BURN-OFF RATES AND PREFERRED POLARITY FOR 5/16" DRAWING SIZE DEEP FILLET PROCEDURE

Rod Size	Brand	Travel Rate	Burn-Off Rate	Direct Current Closed Circuit Amps Straight Polarity	Direct Current Closed Circuit Amps Reverse Polarity	Preferred Polarity	Alternating Current Clos'd Circ't Amps
5/16"	Murex FHP	10"	11½"	195	205	Straight	220
"	Black Devil	"	"	160	205	Reverse	195
"	Westinghouse DH	"	"	...	...	Straight	...
"	Sureweld F	"	"	225	230	Straight	235
"	Sureweld A	"	"	...	...	Straight	...
"	Smithway 20	"	"	...	...	Reverse	...
"	Smithway 35	"	"	...	...	Straight	...
"	McKay 16	"	"	...	...	Straight	...
"	Murex Fillex	"	"	...	...	Straight	...
"	Murex F	"	"	...	...	Straight	...
"	Smoothare DH2	"	"	205	225	Straight	230
"	Red Devil	"	"	...	...	Reverse	...
"	G. E. W-24	"	"	205	215	Straight	235
"	Fleet 9	"	"	...	...	Straight	...
"	Wilson 105	"	"	200	215	Straight	230

mum requirement of 29,000 pounds.

The method used to determine the actual strength produced is to weld a double-T section, and saw out 1½-inch transverse sections from the finished specimen. The specimens are measured for cross section with micrometers, tested in a testing machine, and the load calculated back to 1 inch. The plate material is heavy enough so that the failure is always forced in the weld and not in the material.

Fig. 5 shows a section before and after testing. Each specimen section is tested to determine any defects in work for entire length and to ascertain work uniformity as welding progresses.

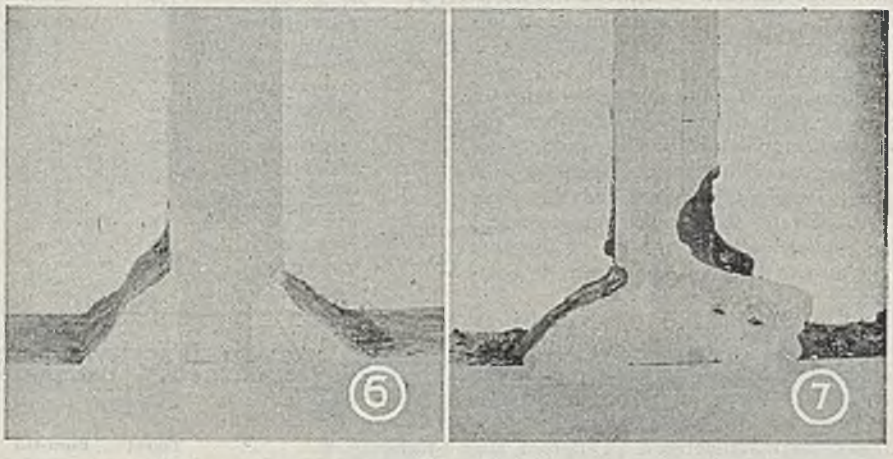
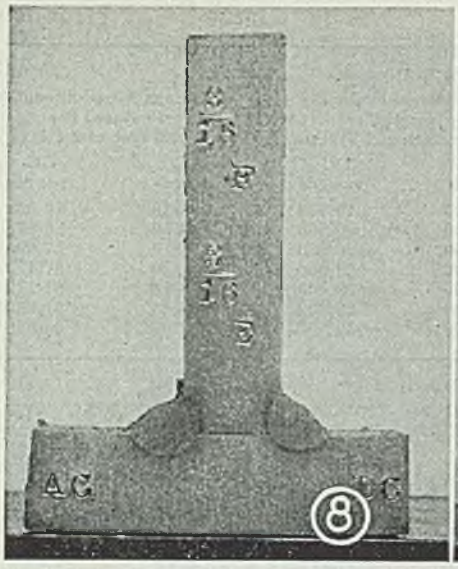
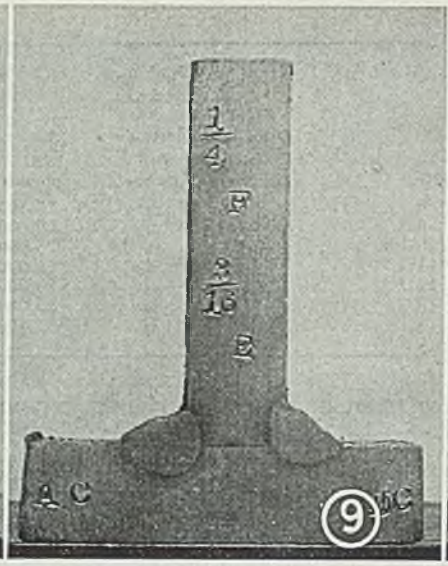


Fig. 6 illustrates a 2-pass ⅜-inch conventional fillet on the left and a 1-pass deep fillet on the right. The welds are made by a horizontal or nonpositioned procedure.

An attempt of a junior welding operator to make a ⅜-inch fillet with the conventional procedure appears in Fig. 7. The arc has badly undercut the stiffener. With the deep fillet procedure, an inexperienced person may produce a good weld with very little experience in a short time.

As a result of several thousand tests, it has been demonstrated that work of better than average quality and strength, and with less fatigue to the operator, at 24,295 pounds with the approximate dure than by using the conventional procedure. Strengths produced with alter-





nating current are about 20 per cent over the minimum required strength and with direct current, about 10 per cent over. Deeper penetration is obtained with the former. Table I shows the average results of tests made over a period of about 18 months. Figs. 8, 9 and 10 show specimens studied as typical of these conditions.

Where deep fillet procedures are used, welds of uniform strength are assured because the arc length is constant, due to electrode coating being in contact with plate and stiffener. Predetermination of heat setting is possible when burn-off rate is known, and penetration can be controlled by the travel rate. See Table II. This also illustrates how burn-off rate may be checked by time required to consume an electrode.

The question has been raised many times as to why a table of burn-off rates was developed for deep fillet procedure as a means of indicating the heat settings necessary, rather than giving the amperage required to achieve the burn-off rate. This may be explained as follows:

Bare wire of a given size and composition would have a definite burn-off rate at a given amperage; however, the coatings applied to the electrode wire by various manufacturers require different amperages to achieve the same burn-off rate, as enough amperage must be applied not only to burn off the wire but also to burn off the electrode coating.

It will be noticed from Tables IV through VII that it requires a different amperage setting for nearly every manufacturer's brand of electrode; also in different lots of electrodes received from the same manufacturer. Different amperages may be necessary due to slight changes in ingredients entering the coating. Therefore, the only safe means at hand for achieving strength desired by naval architects who call for certain drawing size fillets, is to obtain the heat setting by the burn-off rate. This data is set forth in tables herewith. These lists are incomplete due to the fact at times when it is desired to make tests,

(*Please turn to Page* 128)

TABLE V

AMPERES REQUIRED TO ACHIEVE DESIGNATED BURN-OFF RATES AND PREFERRED POLARITY FOR ¼" DRAWING SIZE DEEP FILLET PROCEDURE

Rod Size	Brand	Travel Rate	Burn-Off Rate	Direct Current Closed Circuit Amps: Straight Polarity	Direct Current Closed Circuit Amps: Reverse Polarity	Preferred Polarity	Alternating Current Clos'd Circ't Amps
3/16"	Murex FHP	10"	13"	215	230	Straight	245
"	Black Devil	"	"	170	230	Reverse	225
"	Westinghouse DH	"	"	...	...	Straight	...
"	Sureweld F	"	"	245	250	Straight	260
"	Sureweld A	"	"	...	...	Straight	...
"	Smithway 20	"	"	...	...	Reverse	...
"	Smithway 35	"	"	...	...	Straight	...
"	McKay 16	"	"	...	...	Straight	...
"	Murex Fillex	"	"	...	...	Straight	...
"	Murex F	"	"	...	...	Straight	...
"	Smootharc DH2	"	"	220	225	Straight	245
"	Red Devil	"	"	...	...	Reverse	...
"	G. E. W-24	"	"	235	245	Straight	260
"	Fleet 9	"	"	...	...	Straight	...
"	Wilson 105	"	"	235	240	Straight	250

TABLE VI

AMPERES REQUIRED TO ACHIEVE DESIGNATED BURN-OFF RATES AND PREFERRED POLARITY FOR 5/16" DRAWING SIZE DEEP FILLET PROCEDURE

Rod Size	Brand	Travel Rate	Burn-Off Rate	Direct Current Closed Circuit Amps: Straight Polarity	Direct Current Closed Circuit Amps: Reverse Polarity	Preferred Polarity	Alternating Current Clos'd Circ't Amps
¼"	Fleet 11	10"	10"	310-330	...	Straight	300-330
"	Murex FHP	"	"	295-300	300	Straight	315-320
"	Black Devil	"	"	275	...	Reverse	310
"	Westinghouse DH	"	"	305	310	Straight	315
"	Sureweld F	"	"	335	340	Straight	340-365
"	Sureweld A	"	"	280	285	Straight	305
"	Smithway 20	"	"	185	260	Reverse	260
"	Smithway 35	"	"	290	295	Straight	325
"	McKay 16	"	"	...	...	Straight	...
"	Murex Fillex	"	"	295	320	Straight	315
"	Murex F	"	"	295	305	Straight	310
"	Smootharc DH2	"	"	...	...	Straight	330
"	Red Devil	"	"	220	285	Reverse	270
"	G. E. W-24	"	"	295	305	Straight	335
"	Wilson 105	"	"	285	305	Straight	320
"	Fleet 9	"	"	325	325	Straight	310

TABLE VII

AMPERES REQUIRED TO ACHIEVE DESIGNATED BURN-OFF RATES AND PREFERRED POLARITY FOR ⅜" DRAWING SIZE DEEP FILLET PROCEDURE

Rod Size	Brand	Travel Rate	Burn-Off Rate	Direct Current Closed Circuit Amps: Straight Polarity	Direct Current Closed Circuit Amps: Reverse Polarity	Preferred Polarity	Alternating Current Clos'd Circ't Amps
¼"	Fleet 11	10"	11½"	345-365	...	Straight	375-380
"	Murex FHP	"	"	310-320	345	Straight	370
"	Black Devil	"	"	325	...	Reverse	350
"	Westinghouse DH	"	"	305-320	345	Straight	345-380
"	Sureweld F	"	"	355	360	Straight	395
"	Sureweld A	"	"	320-325	340	Straight	355
"	Smithway 20	"	"	250-260	310	Reverse	305
"	Smithway 35	"	"	330	335	Straight	350
"	McKay 16	"	"	...	...	Straight	...
"	Murex Fillex	"	"	340	345	Straight	370
"	Murex F	"	"	355	350	Straight	370
"	Smootharc DH2	"	"	...	...	Straight	...
"	Red Devil	"	"	270	335	Reverse	310
"	G. E. W-24	"	"	340	345	Straight	370
"	Wilson 105	"	"	330	345	Straight	365
"	Fleet 9	"	"	355	355	Straight	355

Here's Your 3-step plan for

BETTER TOOLS TO CUT PRODUCTION COSTS

Use this sure way to knock the props from under production costs. Let Carpenter help you put this three-step plan to work in your tool room and heat treating department. With it you can reduce machine down-time and actually lower unit costs.

1. Cut The Cost Of Tooling-Up And Reduce Machine Shut-Downs!

It's no trick at all to make sure of selecting the proper tool steel for each job when you use the Carpenter Matched Set Method. Many plants use this method of selection to lick production problems caused by premature tool and die failure. And it works! Now tool makers who have used it are relying on it to get every job done right. They know it cuts the cost of tooling-up and reduces machine shut-down time. And those savings are bound to show up in the cost of the finished product.

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As you know, proper heat treatment is the second step to seeing that each tool is made to do its job right. And the Carpenter Heat Treating Guide quickly gives you this important information about each Carpenter Matched Tool Steel: Type analysis, Forging heat, Normalizing heat, Annealing treatment, Hardening treatment and Recommended drawing range. And this slide chart gives you tips on quenching, oxidizing atmospheres, heating time and heating speed for drawing. For your free copy, drop us a note on your company letterhead.

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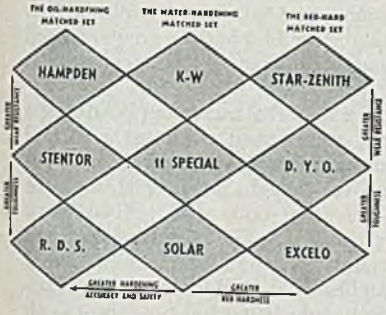

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These are really Matched Tool Steels, as one picks up its job where the other "leaves off."

The key steel is the one in the center, *No. 11 Special*, a straight carbon, tough timbre, water-hardening tool steel. When you have a tool to make, you first find out if it can be made from *No. 11 Special*. If the answer is "Yes", you go no further. But when the answer is "No", you use the diagram to point the way to the tool steel that will do the job. For greater *wear resistance* you go north. For greater *hardening accuracy* and *safety*, you move west, etc.

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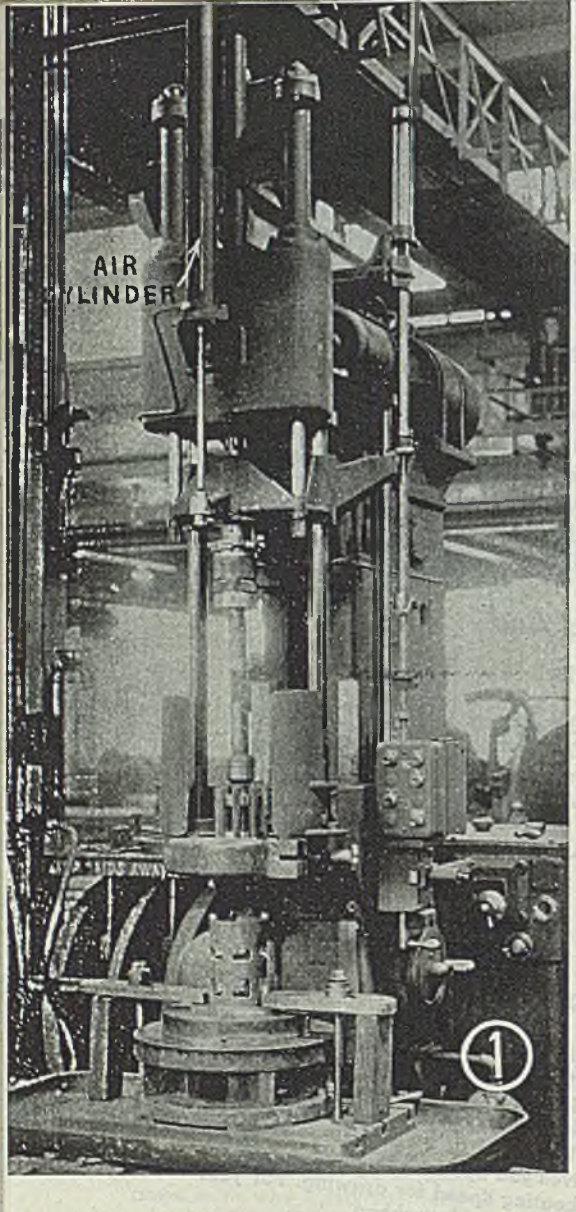
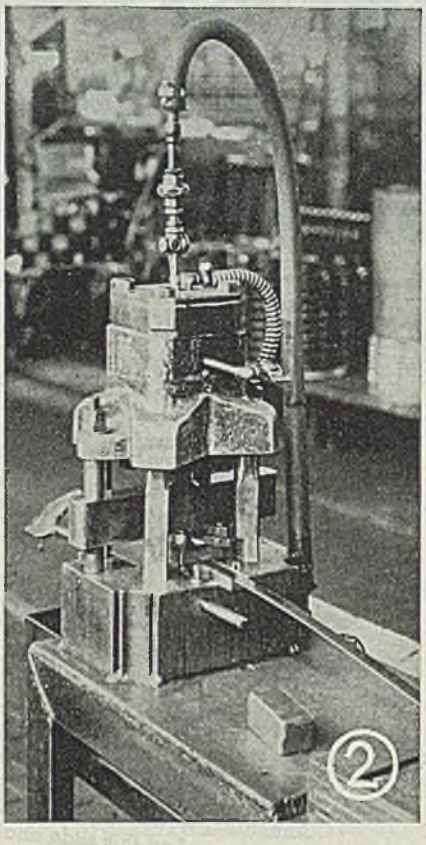
139 W. Bern St., Reading, Pa.

Pneumatic Power in the Machine Shop





APPLICATIONS for pneumatic power in the machine shop have grown from conventional jobs such as hoisting, drilling, chipping, drying and cleaning machinery, to counterbalancing the weights of various machine parts, positioning heavy workpieces by actuating an indexing fixture, and for many other progressive developments.

Although much of this improvement in the position of air motive power has come about naturally, due to its inherent advantages, some of the expanded uses may be attributed to stress of war emergencies. Whatever the reason for its utilization, the satisfactory installations affording ease of control, greater speed and low maintenance costs will remain after war's end.

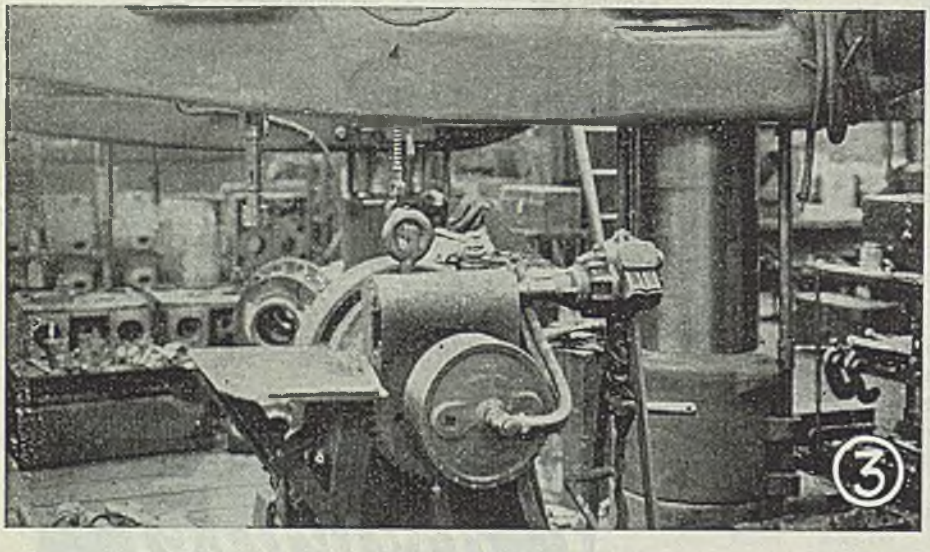
In the counterbalancing application, for example, compressed air forms a natural pneumatic cushion to effectively counterbalance the weight of special machine tools like the hone for special parts shown in Fig. 1. The machine illustrated accommodates hone assemblies of from 1 to 6 inches in diameter, the wide variations in weight being balanced by the air pressure in the cylinder mounted at the top and front of the honing machine.

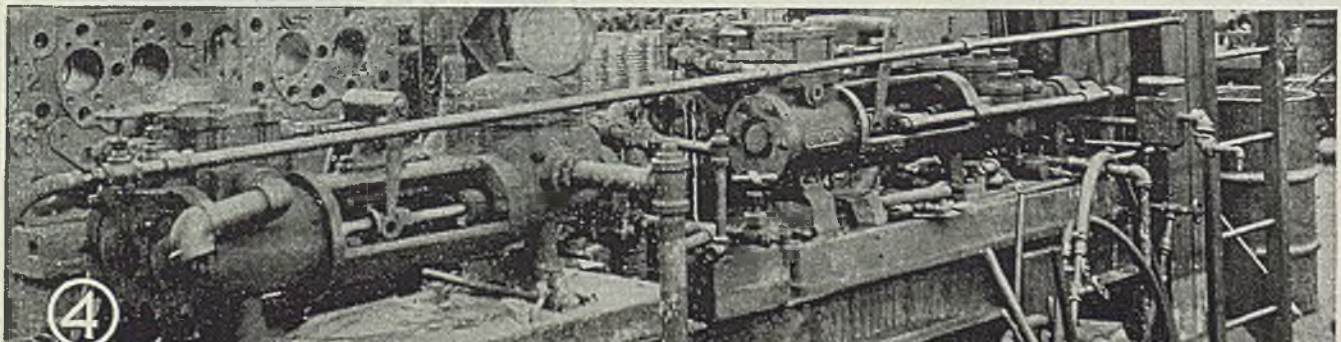
Considerable time and labor is conserved by the turning and indexing fixture illustrated in Fig. 3, one of many air-operated machine tool devices that are helping industry to meet high output schedules. Used in this instance on a radial type drill, the work is clamped to the face plate by means of double-acting air cylinder attached at the rear to the spindle.

A reversible air motor supplies power for turning the work in either direction. This productive adaptation of compressed air permits the positioning of large and heavy parts for any machining operation with a minimum of effort.

Shearing spring-tempered strip steel of a hardness of 45-50 rockwell C to exact length is the job of the single-acting air-operated cylinder seen in Fig. 2. This useful shop tool has only a few moving parts. No gears, cranks or bearings are incorporated in its construction to cause mechanical trouble. The air cylinder actuates the ram to which cutter is at-

(*Please turn to Page* 130)





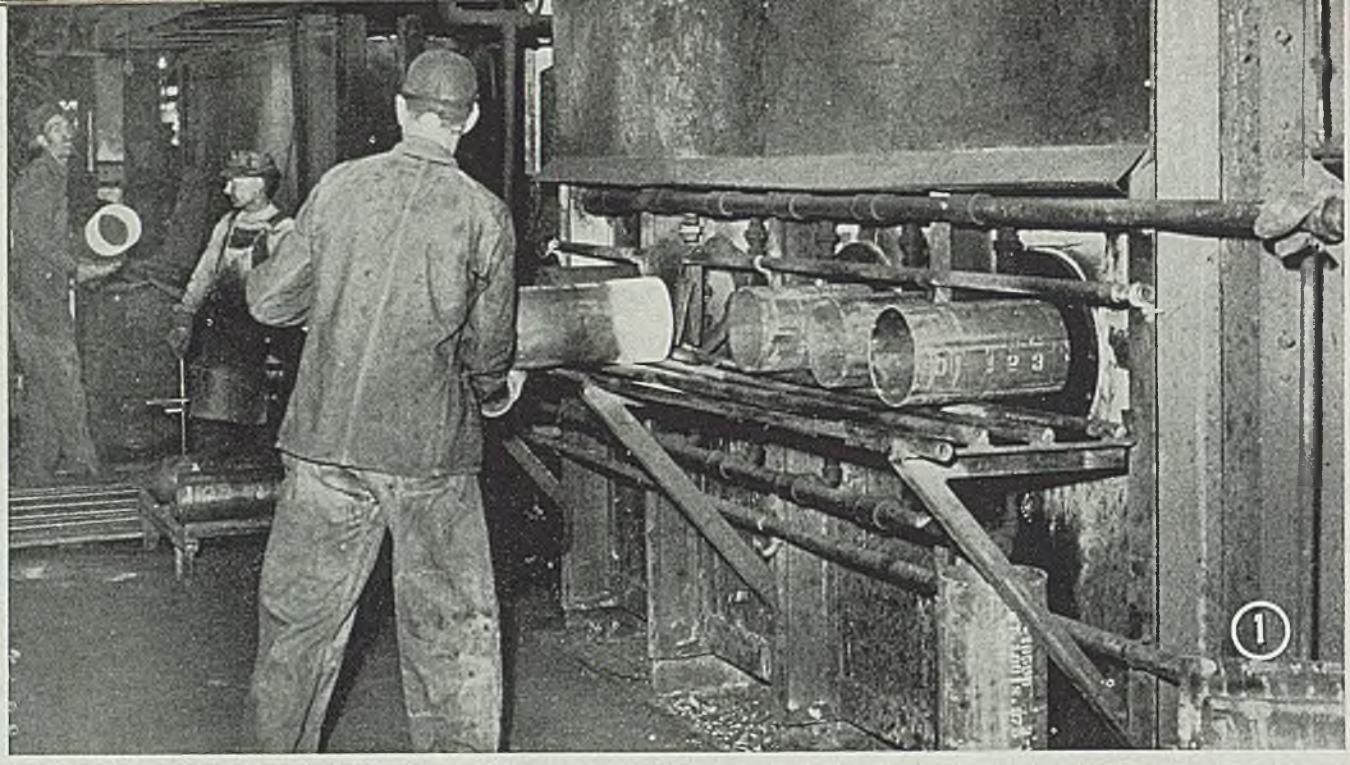


Fig. 1—Tubing is heated in specially designed oil-fired forging furnaces to a temperature of approximately 2200 degrees Fahr. All data from "The Enamelist"

Forging Tube Forms

Power hammers are ingeniously revamped to forge nose and tail on tube sections for bombs, using manually operated wheel and screw devices to feed work to dies. Automatic mechanisms rotate tubing continuously

IN THE SPRING of 1942, Tennessee Enamel Mfg. Co., Nashville, Tenn., whose peacetime products of manufacture include porcelain enameled gas heaters, floor furnaces, signs, stove parts and table tops, accepted one of the first ordnance contracts for 100-pound general purpose demolition bombs. As advanced studies of existing facilities, as well as arrangements for acquiring additional equipment had been made, conversion of the plant into a bomb producing organization required less than 90 days. Nevertheless, a number of production and engineering problems were encountered.

The first was simply that of manufacturing this comparatively new ordnance item on an efficient mass-production basis. At that time, proven production procedures had not been established and experimentation on each operation was required for satisfactory results.

New equipment needed to supplement existing facilities was not readily available. Therefore the problem of rebuilding equipment such as presses and lathes to perform operations unrelated to those for which they were originally designed was encountered. This work, as well as that of designing and constructing special oil-burning forges and testing and handling equipment was done by company engineers with the assistance of local engineering firms.

Fig. 2—Painting the interior by means of a spray gun with extension mounted on fixture in turn supported on carriage that rolls toward conveyor line for easy insertion of spray head

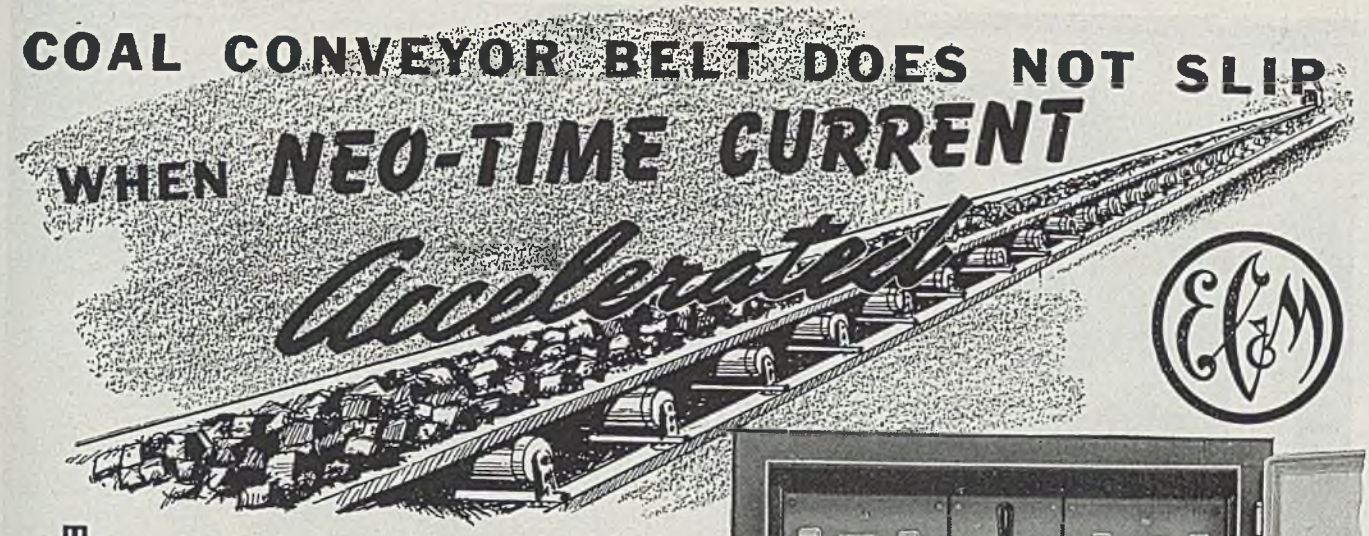
After production was well under way on the 100-pound units, additional contracts were accepted for 500-pound demolition bombs and 115-pound chemical bombs. These new contracts necessitated the installation of different types of machinery and changes in plant layout, but the manufacturing operations practiced by the company are similar. These operations may be summarized as follows.

Tubing Purchased by Carload

Seamless steel tubing in the desired length and gage is purchased in carload lots and stacked in a storage area. From there, the tubing is trucked to the forging department where the nose and tail are formed. The nose and tail are shaped in separate operations, but the methods used are identical—that is:

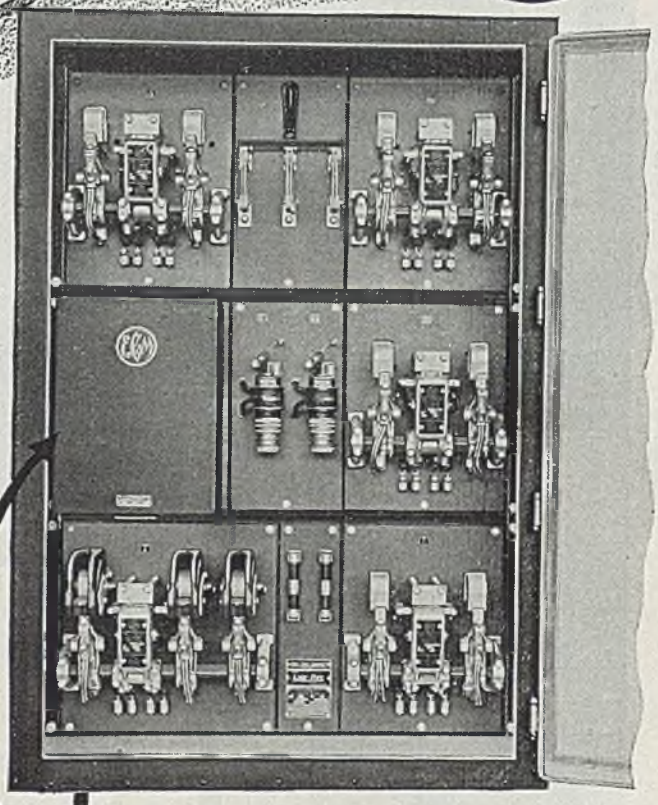
The tubing is heated in specially designed oil-fired forging furnaces to a temperature of approximately 2200 degrees Fahr. and forced into the dies of power hammers by means of manually operated wheel and screw devices. Automatic turning mechanisms rotate the tubing as it is being hammered into shape. The power hammers used

COAL CONVEYOR BELT DOES NOT SLIP WHEN NEO-TIME CURRENT Accelerated



THIS wound-rotor motor Starter controls a 200-ft. long conveyor on the dock of a large power station. Fully loaded, it contains about 20 tons of coal and requires careful acceleration to avoid spinning the head-pulley, which would burn the belt. Climatic conditions, changing the viscosity of the bearing lubrication, also alter the starting requirements.

In winter or in summer, the operator merely pushes a button and the NEO-TIME-CURRENT Starter automatically changes the rate of acceleration to meet the different conditions. It brings the motor up to speed with greater skill than human hands could do it.

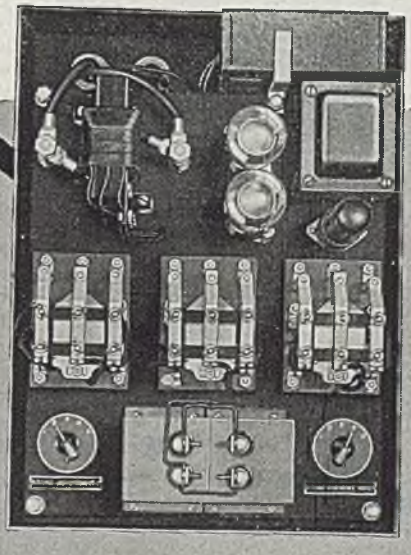


NEO-TIME-CURRENT... an Electronic ACCELERATOR

This is a standard unit for use with all EC&M Wound-rotor Starters having three or more secondary acceleration contactors.

Operation is obtained by a simple electronic circuit which has two elements—a time-element, receiving its energy from the line and an opposing current-element, energized by the motor-current. On light loads, acceleration is quick and on heavier loads, the increased motor-current lengthens out the time per acceleration step automatically.

Write for Booklet 1041.



THE ELECTRIC CONTROLLER & MFG. CO.
2698 EAST 79TH STREET
CLEVELAND 4, OHIO

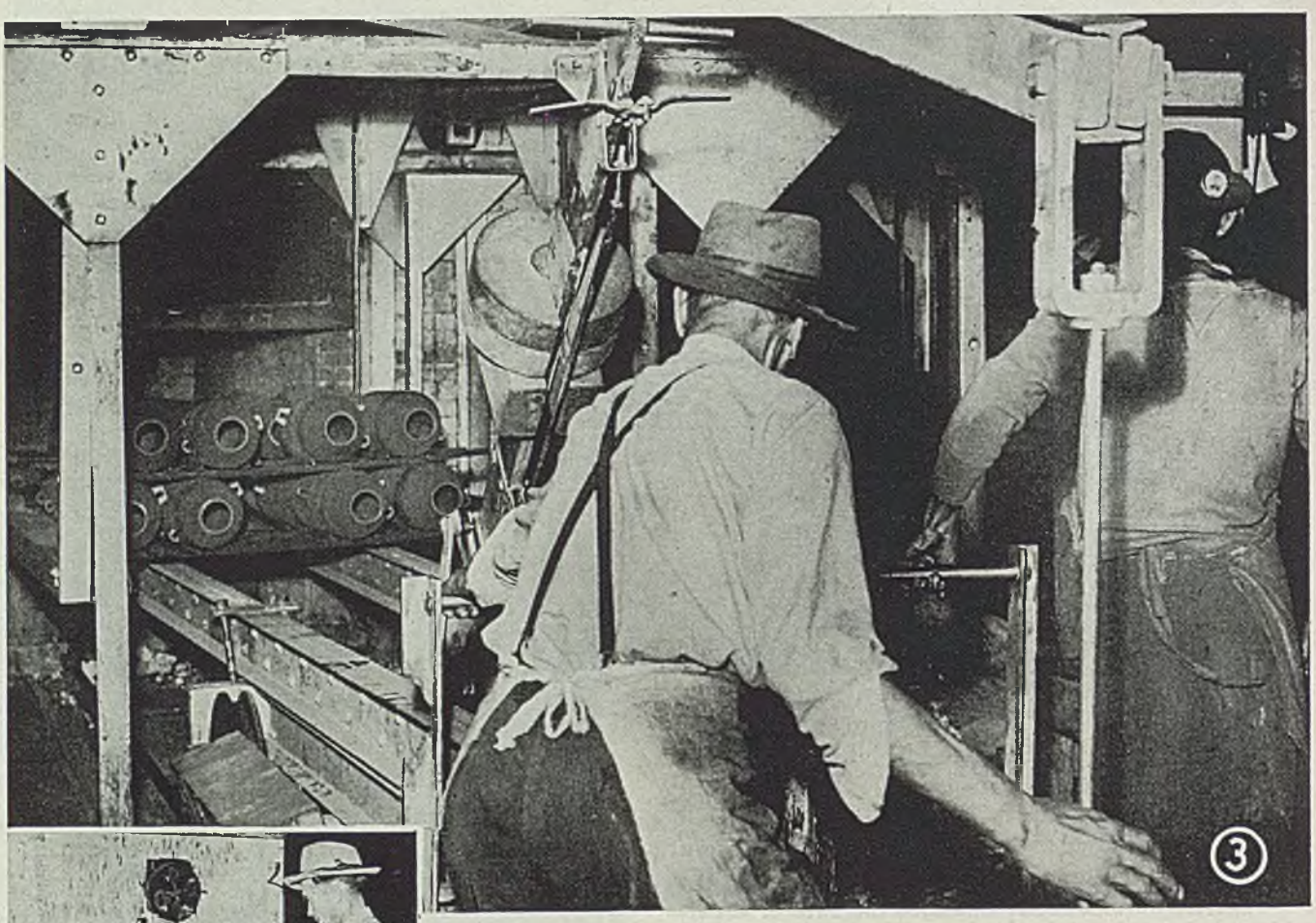


Fig. 3—Regular box and continuous type porcelain enameling furnaces are utilized for heat-treating operations needed to meet physical property specifications. Here a load of bomb cases is being charged into a box type unit

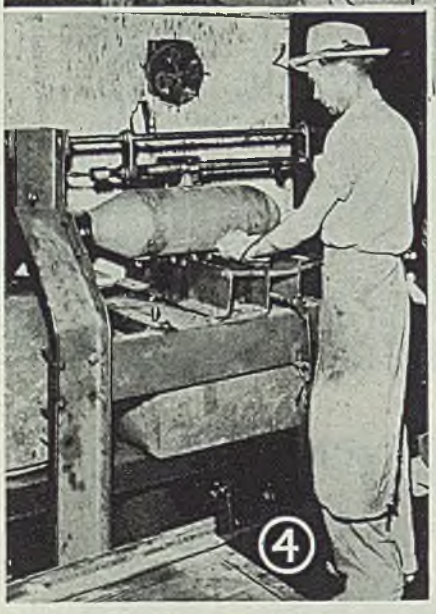


Fig. 4—Hydraulic-operated lug testing machine checks strength of the welds fastening lugs to the bomb

were formerly punch presses converted by company engineers.

At present a robot operated spinning machine is being installed for nose forming operations. This machine will materially reduce production time on this particular operation.

Following the forging operation, the nose and tail is cut off with acetylene torches to the proper length dimensions.

The forged bomb body is then placed in welding jigs and suspension lugs are welded to the bomb body in proper position.

Following the welding operation the bombs are placed in jigs in large drill presses and the nose machining operations are performed. This consists of drilling, boring, facing, under-cutting and chamfering and is performed with combination quick-change tools developed especially for the job.

The piece is then placed on a specially designed hydraulic-operated lug testing device and the strength of the lug welds are tested in three directions. While in position in this machine, gaging operations are performed on the nose machining to maintain production control over the nose machining operation.

The above sequence of operations is performed as line production and pieces are moved between operations on roller conveyor. Following the gaging and testing operations, the pieces are then trucked to storage area, preparatory to quench and draw operations.

The bomb body with lugs attached and nose machined is then placed on a conveyor passing through a continuous flow oil-fire muffle-type furnace and heated to a temperature of approximately 1600 degrees Fahr. After thoroughly soaking the material to insure uniform temperature, the piece is quenched in water by removing the conveyor chain while still hot with a special hoist and hook apparatus. The hot piece is lowered into the water and rapidly cooled to a temperature of approximately 400 degrees Fahr. It is then removed from the water and allowed to air cool to room temperature.

Following this, the pieces are placed in oil-fired and electric box-type porcelain enameling furnaces and slowly heated to a temperature of 1100 degrees Fahr. to produce the proper physical specifications. For these heat-treating operations, a new continuous furnace has been installed. This furnace will be utilized after the war and will add approximately 9000 square feet per hour to the company's porcelain enameling capacity.

After the quenching and drawing, the pieces are conveyed to the former porcelain enamel pickling room, where they are descaled in 10 per cent sulphuric acid solution. This removes all heavy scale and greatly facilitates the sand-blasting operations which follow.

The cleaned and heat-treated bomb body is then inspected for welding cracks and surface cleanliness, after which it is placed in large drill press where the nose threading operations are performed.

Following nose threading, the pieces are moved to the final assembly line where the tail section is machined and threaded on turret lathes.

The machined and threaded bomb body with lugs attached is then placed

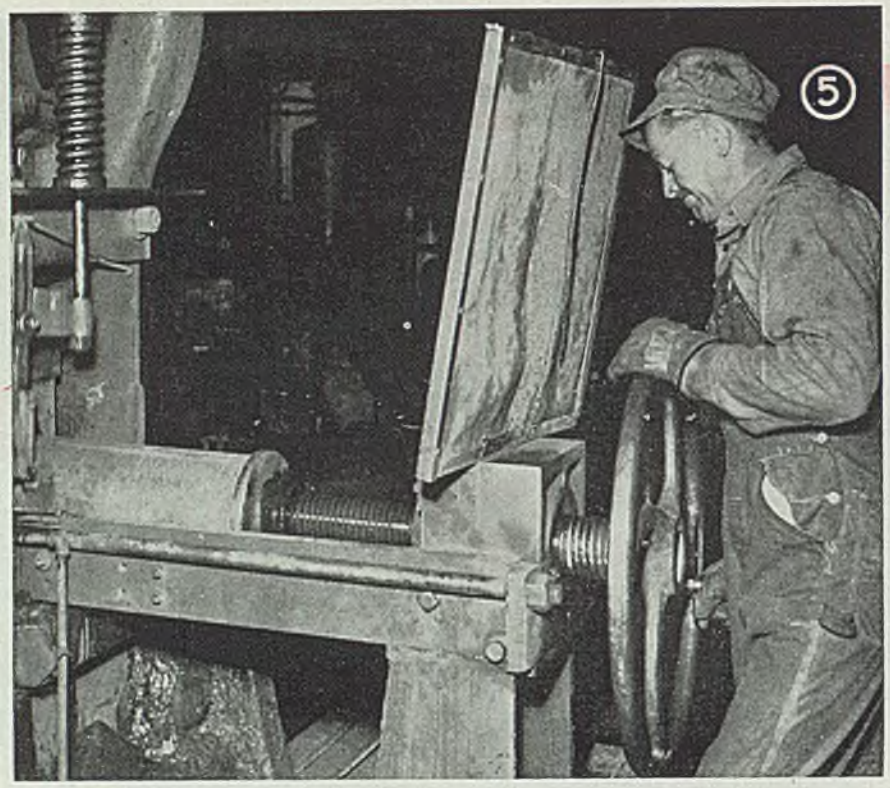


Fig. 5—Heated tubing is forced into dies of converted power hammers for forming nose and tail by this manually operated wheel and screw device

on a bi-rail conveyor where the final inspection and gaging operations are performed in order to insure the highest quality standards. Pieces are inspected 100 per cent on all major dimensions and receive critical visual inspection. Any weld spatters or tube defects are removed by chipping and grinding, smoothness of product being essential to safe loading practices.

Following inspection, the nomenclature is stamped on the bomb body with steel stamps, the piece is cleaned and painted with primer on the outside and acid-resisting asphalt paint on inside, the component parts including base plugs, fin lock nut protectors, fuse seat liners and nose and tail plugs are assembled to the bomb. Paper shipping bands are then clamped onto the bomb body and the completed bomb, its component parts assembled, is loaded in cars for shipment.

Some Contracts Are Completed

Contracts for the 100-pound demolition and 115-pound chemical bombs have been completed; nevertheless, the greater portion of Temco's facilities are still devoted to war work. Contracts for 500-pound bombs have been renewed and quotas increased until today the plant's monthly production exceeds its original quotas by approximately 250 per cent.

In addition to the mentioned bomb contracts, the company has manufactured M-15 smoke grenades for the Chemical Warfare Service. The grenade contract was followed by one for butterfly bombs. Producing these items, alone with 500-pound bombs and a shell container, for which the company is now tooling, is expected to keep the plant busy until victory is won.

Process Provides Bright Alloy Plating

A protective coating consisting of a copper, tin and zinc alloy, known as HVWM bright alloy plating process, has been developed on which patents are now pending. Anodes are made of copper, tin and zinc. This process is unusual as alloy anodes of the same composition as the deposit have been developed; thus, metal concentration of the bath may be maintained automatically. The deposits come from the solution a bright blue-white color. The plating solution is composed of ordinary chemicals and contains an organic addition agent having wetting properties, and special formulas are provided for still and barrel plating.

The anode area should be 85 per cent insoluble and 15 per cent soluble. Ball anodes may be used with steel containers. For the balance of the insoluble anode area, steel is preferable to carbon. With this ratio of insoluble and soluble anode area the bath remains quite stable in respect to the three metal constituents; the anode efficiency is nearly 100 per cent and the cathode efficiency is around 85 per cent.

Nickel, gold, silver, copper and many other metals may be plated over or under this alloy deposit. Chromium may be applied directly over the alloy deposit, although the work should be given a light anodic cleaning to remove the film remaining because of the wetting agent. Except where alloy deposit is to be further plated, special rinses or treatments are not required. The alloy deposit may be readily soldered using rosin as a flux. Alloy-coated parts may be soldered more readily than tin coated parts oxidized due to storage or exposure.

The outstanding property of this process is its resistance to corrosion when applied over copper or brass. A thickness of 0.0002-inch is said to withstand a 200-hour salt spray test, and even after 200 hours little or no corrosion is formed on the surface. In tests on radio frequency instruments it has been found that 0.002-inch of the deposit gives as much protection as 0.005-inch of nickel.

The alloy is relatively brittle in heavy coatings but is seldom used in thicknesses over 0.005-inch. It is harder than nickel and its wear resistance is stated to be better than normal nickel deposits. Even though the alloy may be hard, it may be formed or rolled without flaking when applied in thicknesses of not over 0.0002-inch.

As the alloy is non-magnetic in an electrical field, it is a desirable coating in electrical equipment manufacture; also, it is a good coating for decoration and protection of fine instruments. The throwing power of the solution is claimed to be superior to any other plating process that is now commonly used by industry.

When a mirrorlike surface is required, the alloy deposit may be colored more readily than nickel, and its reflectivity is similar to silver. It is not recommended for application directly on steel where the prime requisite is corrosion protection. A copper undercoating is recommended to obtain full benefit of low corrosion rate between copper and alloy deposit.

The equipment required is similar to that used for copper plating. Unlined steel tanks are satisfactory. Steel coils may be used for heating the solution to the proper temperature, which for still plating is 140 to 150 degrees Fahr., and for barrel plating 150 to 160 degrees Fahr. When more than one tank is operated from a generator on a 6-volt line, a 2-volt drop rheostat is used. Usually the rheostat should be based on a cathode current density of 15-20 amperes per square foot of surface area.

This process was developed by Hanson-Van Winkle-Munning Co., Matawan, N. J., with the aid of the laboratories of Westinghouse Electric & Mfg. Co.

—o—

An illustrated brochure describing diverse operations employed in fabricating tubular parts of seamless copper, brass, and aluminum has been released by Wolverine Tube Div. of Calumet & Hecla Consolidated Copper Co., Detroit.

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Automatic Electronic Exposure Control Provides . . .

UNIFORM X-RAY EXPOSURES

By H. D. MORELAND
Manager
X-Ray Engineering
Westinghouse Electric & Mfg. Co.
Baltimore

Automatic photoelectric X-ray exposure control consists of two units—the photo-tube camera which measures amount of radiation that strikes the negative, and the assembly containing safety timer and power supply. Here C. T. Zavales, engineer primarily responsible for design of the equipment, is inserting a photoelectric tube behind the lens which scans the fluorescent screen, according to diagram at bottom of page

FOR THE first time an electronic method for automatically controlling X-ray exposures has been developed, enabling radiologists and technicians to obtain uniformly dense photo-fluorographic exposures automatically, rapidly, and *with an overall increase in operating efficiency of about* 100 *per cent.*

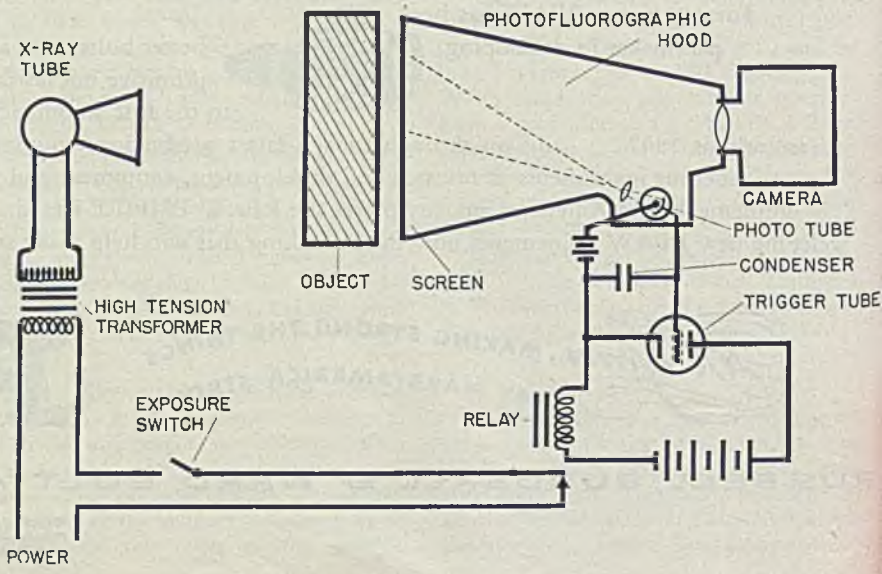
The photoelectric timer operates on the principle of the exposure timer which amateur photographers use. X-ray radiation, passing through an object, strikes a fluorescent screen and is converted into visible radiation. A section of the luminous screen is scanned by a photoelectric tube which in effect measures the light leaving the screen. When enough light has left the screen for the desired film exposure, the photoelectric timer actuates a relay, opening the X-ray circuit and terminating the exposure.

Although first used in medical radiography for mass chest surveys on miniature roll films, the development will undoubtedly be generally useful and will include industrial X-ray analysis. Objects such as castings, conducted on conveyors, can be inexpensively, quickly and uniformly photographed on miniature roll film using the photoelectric control. Large, irregular objects need only be positioned before the screen. Since the photoelectric control responds to the actual light on the screen, deviations in internal structure of object X-rayed will not deceive timer. Result will be films of desired density, analytically satisfactory, attained with minimum cost.

Until now, a major difficulty barring full utilization of the analytic capabilities of X-ray has been the lack of automatic exposure controls. Use of the new phototimer automatically assures correct X-ray exposure, enabling the technician not only to double number of exposures formerly made, but to achieve better and more useful results.

In order to evaluate accurately X-ray pictures it is important that the exposures be uniform in density and in what photographers call "contrast"—the sharpness of difference between the light and the dark areas.

X-rayed objects may vary not only in size and thickness but even in the degree to which X-rays are transmitted. These variables make it difficult to ob-



Right—Schematic diagram of control: Closing exposure switch energizes X-ray tube, causing radiation to pass through object. Radiations strike fluorescent screen which converts them to visible light radiations. These in turn are picked up by lens that focuses them on the photo-tube. Amount of radiations thus controls amount of charging current fed to condenser which in turn shuts off X-ray tube when the desired exposure has been attained

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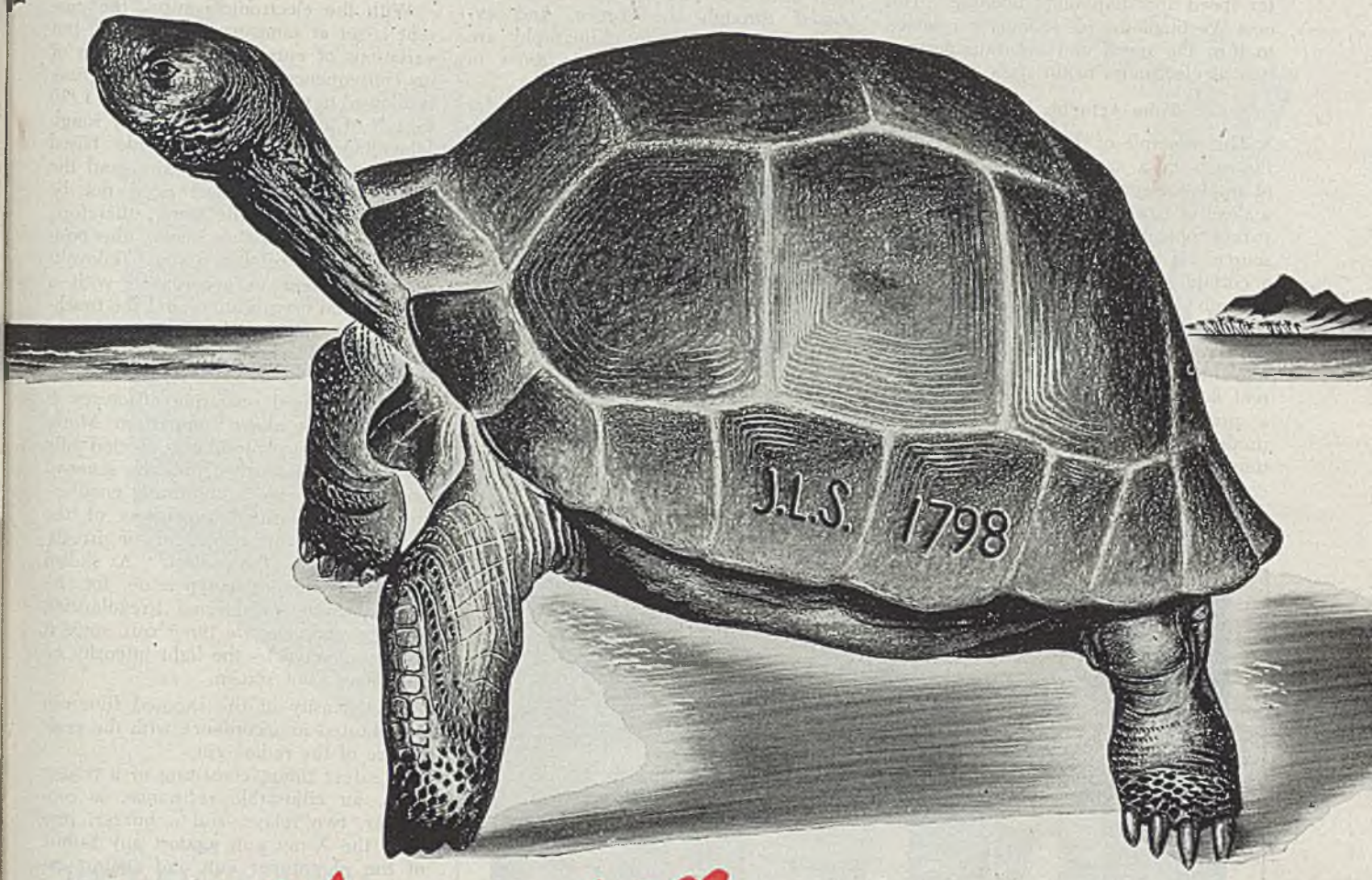

"Old Tuffy"

When whaling in the South Pacific was profitable many a harpooner left his card for future generations to find carved on the shell of an ageless tortoise.

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tain uniform film exposures. Expert technicians develop considerable skill in estimating X-ray penetration, but such evaluations and measurements are time-consuming and at best are only approximations. Therefore even the best technician can only attain comparative uniformity of film exposures.

The procedure is much like that used by a photographer who has no exposure meter. He must use his past experience to judge the proper setting of his camera to take into account light intensity, shutter speed and diaphragm opening. The new Westinghouse phototimer is a device to turn the speed and accurate perception of electronics to this task.

Tube Actuates Relay

The principle of the timer can be easily seen in a simple circuit consisting of a photoelectric tube, a relay circuit, a sheet of frosted glass, a partially transparent object, and an adjustable light source. If the light source is turned on, a certain amount of radiation will pass through the rather dense object and reaches the frosted glass. The light from the screen impinges on the tube activating the unit and a proportionate current flows in the phototube circuit. At a predetermined exposure factor (the product of the light intensity and the time), the photoelectric tube actuates the electronic relay and the light turns off.

If an object considerably denser is introduced between the light and screen, less light reaches the phototube and the current output is correspondingly less. This means that the photoelectric tube will permit the light source to radiate for a considerably longer period of time so that a constant exposure factor is maintained.

Deviations in the density of the intervening object vary the output of the tube, and this varies the period during which the light source is permitted to radiate. The tube will not turn off the light until a given quantity of light has passed through the screen, and exposures of the film in radiography are controlled by a photoelectric timer in this manner.

The electronic timer developed for this application consists primarily of a multiplier photoelectric tube and a condenser-thyratron-relay system.

Five variables, in general, are involved in X-ray photofluorography: (1) thickness of the object, (2) exposure time, (3) X-ray tube voltage, (4) X-ray tube current and (5) distance from X-ray tube to fluorescent screen. In medical radiography prior to the development of the phototimer, the tube current and the distance were the only fixed factors—for example, 200 milliamperes and 40 inches. The radiologist measured the thickness of the subject and in accordance with that measurement altered the applied X-ray tube voltage in steps of one kilovolt over a range of 60 to 100 kilovolts.

The necessary exposure time was then estimated and set on a separate motor driven timer. In all, the procedure involved five steps: measurement of the subject, positioning before the fluorescent screen, adjustment of voltage, setting of the exposure timer, and making the X-ray exposure. Moreover, variations in line voltage necessitated constant checkings and adjustments of the unit if properly exposed films were to be obtained.

With the electronic control, the current is set at some particular value, but variations of current (or voltage) are of no consequence, and the exposure time is allowed to vary over a range from 1/20 to 1/5 of a second. Only a very rough kilovoltage adjustment is made based on an estimate of subject size, and the thickness of the subject need not be measured. Using the timer, therefore, the procedure involves merely the positioning of the subject, a rough kilovoltage adjustment in accordance with a quick visual classification, and the touching of an exposure switch.

Operating Efficiency Increased

The increased operating efficiency is evident in the above comparison. Moreover, since the phototube is affected only by the light intensity from the scanned section of the screen, uniformly good exposures are insured regardless of the thickness of the object or of irregularities within the object. A skilled technician cannot compensate for invisible, unknown internal irregularities, but the photoelectric timer can, since it is only affected by the light intensity on the fluorescent screen.

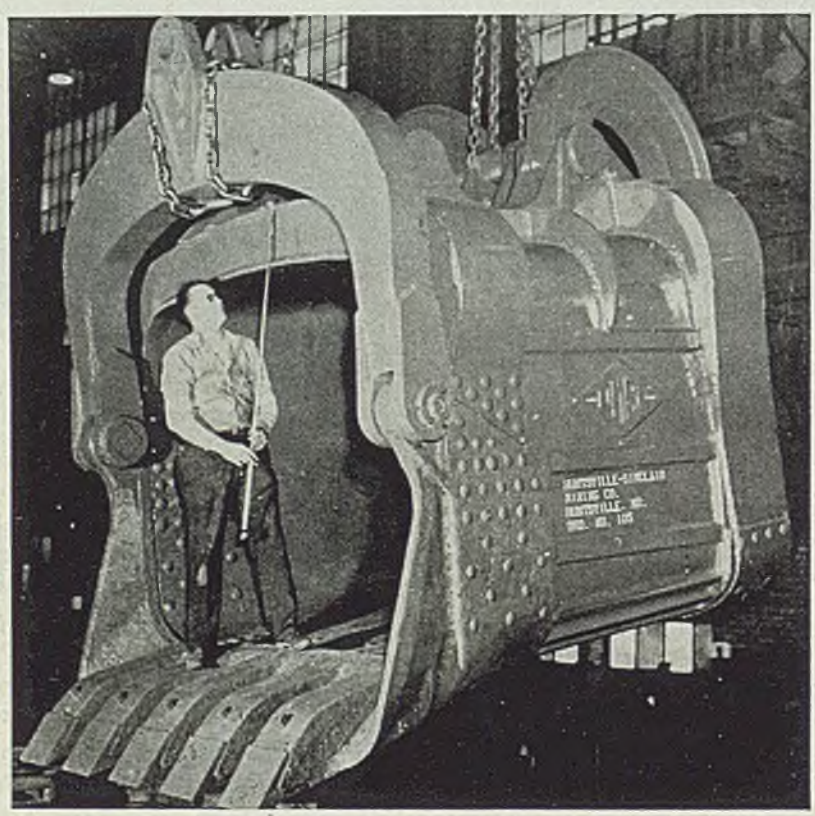
The density of the exposed film can be adjusted in accordance with the preference of the radiologist.

A safety timer, consisting of a trigger tube, an adjustable resistance, a condenser, two relays, and a buzzer, protects the X-ray unit against any failure of the phototimer unit and against excessively long exposure times exceeding the capacity of the X-ray tube. Phototimer failure can occur only if an exposure is attempted before the unit has heated or if some component of the unit fails.

Unduly dense objects, on the other hand, result in long exposure times since the phototube does not terminate exposure until proper photographic exposure is secured. There is thus the possibility that the rating of the X-ray tube may be exceeded in exposing unusually dense objects unless an auxiliary control terminates exposure.

One of the relays prevents an exposure from being initiated until the phototimer is ready for operation. This means that the circuit will not be closed unless the timer components have heated properly and are functioning. The other relay will open the circuit when the safety trigger tube fires. Protection of the X-ray tube is assured by choosing the circuit constants so that the trigger

(*Please turn to Page* 132)



WELDED DIPPER: Constructed largely of high-tensile steel plates, this shovel dipper is 7 feet 3 inches high and 8 feet 9 inches wide, weighs 33,000 pounds, and holds 13 cubic yards. Welding a dipper of this size at Pettibone Mulliken Corp., Chicago where dipper was made, requires 700 pounds of electrodes. Photo courtesy Hobart Brothers Co.

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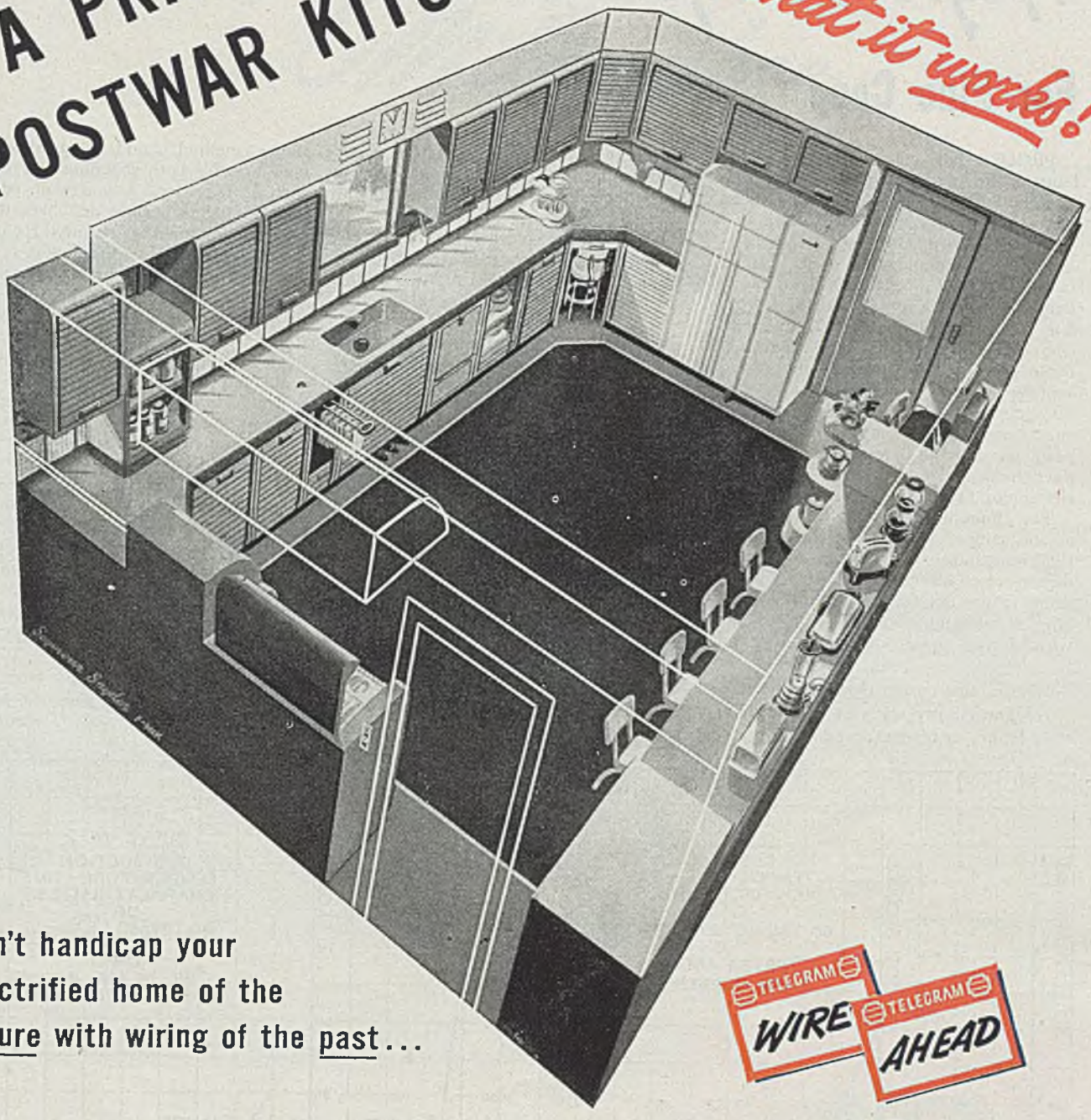

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High-Temperature Solders

For Fine Copper Wire

PROOF that commonly used high temperature molten solders have destructive effect on copper wire has been discovered by engineers of the Fairchild Camera & Instrument Corp., New York.

While conducting tests that resulted in the finding of a new method for clean-stripping Formex type insulation from fine wire (sizes No. 36-44), Fairchild engineers explored this interesting phenomenon, and have worked out a preventire. Since its existence may not be generally known, this destructive effect and the remedy should be of particular interest to engineers and production men in the electrical, radio and electronics fields.

The Fairchild tests with small diameter copper wires show the need of rigid temperature control, and, to a lesser degree, close attention to solder composition in the hot tin dip method of tinning or soldering wires. The life of fine wire, dipped in any solder, is lessened with increasing solder temperature. Low temperature solders, with a melting or liquid point of 600 degrees Fahr., should be used for tinning and making joints on wire sizes finer than approximately No. 34 (0.0063-inch diameter).

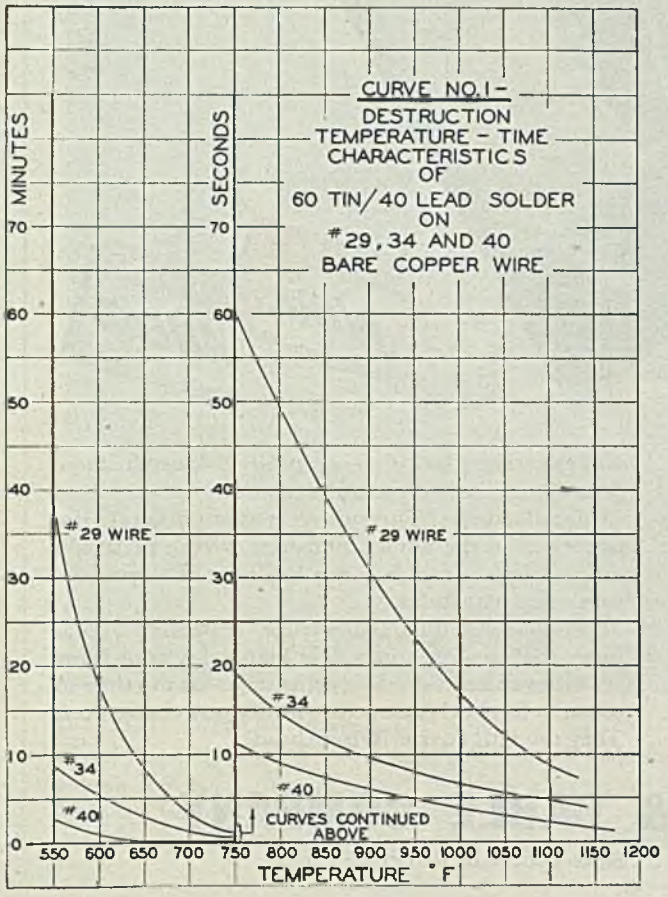
Conclusions reached indicate high solder temperatures are more destructive to wire if the tin content of the solder is too high. This destructive effect also increases as the wire diameter becomes smaller. By proper control and by proper clean-stripping — in case of insulated wires, synthetic or otherwise—this danger can be avoided. Tests reveal positively that life of a given wire is greater if lead content of the solder, for any temperature, is higher.

Hitherto, one of the most widely used methods of stripping and tinning Formex-insulated wire has required that the wire be dipped into molten solder held at about 1025-1100 degrees Fahr. This is commonly known as the "hot dip solder method," and is a single-step operation for both stripping and tinning such coated wire. Although an efficient method, it has a major drawback in that high temperatures are required for proper removal of synthetic insulation.

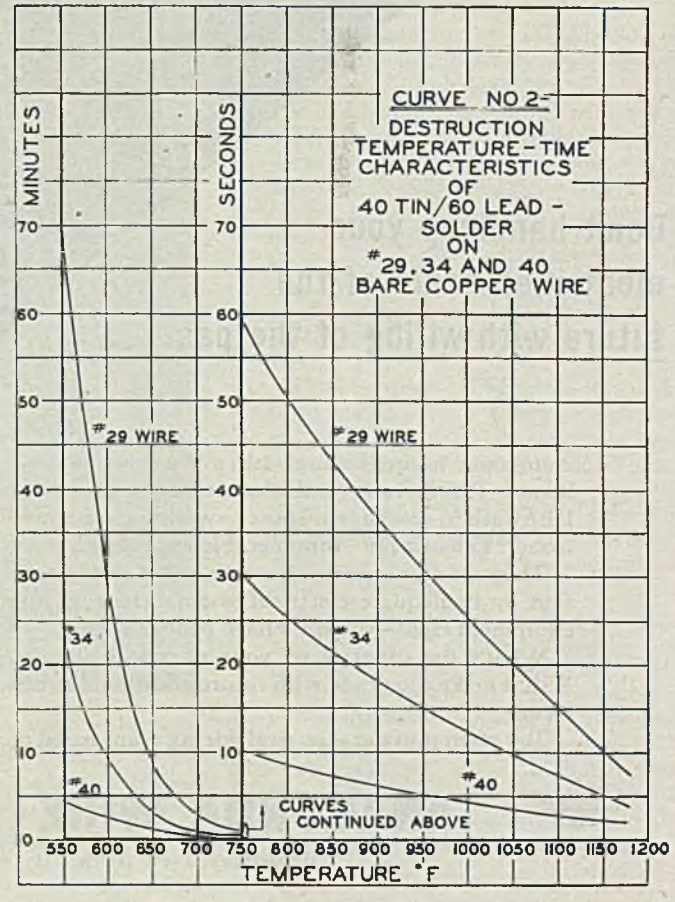
In this method, laboratory tests show two effects: First, the wire suffers a reduction in diameter in the stripped and tinned section; second, some embrittlement of the wire occurs due to the high temperatures encountered.

The crux of the investigation of the hot dip solder method shows other factors. Synthetic rosin-coated wire must be dipped, above a critical temperature of 932 degrees Fahr., into molten solder. Polyvinal acetal insulation is transformed by the heat, and insulation in this action apparently serves as a flux to permit tinning of the copper wire in the same dipping operation. More positive and complete stripping and tinning are obtained at slightly higher temperatures,

Destruction curves showing time required for destruction of fine copper wires at various temperatures in molten solutions of 60 per cent tin, 40 per cent lead type solder



Time-temperature destruction curves for fine wire in solutions of molten 40 per cent tin, 60 per cent lead type solder



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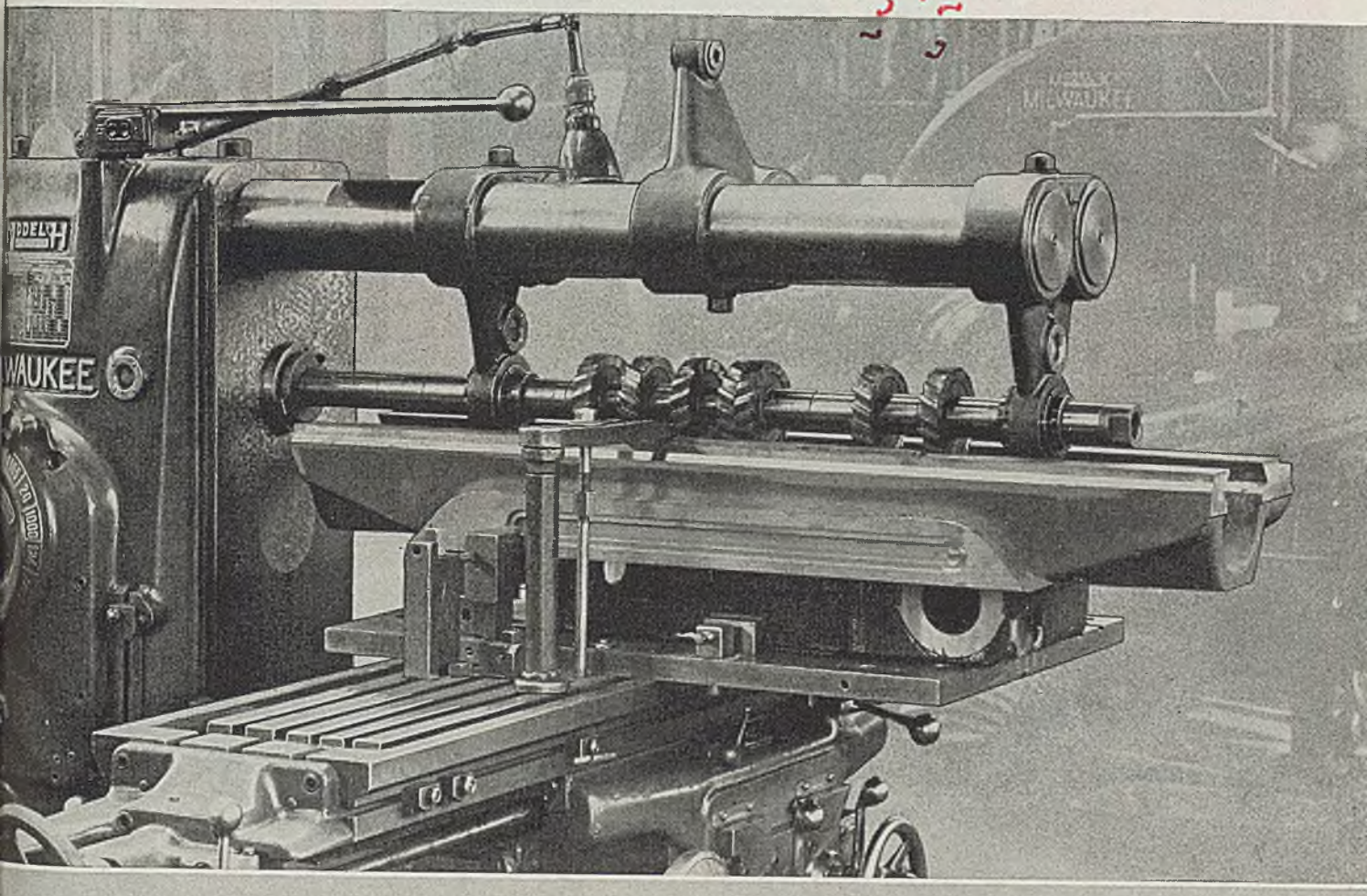

Five side-milling cutters and one pair of interlocking side-milling cutters are mounted on a special 51-½B42 Milwaukee Arbor held in the spindle of a Milwaukee 4H Milling Machine. Two arbor braces support the arbor while a third increases overarm rigidity. Seven faces are straddle milled simultaneously in this set-up in which the knee is fed vertically.

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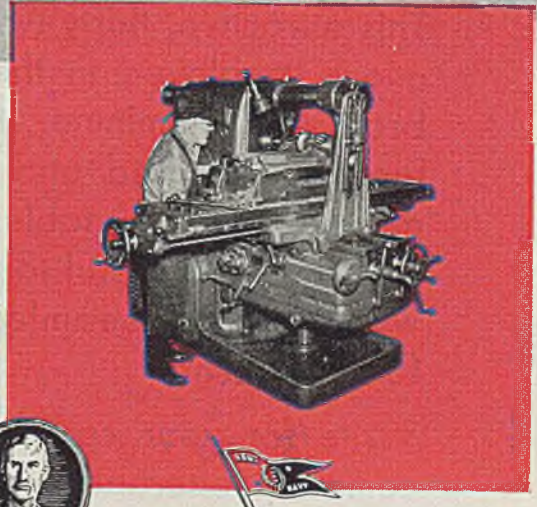

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approximately 1025-1100 degrees Fahr. For example, in the small wire sizes of No. 29 H. F. (Heavy Formex) and No. 40 H. F., the action is completed in about 10 and 3 seconds, respectively, both at about 1050 degrees Fahr.

Further, if the wire is kept in the hot solder long enough, the submerged section is completely eaten away. "Long enough" is an inadequate expression here; for No. 29 H. F. wire it represents about 20 seconds, and for No. 40 H.F., 5-6 seconds. The leeway for No. 29 is relatively appreciable, but not for No. 40 wire. Heavy Formex will not properly strip and tin below the indicated times, and fine wire suffers by this tight control. Although stripping-tinning action may be held through close control to the minimum time required, some copper loss can be expected. Higher temperatures, up to 1175 degrees Fahr., reduce the minimum dipping times, but also shorten the destruction times. No. 40 H.F. is destroyed practically at the same time the stripping and tinning are completed.

This phenomenon in wire destruction is not alone interesting, it is important and serious. Such reduction in diameter in hot tin dipping means weakened leads, perhaps production losses either at the dipping operation, or later in assembly, and an inferior product that fails in the field; this is especially true in the finer wire sizes of No. 34-40, or even finer.

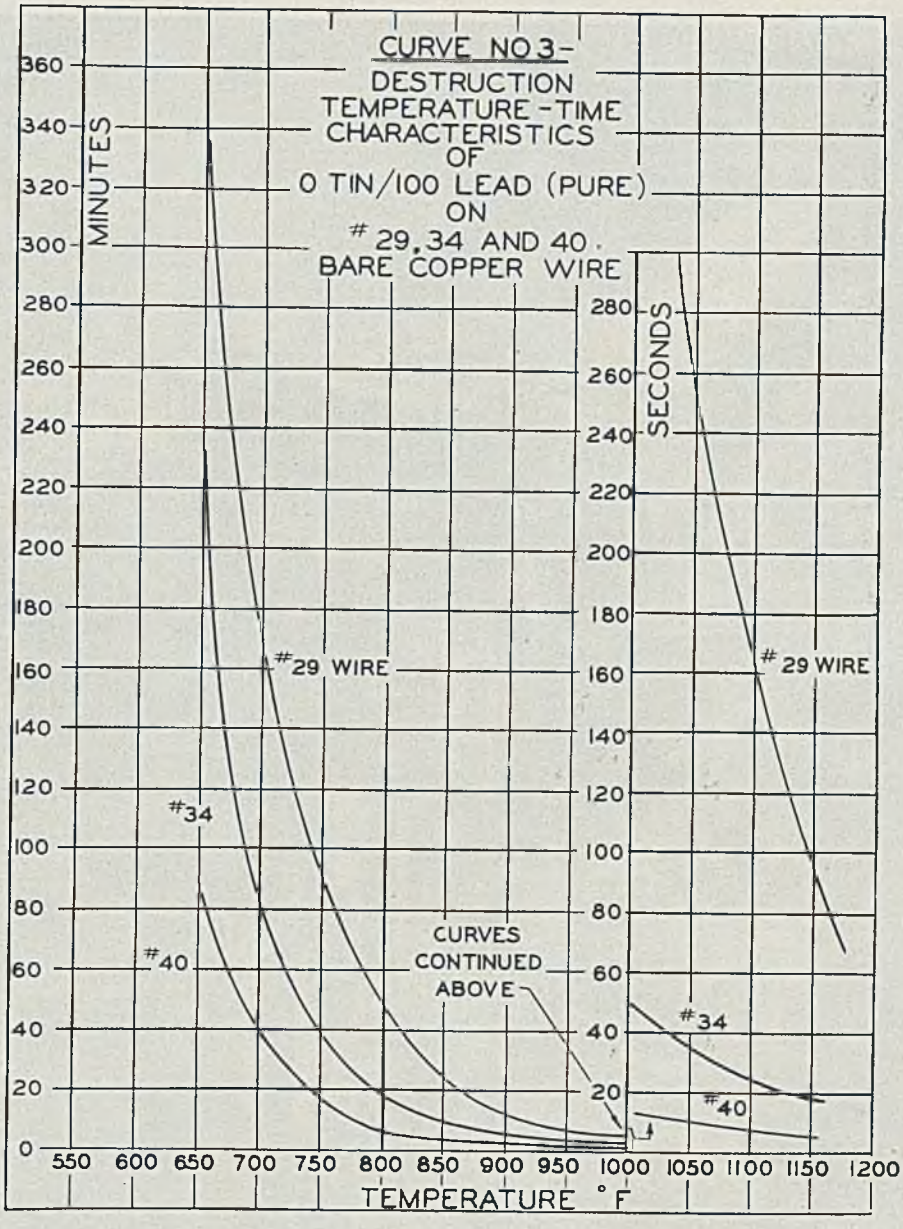
Based upon these initial observations, detailed tests were conducted by Fairchild engineers. The tests were to determine the time required for complete destruction of copper wire. Three variables had to be considered in these tests:

(1) **Wire Size**—Three wire sizes, Nos. 29, 34 and 40, were selected as representative of the more commonly used small and fine wires which would suffer to some degree under this known destructive action.

(2) **Solders** — Three tinning solders, 60 tin/40 lead, 40 tin/60 lead, and 0 tin/100 lead (using pure lead), gave an approximate general working range down to pure lead. This was considered an indicative selection of tinning solders.

Incidentally, metallurgically, all solders with a melting point below 600-700 degrees Fahr. are defined as "soft" solders. All solders having a melting point of approximately 1100-1200 degrees Fahr. are considered "hard" solders; this includes silver solders. Silver solder melting point is about 1200 degrees Fahr. All the tin/lead solders are considered "soft," but 40/60 is often referred to as "soft" solder; 50/50 as "common" solder; 60/40 as "hard" solder. The difference in solder designations, metallurgically and in the trade, should be borne in mind.

(3) **Solder Temperature**—For purpose of the tests at Fairchild's, temperature ranges of 550 to 1175 degrees Fahr. were selected. A 600 degree range represents the lowest reasonable working temperature practical, just above the melting or liquid points of soft solders. It should be noted that 60/40 solder melts and goes into the liquid state at about 400 degrees Fahr., 40/60 solder becomes mushy at its melting point of about 360 degrees Fahr., and goes into the liquid state at about 475 degrees Fahr. and pure lead melts to a liquid at 621 degrees Fahr.



Destruction curves for fine wire in pure lead at various temperatures

The 1100 degrees Fahr. group, however, was considered as representing the approximate working range that would be encountered in normal practice for hot tin dip stripping of Formex. In these laboratory tests it was found that heavy Formex coated wire required minimum temperatures of 1005-1025 degrees Fahr. to be stripped.

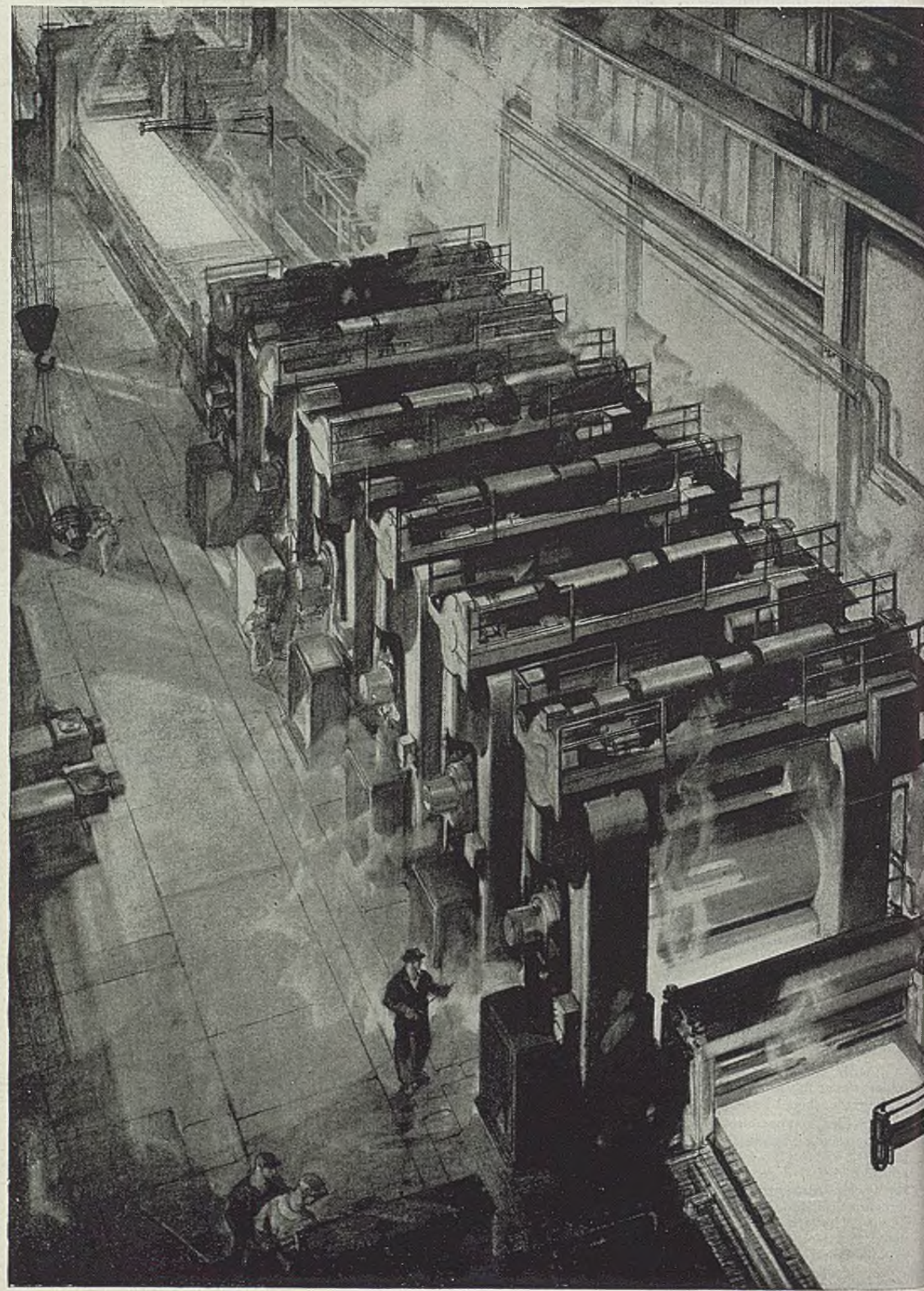
Wire Preparation and Test: All test samples of copper wire were stripped in advance of the synthetic insulation. This was essential because, first, the synthetic insulation would not be affected by temperatures below 1000 degrees Fahr.; second, all wire specimens should be in like condition for consistent test results. Formex was stripped from the wire samples by the new Fairchild process of stripping Formex coating by dipping the wire in two chemical solutions, leaving test specimens in thoroughly clean and usable condition.

All wire test specimens were bent into a standard hairpin shape with one side bent outward at right angles near the end opposite the loop. The specimens were handled by this projection. They were plunged, loop down, into the molten solder, only deep enough to permit the free side to remain out of the solder to about one-half its length. When this vertical projection fell over, due to the destructive action of the solder, the test specimen was considered destroyed as the wire was so eaten away to be incapable of supporting even this small weight.

The wire life or destruction time was measured accurately from the moment of entry into the solder. The solder was kept in a temperature-controlled, electrically-heated cast iron pot of 2 cubic inches capacity. Dross was scraped from solder surface immediately before each test.

Approximately 400 wire samples were tested. All tests have been plotted up in Curves 1, 2 and 3. The curves represent the average values for each test condition. Similar destructive results were ob-

(*Please turn to Page* 133)



SHIP AND ARMOR PLATE

The great strip-sheet mills of the United States (see illustration) designed to furnish America with steel for the millions of automobiles, refrigerators, ranges, kitchen cabinets, even toys, demanded every year, were quickly made ready when war came to do the big emergency job of rolling necessary tonnages of armor plate for tanks and the millions of tons of steel plates for the vast program of building Liberty and Victory ships and other craft. In addition these mills rolled immense tonnages of strip for tinplate to preserve foods and drugs for our fighting men.

Steel plates for a ship-a-day were rolled on the strip-sheet mill in the Pittsburgh Works of the Jones & Laughlin Steel Corporation, the Maritime Commission announced recently. This plant flys the Maritime "M" flag with 2 extra stars.

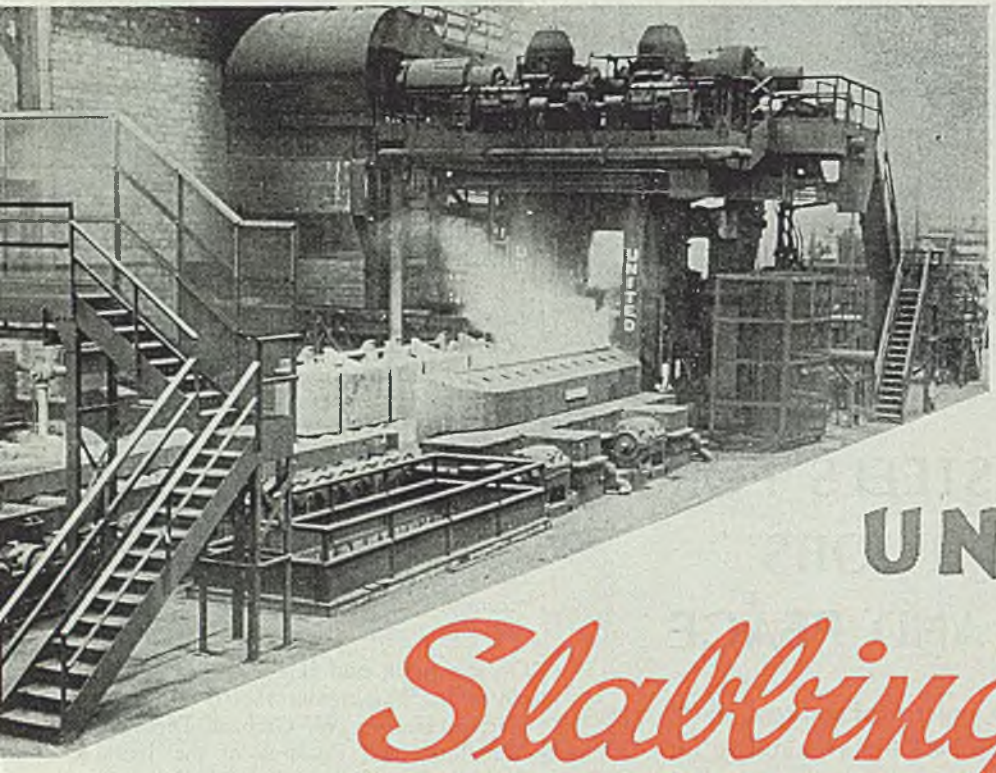
On a scratch pad in the Army Ordnance offices in Washington, shortly after Pearl Harbor, Herbert W. Graham, Director of Metallurgy and Research of the Jones & Laughlin Steel Corporation, jotted down the formula for a tough, special-purpose steel that, using a minimum of critical alloys, became the basis for large tonnages of armor plate for tanks, guns and even airplanes to protect the lives of our fighting men, Charles T. Lucey, Scripps-Howard staff writer reported. Mr. Graham is now in Chungking heading the steel division of a special mission organized by Donald Nelson to stimulate war steel production in China.

Strip steel pilot mill has been installed by Jones & Laughlin in its Research and Development Laboratory at Pittsburgh, alongside the small furnaces and rolling mills of the original J&L pilot plant, only one of its kind in the industry.

Hoop skirts needed steel, so, to meet fashion's demands, the first process for cold rolling of high-tempered, flat steel was patented and perfected in 1859 by the Washburn & Moen Wire Works, Worcester, Mass. In the quarter century that crinolines were in style the consumption of flat wire to keep milady's hoop skirts billowy reached the astonishing volume of more than 6 million pounds a year (3,000 tons). This type of mill was forerunner of modern high speed cold rolling mills that today turn out mile-long coils of shining strip steel for many applications.

Bernard Lauth, J&L partner, invented the 4-high rolling mill in 1864 and took out patent No. 41,307 on it. This type mill, for the first time employing the backing-roll principle, was the predecessor of the modern high speed, continuous strip-sheet mills.

In three years of World War II—from Dec. 8, 1941, through Dec. 7, 1944, steel plants of the United States produced a record-breaking total of more than 260 million tons of steel ingots and castings, a tonnage more than 80% larger than was produced in three highest years of the first World War (1916-1918).



New 45 x 80-inch universal slabbing mill designed to roll alloy, stainless and low-carbon steel slabs

UNIVERSAL Slabbing Mill Differs from Most Designs

Vertical rolls are separate from drives and are equipped with detachable couplings to facilitate roll changes. Mill rolls are direct driven through universal spindles by individual motors and can be reversed in three seconds. Wet and dry scale disposal systems are provided. Gas scarfing machine is operated from pulpit by push button control

By A. G. ERICSON*
Chief Engineer, Homestead Works
Carnegie-Illinois Steel Corp.
Munhall, Pa.

ONE of the most modern mills of its kind in this country—a 45 x 80-inch universal slabbing mill—recently was completed at the Homestead works, Carnegie-Illinois Steel Corp. for the Defense Plant Corp. Included in the unit is a stripper building, soaking pit building housing 20 pits, the mill building with motor room, and three slab yards capable of storing approximately 100,000 tons of slabs.

Pits are 15 x 16 x 13 feet deep, gas-fired, nonreversing recuperative units equipped for full automatic operation and control. Six ingots 29 x 66 x 96 inches long weighing 40,425 pounds are usually charged in these pits, or four 34 x 66-inch big-end-up ingots weighing 55,000 pounds each with hot tops. Stainless steel ingots 28 x 60 inches and 27 x 46 inches are also heated in these pits.

In designing the mill provision was made to roll all grades of alloy and stainless steels as well as low-carbon steel slabs into slabs from 2½ to 20 inches thick and from 20 to 62 inches wide, from ingots weighing from 14,000 pounds to as high as 70,000 pounds.

Mill equipment includes an ingot buggy, receiving table, ingot turner and scale, front and back mill tables with manipulators, pulpit, heavy duty upcut shear facilities, slab scale, tilting table and piler cars. Mill tables are driven from a line shaft and are of heavy construction, all equipment being provided with roller bearings throughout.

If rolled with the piped end leading, it is not unusual for too much metal to be cropped at the shear. The ingot turner installed at Homestead makes it possible to avoid this, presenting the slab butt end first so that only enough metal is cropped off to square the slab. This results in a maximum of the excess metal being removed from the piped end.

Sufficient lift is provided in the slabbing mill to permit rolling on edge and it is standard practice at Homestead to bring the ingot into the mill on edge for a scale breaking pass. Manipulator fingers on the delivery side of the mill facilitate edge rolling.

Experience to date has justified the application of roller bearings to the 45 x 80-inch rolls. Maintenance costs have been low and no mill time has been lost for bearing changes or repair. Likewise, the roller does not find it necessary to check the thickness of his slabs at frequent intervals and the time ordinarily consumed in readjustment and leveling of the rolls is saved. No difficulty from scale or water entering the bearings has been experienced.

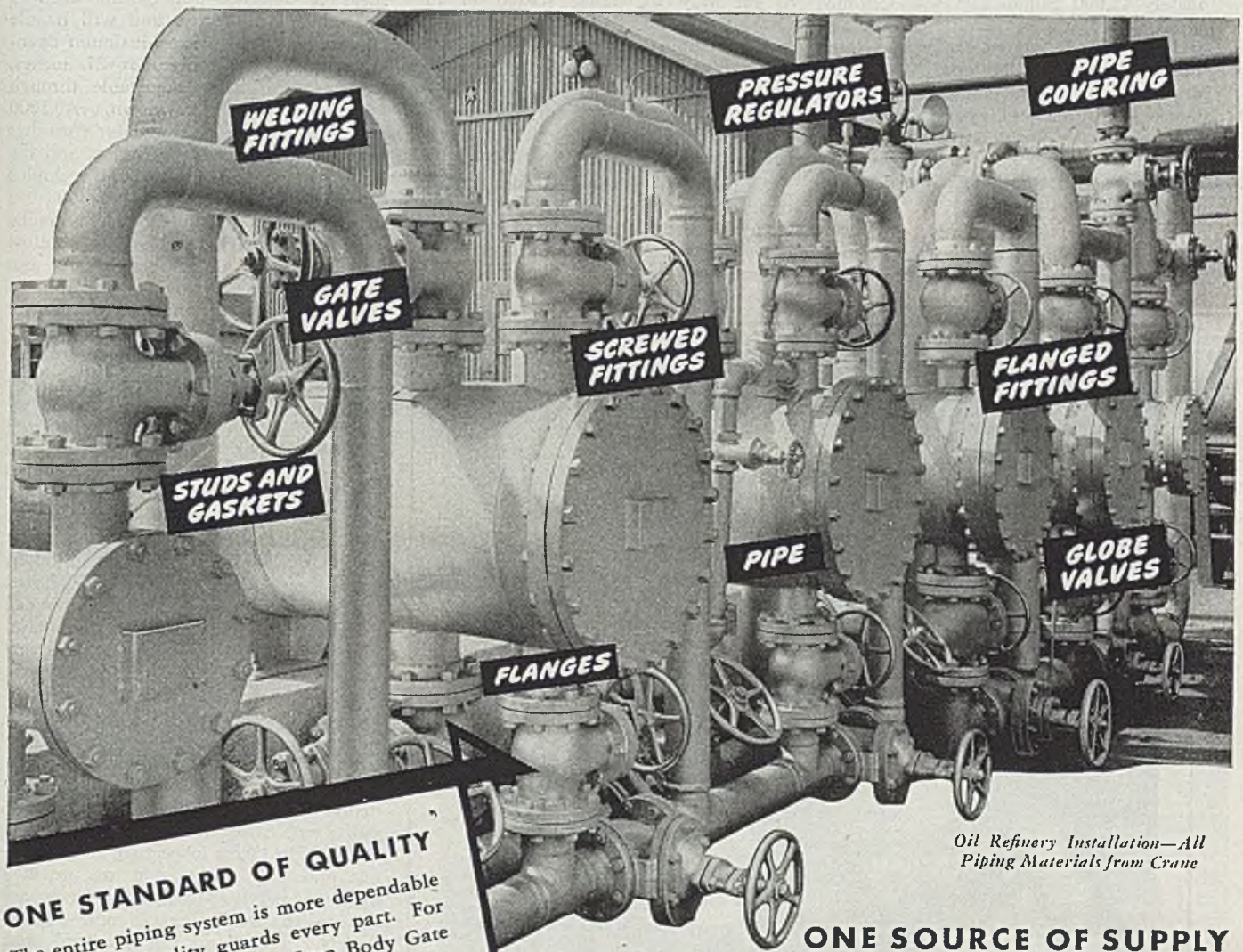
The mill rolls are direct driven by two 5000-horsepower motors through universal spindles, the top roll and spindles being counterbalanced. Roll speeds may be varied from 470 to 940 feet per minute and the mill can be reversed from base speed in three seconds.

The vertical mill, which has 36 x 80-inch rolls, is of the attached type and is driven through overhead gear reduction units by a 3000-horsepower motor. It differs from most designs in that the rolls are separate from the drives, being connected by easily detachable couplings to facilitate roll changes. The overhead roll drives move with the edger rolls and are operated by the same adjusting drive as is used for positioning the rolls.

Mill scale disposal at the Homestead slabbing mill is unusual in that it combines both wet and dry systems. A

*From a paper presented before Pittsburgh section, Iron and Steel Engineers, November 18, 1944.

Call Crane for All Materials for Any Piping System



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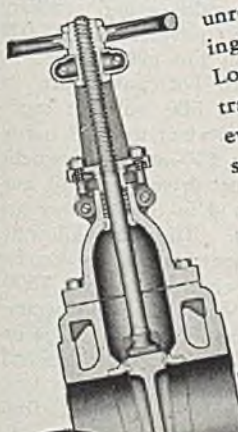

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steel-lined flushing flume runs under the mill from the ingot receiving table to the slab shear, pitching down from each end to discharge in a Y approximately 20 feet ahead of the universal mill. The scale pit, which is outside of the mill building, has a water capacity of approximately 43,000 gallons and will accumulate up to 150 tons of mill scale before starting to pile above the water line. From 4500 to 5000 gpm of water, drawn from coolers and other equipment, keeps the wet system in operation. Normal drainage is by gravity but a 6000 gpm sump pump is provided to remove water from the scale pit during flood stages of the river.

Heavy scale is caught on a grid consisting of 5 x 2-inch billets set on 8-inch centers across the flume. Ordinarily the larger pieces of scale are shattered and fall into the flume. Those which remain on the grids are hooked off into a tray running on a monorail in a corridor adjacent to the flume. These trays are dumped into charging boxes, lowered into position on cars which are advanced to the tray unloading station in the working corridor.

This combination of wet and dry scale disposal systems eliminates the possibility of clogging of the flumes, avoids wedging and blocking in chutes and hoppers, and prevents mill shutdowns being caused by faulty scale disposal.

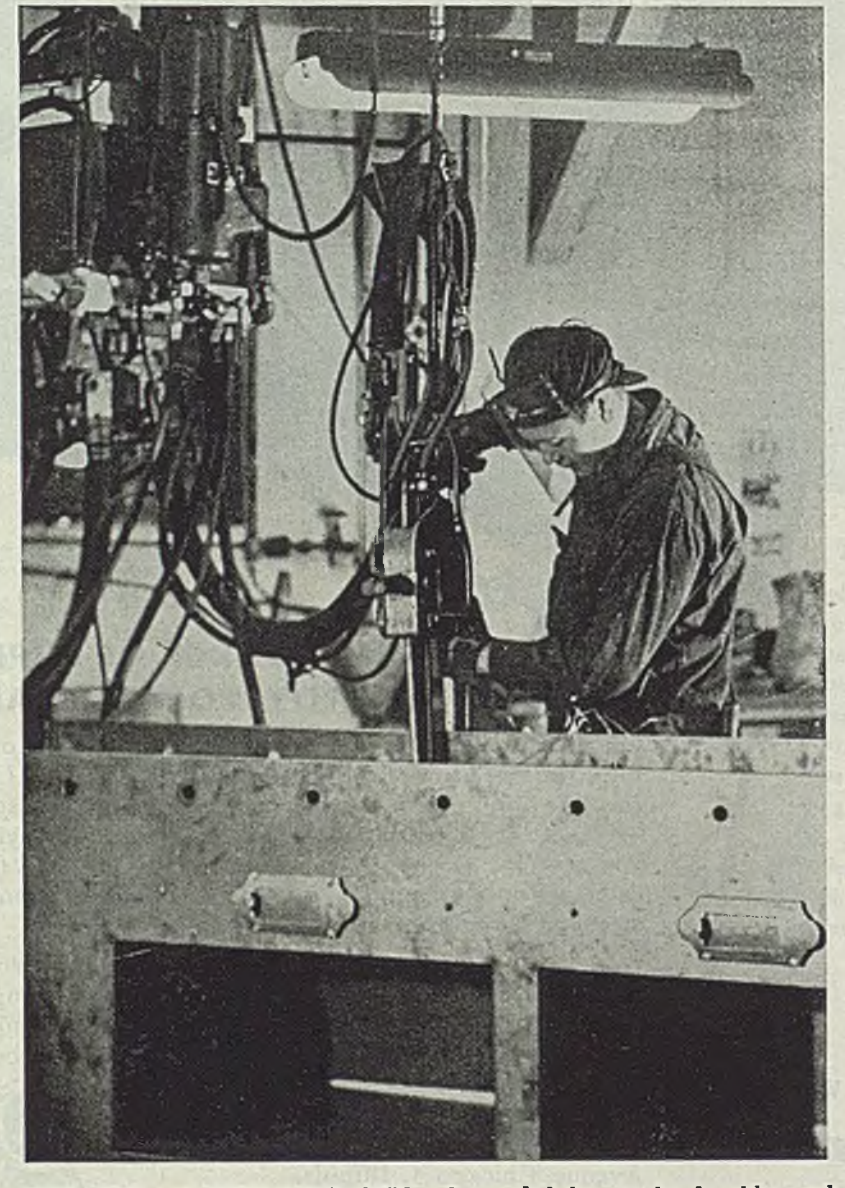
A gas scarfing machine, designed to remove relatively thin layers of steel from the vertical edges of 3 to 8-inch hot slabs is located between the universal mill and the shear. Control is from the operating pulpit, where the operator can set from three to seven nozzles in operation by push button control. Fairly smooth surface is obtained with a table speed of 100 feet per minute, gas pressure of 45 pounds per square inch.

The hydraulically-operated upcut shear is designed for cutting sections up to 20 x 60 inches and will handle lengths up to 20 feet. Maximum opening between the knives is 27 inches, the top head being adjustable through a motor-operated screwdown. A 1000 psi weighted type accumulator furnishes pressure for the shear cylinders and the holddown. Three horizontal duplex plunger pumps, operating at 4500 psi furnish power for the 40-inch hydraulic cylinder which operates the bottom knife. One or all of these pumps can be operated as desired to control the speed of cut, two pumps being sufficient to develop maximum capacity of the shear. Limit switches provide for unloading the pumps when the bottom knife overlaps the top knife by ½-inch, a cam-operated pilot valve serving as an additional safety precaution.

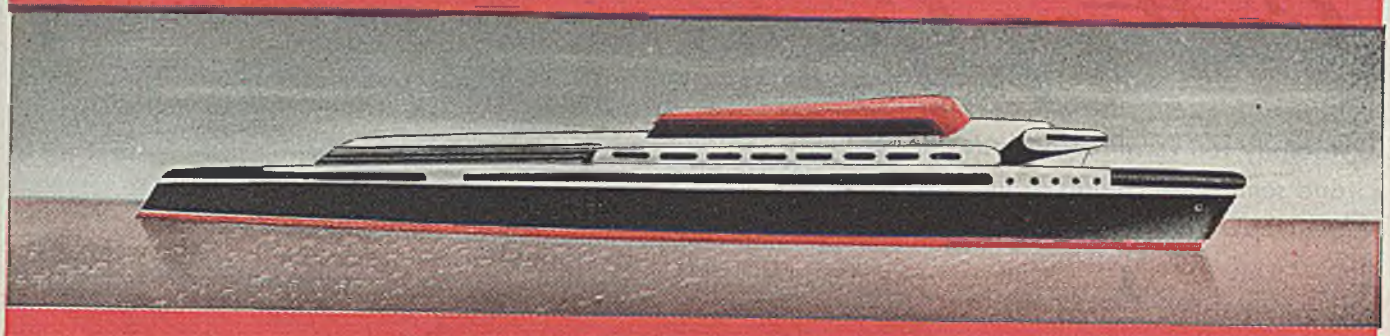
Cropped pieces drop onto a chute which delivers them to a flight type conveyor. This takes them out of the mill building, discharging down a chute to the scrap yard floor for handling by crane tongs directly into charging boxes.

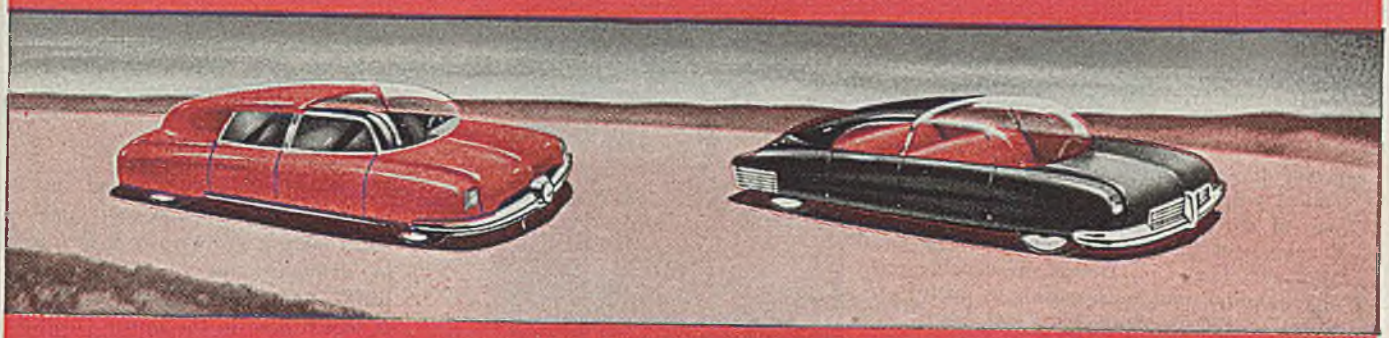
Three motor-driven cars are provided to take slabs from the tilting table. No. 1 and No. 3 cars are used for transporting slabs into the adjoining slab yards, No. 2 being used as a standby unit and for handling slabs too long for the other cars. No. 1 car does the bulk of the work. About 110 feet of slab yards A and B are without roof, to speed up dissipation of the heat from the hot slabs and steam from water cooling. Scarfing docks for inspection, hand scarfing, and slab conditioning are provided in the A and B yards. These docks are serviced by gantry cranes and scarfing outlets. The C yard is provided with scarfing outlets but has no gantry crane. Slow cooling and preheating pits are available in all three yards.

Approximately 105 motors developing 21,670 horsepower are used in connection with the main drives and auxiliary equipment; three equivalent to 13,000 horsepower are on the main drive, 16 equivalent to 2010 horsepower are on the Ward-Leonard 500 volt dc auxiliary drives, 44 equivalent to 2475 horsepower are straight 250-volt dc magnetic control on auxiliary drives, and 44 motors equivalent to 4190 horsepower are 440-volt ac units. The 3500-kilowatt, 700-volt generators provide power for the main drives, being driven by a 7500-horsepower, 6600-volt, 25-cycle wound rotor flywheel induction motor. Two exciter sets furnish power for control. Power for the auxiliary motors on variable-voltage control is supplied from two 7-unit motor-generator sets driven by 1250-horsepower, 6600-volt, 25-cycle synchronous motors. The dc auxiliary drives operating under magnetic controls are supplied by a single 1500-kilowatt motor-generator set.



PORTABLE SPOTWELDING GUN: Suspended by overhead cables and counterbalanced for movement in any direction, this unit joins large ranges too heavy for conventional equipment at Washington Stove Works, Everett, Wash. Electrodes can bear on any body point, thus cutting production time from 1½ hours to 15 minutes. Automatic time and heat controls are provided in this heavy-duty installation, built by Progressive Welder Co., Detroit





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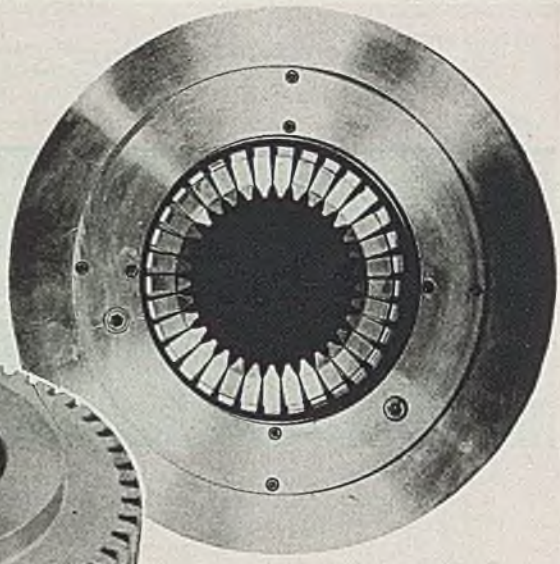
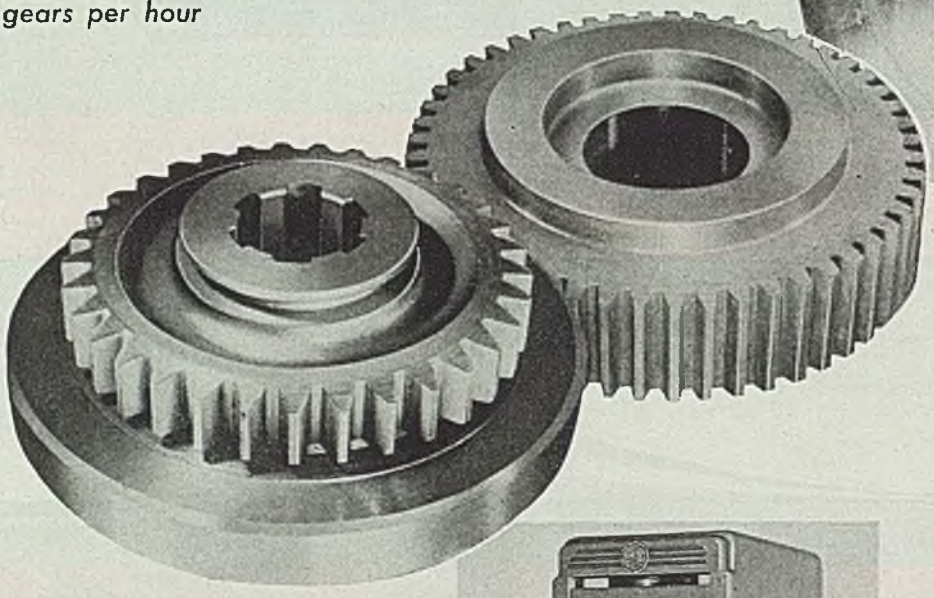
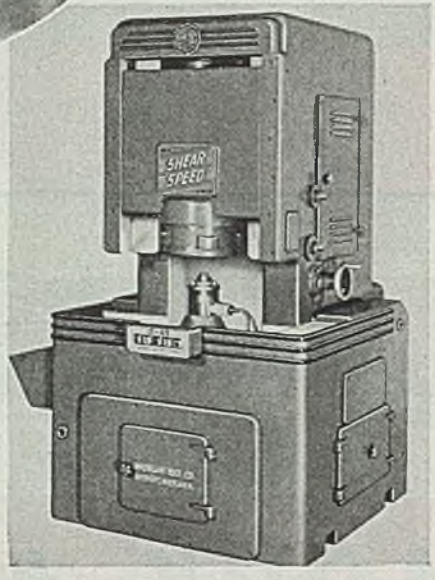
All Teeth Are Produced Simultaneously in New Method for

Cutting Gears

Radially fed form-tooth blades are capable of rough and semi-finish cutting as many as 60 to 100 or more gears per hour







Top to bottom—

Fig. 1—Interior of cutter head, showing assembly of individual simple form tool blades, each responsible for removing the metal between two adjoining teeth in a gear. This head is for a gear 4 inches in diameter with 33 teeth. Blades are easy to sharpen, cutter heads are so quickly removable and replaceable as complete units, that practically continuous production is assured

Fig. 2—This gear, 4 inches in diameter, with 1 inch face width and 51 teeth, was cut by the new machine in less than 1 minute

Fig. 3—Shoulder gears such as the one shown here may be cut as fast as other types

Fig. 4—(Left)—Shear-Speed cutter designed for rough and semi-finish cutting gears up to 4 inches in diameter and 2 inches face width. Ram containing cutter head is shown here in the upper (loading) position

RADIALLY-fed form-tool blades cut all gear teeth simultaneously with unusual speed in a new gear cutter. The method is said to represent the first major advance in equipment and processes for the production of spur and helical gears and splines since the early part of the century. This cutter, under development for the past few years by Michigan Tool Co., Detroit, is capable of rough and semi-finish cutting as many as 60 to 100 or more gears per hour, depending on the job. Cutting time required for the gear shown in Fig. 2, for example, was under one minute.

The company's objective in the development of the Shear Speed cutter was to bring the speed of gear cutting up to the level set by modern gear-finishing machines. Up to the present time, one gear-shaving machine has been capable of handling the output of a considerable number of shapers and hobbers, the actual number differing according to the particular job. With the new machine, production times for rough cutting and finishing can be equalized and predetermined. One cutter and one shaving machine can be counted on to produce continuously a definite quantity of gears per hour or day.

Balanced cutting pressure is applied around the gear. Only a simple grinding operation is required to bring dull blades back to correct form. The machine is easy to operate and no particular skill is required for its operation. Gears are merely placed on the work holder. Chucking is part of the automatic machine cycle. The operator presses a button to start the machine. When the machine has completed its cycle it returns automatically to loading position and releases the finished gear for removal and loading of another blank. The design eliminates chance of loose arbors. There are no nuts to tighten.

Cutting action of the machine is as follows: When the gear is automatically clamped, the head of the machine, containing the cutter head (see Fig. 1) automatically lowers into cutting position. It automatically locks in this position. The work now reciprocates vertically. At the beginning of each up-stroke, all blades are advanced radially (fed into the work) an equal amount. On the return stroke, the blades are retracted slightly as on conventional gear-shapers to provide clearance for the tools. The amount that blades are fed into the work on each stroke is adjustable. Correct sizing of the work is also automatically controlled and adjustable.

A "jog" control also is provided on the machine to inch it for set-up adjustments when shifting the machine to a different job. Adjustments are provided for speed of vertical reciprocation and length of stroke. To sharpen blades, or to change over to another type of gear to be cut, the entire inner cutter-head assembly is removed, as a unit, permitting insertion of another cutter head

(*Please turn to Page* 135)

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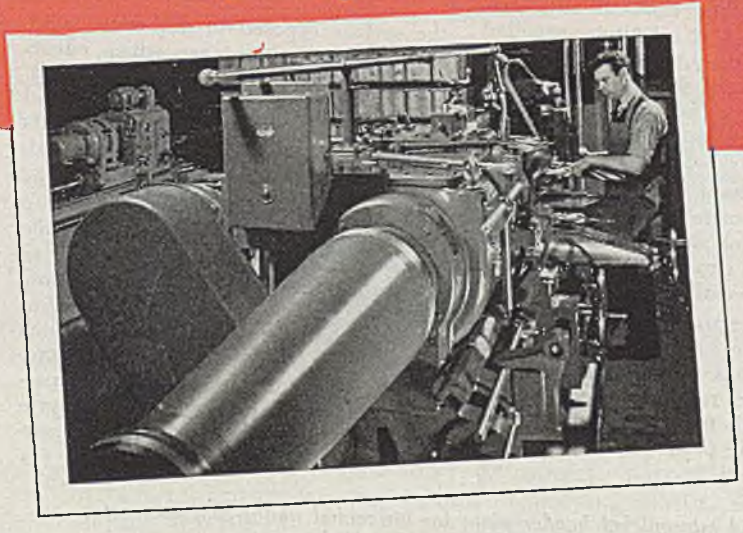

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Laminating Steel and Cupronickel

Process for super-cladding header plates for motor-generator sets and similar applications where vibration puts laminated assemblies to severe test accomplished by combining single mild steel plate with two lesser thicknesses of cupronickel. Copper binder and hydrogen brazing make good bond

By J. V. KIELB
Easy Washing Machine Corp.
Syracuse, N. Y.

LAMINATION of steel and cupronickel is one of the newly developed processes which conserves nickel as well as copper, another essential raw material. Its product, or substitute, is called "super-clad." Today, there are many companies engaged in the manufacture of materials which require such ferrous and nonferrous materials to be laminated.

The possibility of modifying a product with some alternate material during an emergency is not always realized. One such material is cupronickel (70-30) combined with low carbon steel.

Generally, cupronickel in stock-size thicknesses from 1/16 to 1-inch is being used on products where high corrosion and electrolytic resistance qualities are necessary. This type of material is applied where the product is attacked on the surface exposed to salt water, acid, erosion, or any substance which effects its destruction. Oil and water coolers, air-cooled motors and generators, and condensers are some of the products that have use for this type of material.

In one case, the inner surface of air-cooled generator units was exposed to corrosion and electrolytic action while the outer surface was exposed only to the air, and sometimes, oil distribution. Fig. 1 shows one section of the unit of an air-cooled motor and generator which formerly was made from solid cupronickel. Under the new method of super-cladding, it has only 0.032-inch cupronickel on the inner and outer side surfaces. Fig. 2 shows cross-sectional area of this unit under low magnification. Later, it was found that this clad was necessary only on the inside surface which was exposed to salt water.

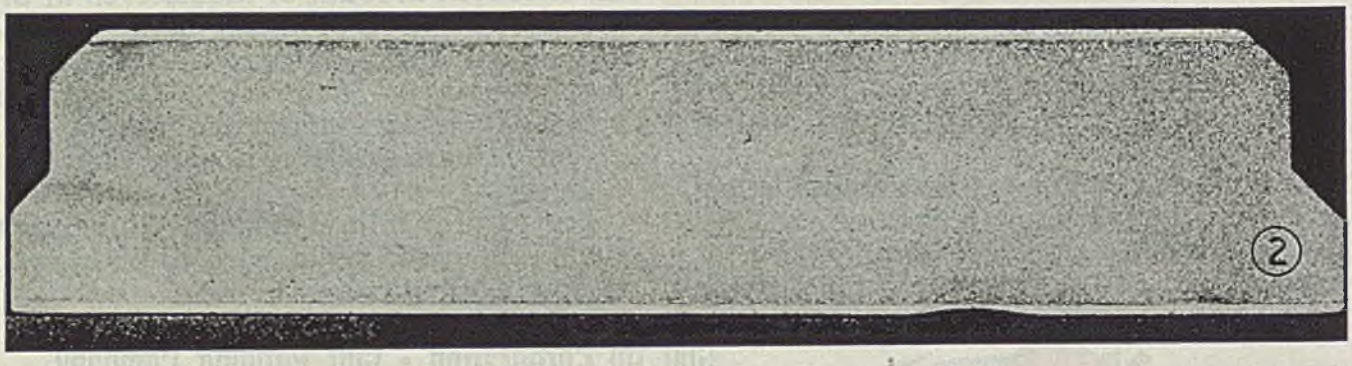
Super-clad with one surface is illustrated in Fig. 3. Specimen shown has wall thickness of only ⅛-inch, with the layer of cupronickel being 0.020-inch thick. Where all surfaces are attacked by corrosion, another application would be necessary in order to maintain these resistant qualities. In this application, original weight of solid cupronickel section averaged 22 pounds as shown in Fig. 1, whereas with super-clad, the amount of cupronickel is from 10 to 14 ounces, with the balance mild steel stock. Combined section was approximately 2 pounds lighter than the original stock, thus making the complete unit of six sections 12 to 15 pounds lighter than the original.

As to the conservation of nickel and copper, it is estimated that 82 to 90 per cent saving per unit was established by this new product. In the model under discussion, it resulted in savings of 12,000 to 15,000 pounds of nickel in

Fig. 1—Solid cupronickel header plate for air-cooled motor-generator set

Fig. 2—Cross section of super-clad header plate at low magnification

Fig. 3—Cross section of product which has only one surface of cupronickel



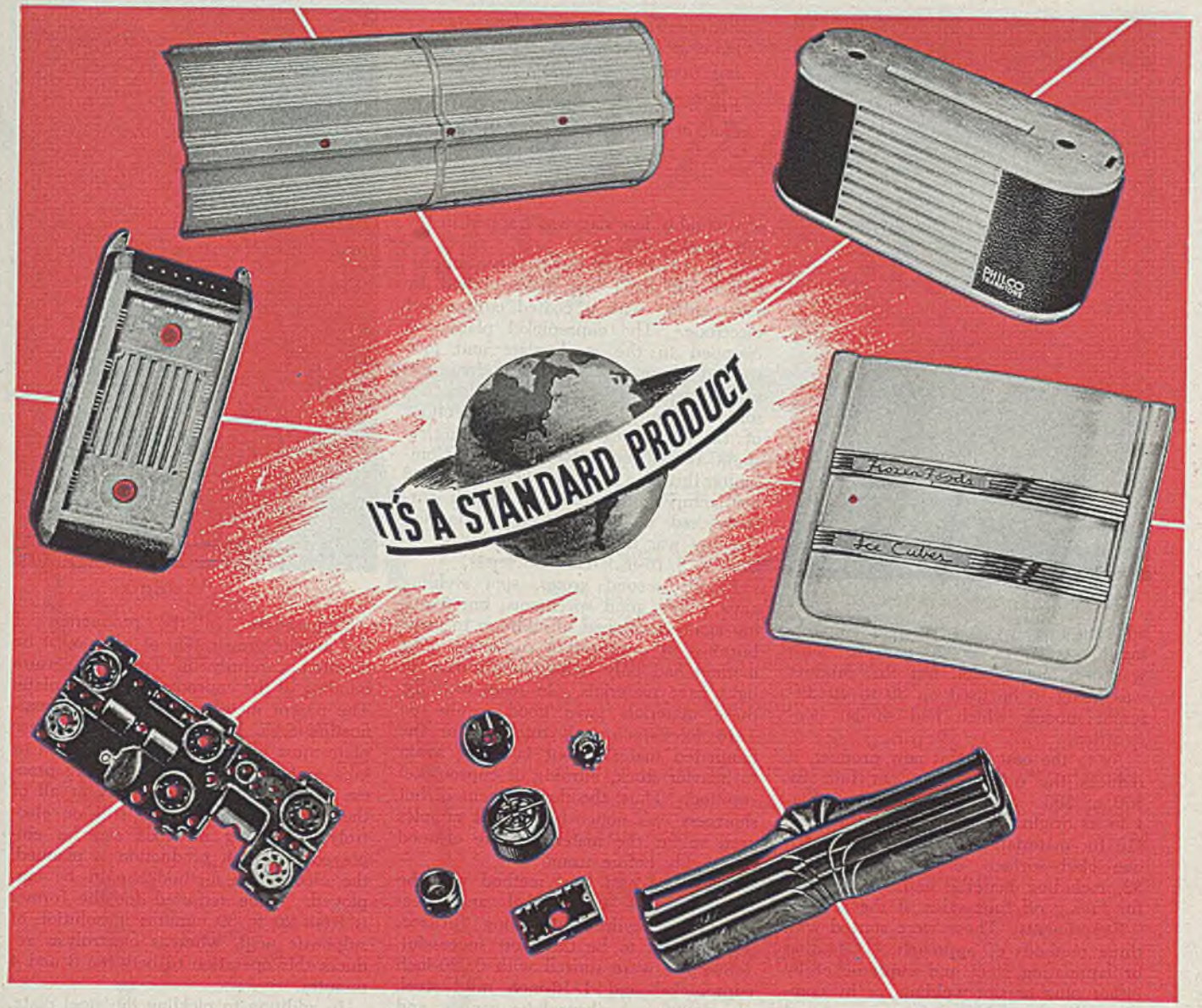


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Fig. 4—Cross section of laminated plate at high magnification showing bonding and grain structure

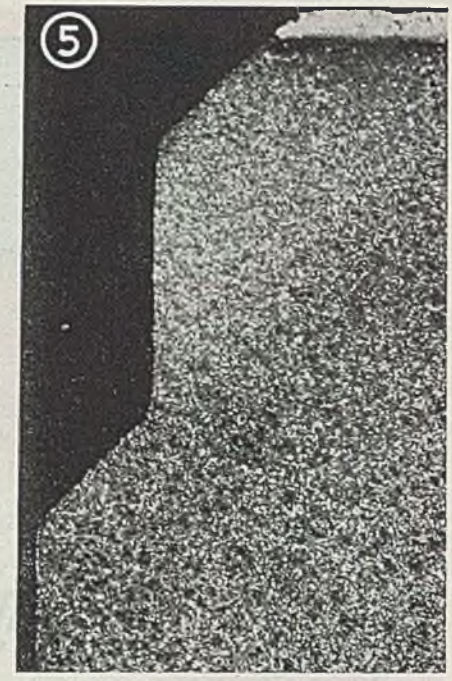

Fig. 5—Edge section of laminated plate at high magnification indicating machinability

addition to a saving of copper amounting to 30,000 to 35,000 pounds. This was only one model, but this product was going to be used on 30 to 40 different models which had similar construction.

As to the cost of this new product, it reduces the original cost per unit by $50 to $60. Section illustrated in Fig. 1 in its original form cost approximately $10 for material, while super-clad, with one clad surface, costs approximately $2, including material and actual labor for facing off four sides of the section.

Experiments: These were started with three methods of approach: (1) Joining or laminating steel and cupronickel by either plug or slot welding, or by complete electric welding of transverse and longitudinal seams; (2) resistance welding by spot and seam method; and (3) by application with a hydrogen brazing furnace. Procedure with the hydrogen brazing furnace proved most successful. In all instances, it was possible to use each application within its limits. Although the first and second methods were not practical here, they will be outlined as they might prove useful in other applications. With the principles of making stainless and nickel-clad steel in mind, thought was given to rolling steel and cupronickel together. This was left as a last alternative to laminate this product.

One-inch diameter plug welds were staggered 7 inches, center to center. A 3/32-inch diameter coated cupronickel electrode was used to fill these holes. This method revealed warping of the thin wall thickness of cupronickel, also many irregularities developed in its surface, caused by heat from the arc. Later it was found that the heavier the wall thickness of the cupronickel, the less irregularities and warping occurred. The same characteristics were found in slot welding, even though the handling during welding was simplified. This made it easier for the welder to handle, and considerably less slag was trapped in the fusion area.

A seal-tight surface between cupronickel and steel was accomplished by arc welding with a coated cupronickel electrode. The cupronickel plate was clamped to the steel plate and tack welded along transverse and longitudinal seams. All joints were sealed, but some warping developed in the sections of the cupronickel plate, resulting in slight air pockets between plates. Combining this plan with slot welding proved satisfactory, but inasmuch as all surfaces had to have machined finishes, the cost was too high, especially on ⅛-inch to 5/16-inch clad thickness.

In the second group, spot welding gave a few good specimens, but warping again developed in addition to some burning of cupronickel surfaces. This method had only limited application to light gage materials. In seam welding, these materials gave good results on 1/16 to ⅛-inch wall thickness of the laminated material, but in going again to heavier stock, burning of cupronickel resulted. Thus, the development of hot shortness was noticeable. In all samples used so far the materials were cleaned thoroughly before using.

The third and final method was the lamination of cupronickel and steel through a hydrogen brazing furnace. This proved to be the most successful.

Samples were started with 0.020-inch cupronickel and 1/16-inch mild steel, plus 0.006-inch electrolytic copper, and a special flux as an additional binder. Pilot work revealed that copper thickness will vary according to thickness of steel and cupronickel. Copper spots developed on many samples after brazing the cupronickel and steel surface, although bonding was excellent and warping within the plate was very slight. After brazing with only one side of the steel covered with cupronickel, most of the samples revealed a tendency toward distortion in the outer edges of the material. This produced a concave structure which predominated more with materials 3/16-inch or less in wall thickness. Most of this was due to the difference in coefficients of thermal expansion for steel and cupronickel. Also, it was revealed that rate of bonding and cooling was too rapid. However, material which warped as a result could be straightened easily without affecting bonding structure.

After much testing on experimental pieces for bonding, gas pockets, blistering, etc., a process specification was written to cover each class of model. Details appearing in subsequent paragraphs with preparation, brazing and production handling, apply to the model illustrated in Fig. 1.

Preparation: In the production of this article, preparation of parts must be handled carefully in order to insure bonding of the cupronickel to steel plate. The parent metal may be in the classification SAE 1010 or 1020. The base plate must be free of scale, corrosion or grease of any kind. The pickling process was used to eliminate any or all of these conditions. Either still or electrolytic pickling methods can be employed. If high production is planned, the electrolytic method should be employed. Time required for the former is from 20 to 30 minutes in solution of sulphuric acid, whereas electrolysis reduces this operation to between 3 and 4 minutes.

In addition to pickling the steel plate, the cupronickel and brazing sheet of copper should be thoroughly cleaned by washing and degreasing. After cleaning, they should be thoroughly dried to prevent oxidation on their surfaces. This material should be used within 24 hours after cleaning as there is a possibility of oxides developing on surfaces of the metals to complicate bonding.

Binder used in bonding consists of a copper sheet, (deoxidizing or electrolytic) varying in thickness according to size of product to be made. Some care is required as to amounts of the specially prepared flux to be used between surfaces, because gases may be generated during furnace operation causing pin holes in the cupronickel surface and making the bonding metal visible. To partially offset this possibility all plates can be made ½-inch longer and ½-inch wider than dimensions desired, allowing impurities to form on outer surfaces. These can be trimmed off later, leaving a perfect bonding area.

Brazing: In uniformly fluxing one side of the steel and the cupronickel plate, the flux should be applied in a very thin layer over the entire area. The copper sheet is placed upon this fluxed surface of the steel. Cupronickel plate

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SULPHITE-TREATED alloy and special steels, which we have produced for a number of years, have solved many problems for steel users. They have been most satisfactorily applied where machinability is of first importance.

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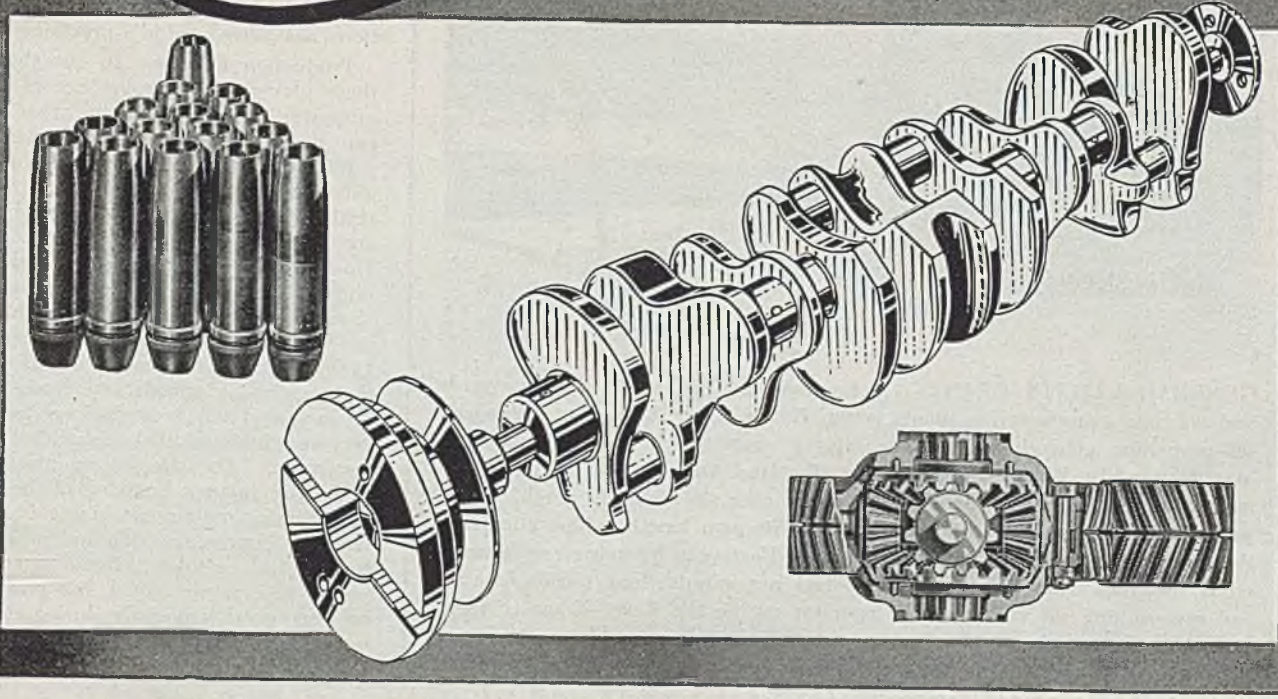


now is inverted with the fluxed side touching the copper plate surface. Particular attention should be paid to alignment of all three plates. This should be checked before the materials are placed on the furnace conveyor. Lighter gages of both copper and cupronickel plates will show some warping, therefore, weights are employed to keep all three plates together for good bonding action. To prevent weights from bonding with top surface of finished product in furnace heat, a piece of carbon strip the same length and width as the cupronickel plate should be inserted between the weights and upper plate. From 10 to 20 pounds deadweight is evenly distributed across top of carbon strip.

Operation Conveyorized

Material now is placed on belt conveyor leading to hydrogen brazing furnace. Brazing temperature is held at 2050 degrees Fahr., plus or minus 25 degrees. Rate of travel of conveyor will vary according to product to be made and thickness of stock used. In case under discussion, rate of travel of the stainless steel belt through the furnace was under 3 hours. In one instance, rate of travel was changed during the time material entered maximum heating chamber and before reaching cooling chamber. A standard hydrogen brazing furnace of the belt conveyor type was used in this operation. In the cooling chamber plates moved slowly until they reached temperatures of between 200 to 300 degrees Fahr., and then were moved from conveyor to a skid. These plates in some cases warped slightly after brazing. Conditions ranging from a minimum of warping to no distortion at all were shown when both surfaces of the steel plate were contacted with cupronickel plates. As previously noted, some plates of the laminated structure were distorted due to disparity in coefficients of thermal expansion for steel and cupronickel; blistering occurred only when too many impurities were present between plates, or when too much copper binder was used. The other development was the creation of gases during furnace brazing, caused by excessive application of flux. It was claimed dark soot developed at the start, affecting hydrogen control. This was minimized by more careful distribution of flux.

Many samples were tested to determine correct proportions in use of copper as the bonding medium. Accompanying table shows approximate thicknesses for each of the three components going into a super-clad product based on steel plate sizes from 1/16 to ¾-inch.

Thickness of copper should be at a minimum, pilot tests indicating 0.006-inch as average for lighter gages of steel and cupronickel. However, as shown by table, copper thickness was reduced to 0.0015-0.002-inch when combined as bond with 1/16-inch thick steel and 0.020-inch thick cupronickel. Views in Figs. 4 and 5 at high magnification show grain structure and bonding of these metals in a header plate. It is apparent that copper sheet on top strata bonded deeper into the steel plate than did the lower bonding sheet.

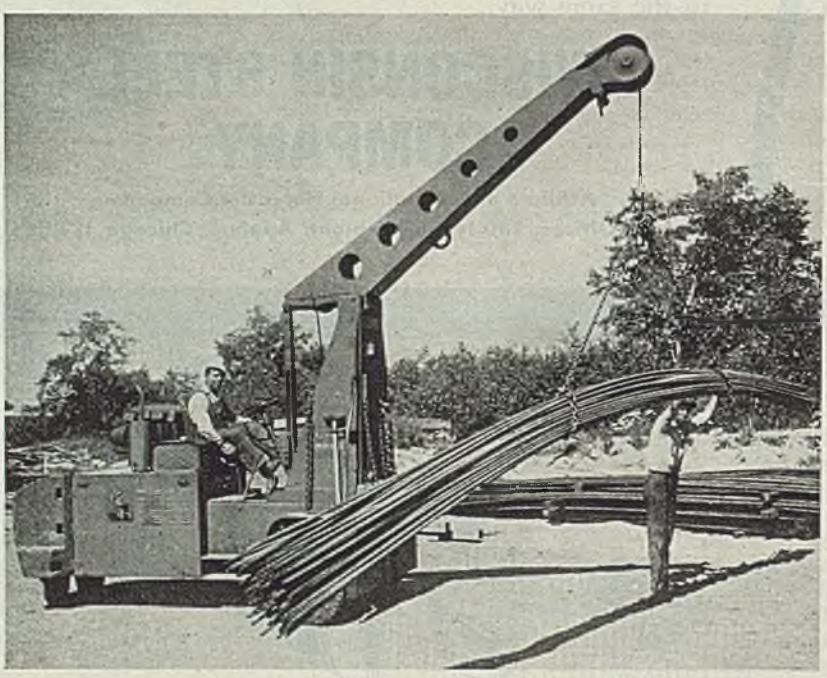
THICKNESSES RECOMMENDED FOR SUPER-CLADDING

Mild Steel Plate Inches	Cupronickel Inches	Copper (Binder) Inches
⅛	0.020	0.0015–0.002
⅛	0.020–0.025	0.002 –0.003
¼	0.025–0.032	0.003 –0.0048
½	0.032–0.047	0.003 –0.0048
¾	0.032–0.062	0.003 –0.006

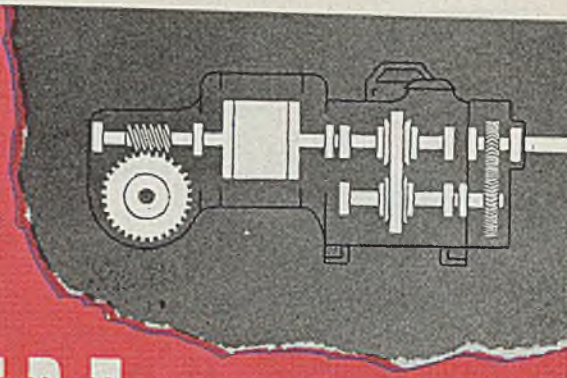
Hardness records of the header plate illustrated were kept until completion of the piece. Hardness of the mild steel section averaged 60 rockwell B before brazing, while cupronickel plates averaged 44 rockwell B. After brazing, hardness in the steel plate area near the bonding zone changed, with average hardness ranging close to 64 rockwell B on both edges. This increased hardness extended into the steel plate as far as ¼-inch from the bonding zone. Center section showed little or no change. In comparing the readings at both edges, it was noticed that the top section, i.e., the cupronickel plate that was on top as it went through the brazing furnace, gave lower hardness readings than that of the copper on the lower side. Penetration into the cupronickel plates was about the same on both surfaces.

Using 0.032-inch cupronickel thickness on the top side, with binder of 0.006-inch copper on the ¾-inch steel plate, it was found the copper would penetrate deep into the steel and, on some occasions, blisters or bubbles would develop on the steel surface of the lower side. Remedial action to correct this trouble and other unsatisfactory conditions has been set forth previously.

Production Factors: In straightening these plates after warping occurs, a set of power rolls or hydraulic arbor press can be employed. Type of operation generally depends upon thickness of plate and amount of distortion. After straightening, the plates for the header are sheared, or in some cases cut on a Do-All machine, to the required size. Shearing and machining of material should be arranged so that if rough burrs are left, they should be on the steel side. Under a production setup it was found that machining speeds and feeds could be increased when cupronickel material was at minimum thickness and steel at maximum. To gain better production as well as prevent breaking of the bond after joining metals, machining is begun from the cupronickel side and progresses toward the steel plate. Bonding, according to practice described, has proved to be very good, especially during drilling operations. Lightness of plates also contributes to machinability.



GENERAL UTILITY CRANE: A familiar sight in west coast shipyards and wartime manufacturing plants is the Hyster Karry Krane—a high-speed self-propelling general utility crane with a capacity up to 10,000 pounds. Manufactured by Willamette Hyster Co., Portland, Oreg., the crane has pneumatic tires, a big power plant and operates over all kinds of rough, unimproved floor and road conditions. It turns in its own length, which eliminates the need for use of a revolving boom crane. Loads can be hoisted or lowered while traveling. Fast lift speed of 35 feet per minute, four speeds forward and reverse and full vision for the operator enable the Karry Krane to meet the requirements of most materials handling problems



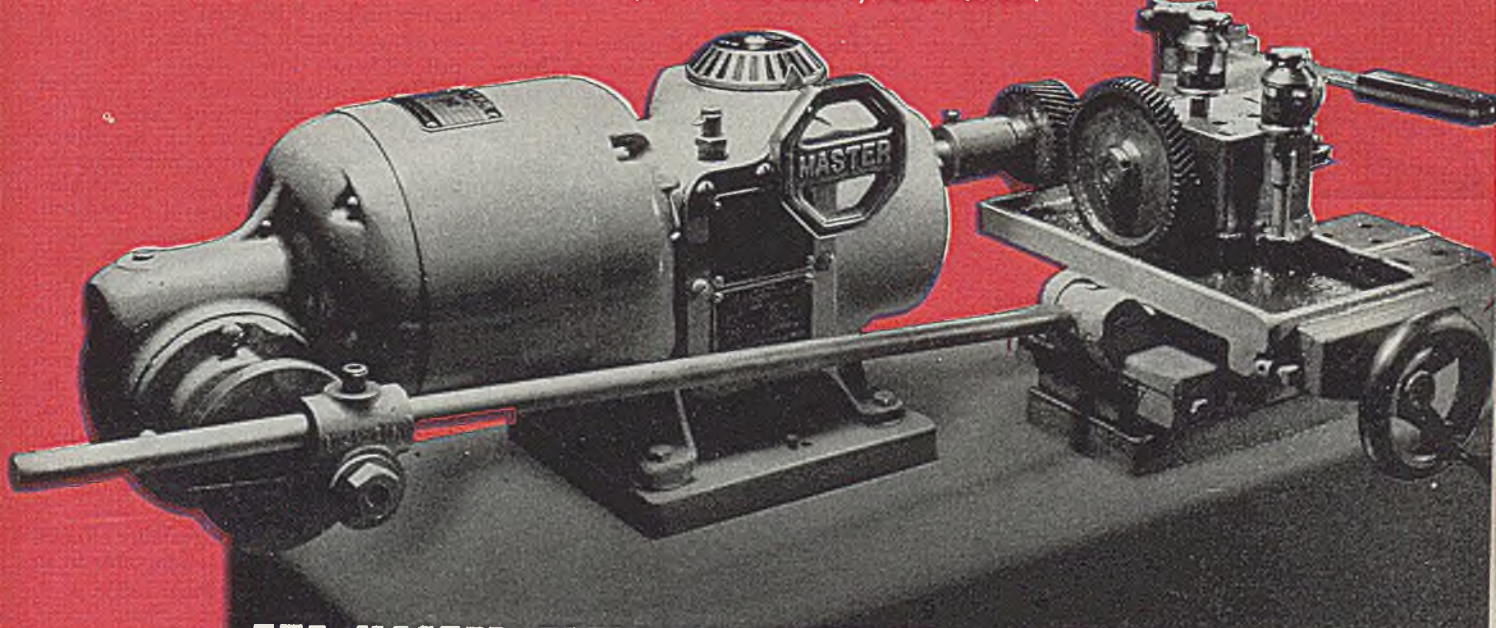
DOUBLE FEATURE

Ingenuous fellow, the designer of this gear lapping machine. Fully alert to the wide diversity of the Master line, he has been able to select units which combine to give him exactly the "double feature" action he needs.

This power drive incorporates a mechanical variable speed unit and a stage of gear reduction on the right hand end to provide variable speeds, in exactly the right range, for the spindle drive. On the other end is a right angle worm gear drive that provides oscillating motion for the lapping table. All of these . . . the motor, the variable speed drive, the two gear reductions . . . all are standard Master units, that easily combine into one compact, integral, power package. Saves ordering and mounting time . . . saves space . . . saves money.

Probably you will not need exactly the same combination of motor features illustrated below, but the Master line includes motors for every current specification, every type of enclosure, and every type of mounting arrangement . . . in fact, is the most flexible, the most versatile line of motor drives in the world.

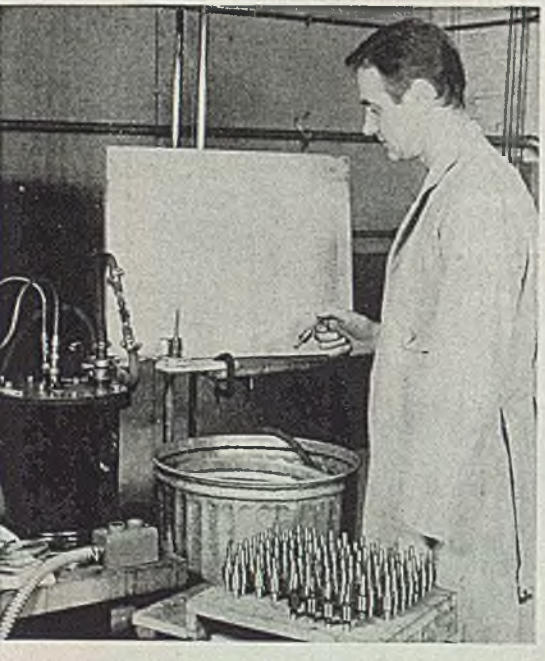
Investigate Master's unusual ability to serve you economically with motors that really fit the job in sizes from 1/10 to 100 HP.



THE MASTER ELECTRIC COMPANY • DAYTON 1, OHIO

Job Shop for INDUCTION HEATING

By REX BAUBIE, *Chief*
Induction Heating Division
Central Boiler & Mfg. Co.
Detroit



Above—Heating coils and fixtures of various design, each for a specific job, are readily available

Below—Repetitive localized heat treating with induction unit. Heating is so rapid that parts may be removed by hand for quenching. Part is inside small coil in front of board above quench tank

ECONOMIC factors involved in the practice of heat treating metals by application of electronically induced high-frequency current have given rise to an entirely new service in the metalworking industries—the induction heat treating job shop.

Induction heat treating as a job shop operation rather than a departmental function within a plant is a logical development created by wider acceptance of induction heat treating itself. It is justified economically if consideration is given cost of installing the necessary equipment, training the personnel to operate it and maintaining that personnel through the idle periods bound to occur from time to time within a large industrial plant.

In the case of small plants or other job shops the economic value of "farming out" such work to a specializing shop is even more pronounced because of (1) high cost of the equipment, (2) the limited use it would have, (3) the trained technicians its operation requires and (4) the per-unit cost of work turned out.

The job shop having an induction heating department, experienced in that highly specialized type of operation and fully equipped to handle any induction heat treating operation, need not suffer from such economic prohibitions.

Assuming its business is sufficient to keep its equipment in operation most of the time, costs can be spread over numerous projects, thus lowering the cost per-unit to a figure an owner using the equipment only occasionally cannot hope to attain. Furthermore—and this is important—the induction heat treating job shop can supplement its lower per-unit cost with the counsel and services of electronic and metallurgical engineers of a caliber few occasional users of the process could afford to maintain.

The nature of induction heat treating makes it adaptable to projects of widely different requirements as to size, shape and length of run. That, fortunately, is inherent in an electronic induction circuit. Fortunately the more costly elements of the apparatus transformers, rectifiers and oscillators—remain more or less standard for all types of heat treating jobs. The fixture which actually applies energy to the work being treated, the coil, is not only the least expensive part of the equipment but is both detachable and interchangeable. It is in reality an attachment but is of course as necessary to operation of the unit as a drill bit is to a drill press.

High frequencies necessary to heat treat inductively are generated by the more expensive elements of the equipment and delivered to output terminals. The coil is attached to the terminals simply by plugging in. Removal of one coil, substitution of another is no problem.

Induction heat treating coils, however, must be designed to meet specific requirements of a given job. Adequate coverage of the area to be treated and proper clearance from the work are two of the more important factors in coil design. It also is important to know what frequency to use as well as exactly how long to expose the work to that frequency. Those are problems for the induction heating engineer.

Through the interchangeability of coils, induction heat treating is adaptable to an

(*Please turn to Page* 136)

New MUREX WALL CHART

A helpful guide to selecting the right Electrode for the job

This new chart, just off the press, contains a complete list of Murex Electrodes divided into four groups for quick reference; mild steel, special steels, stainless steels and hard surfacing. Electrodes are described according to AWS-ASTM class. Color identification, recommended current strengths, polarity, and physical properties are also given. In addition, there are brief descriptions of the electrodes' general characteristics and applications.

The chart is 24" x 37", printed in four colors.

Copies will be sent free to those who request them on their company letterhead.

METAL & THERMIT CORPORATION
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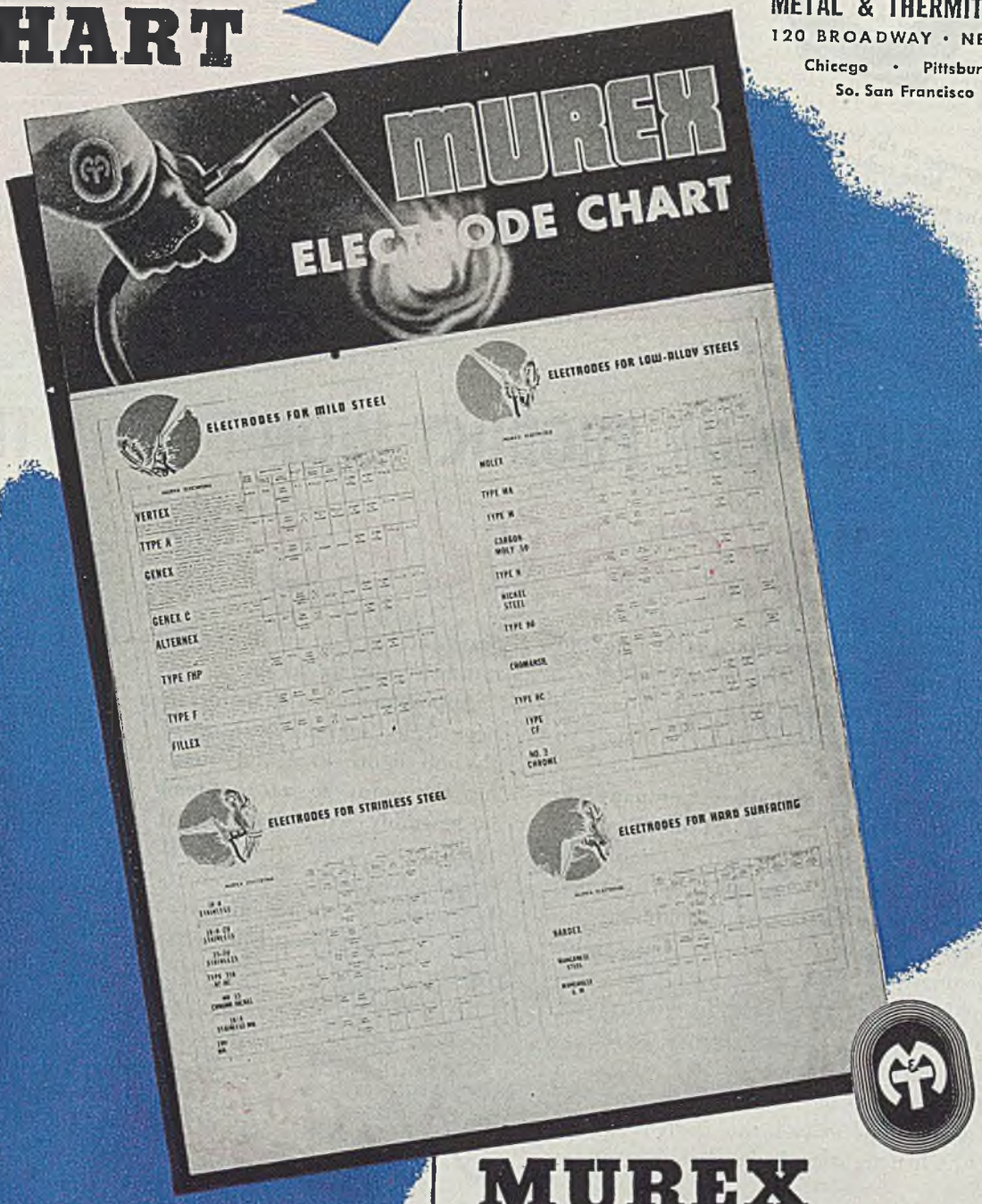
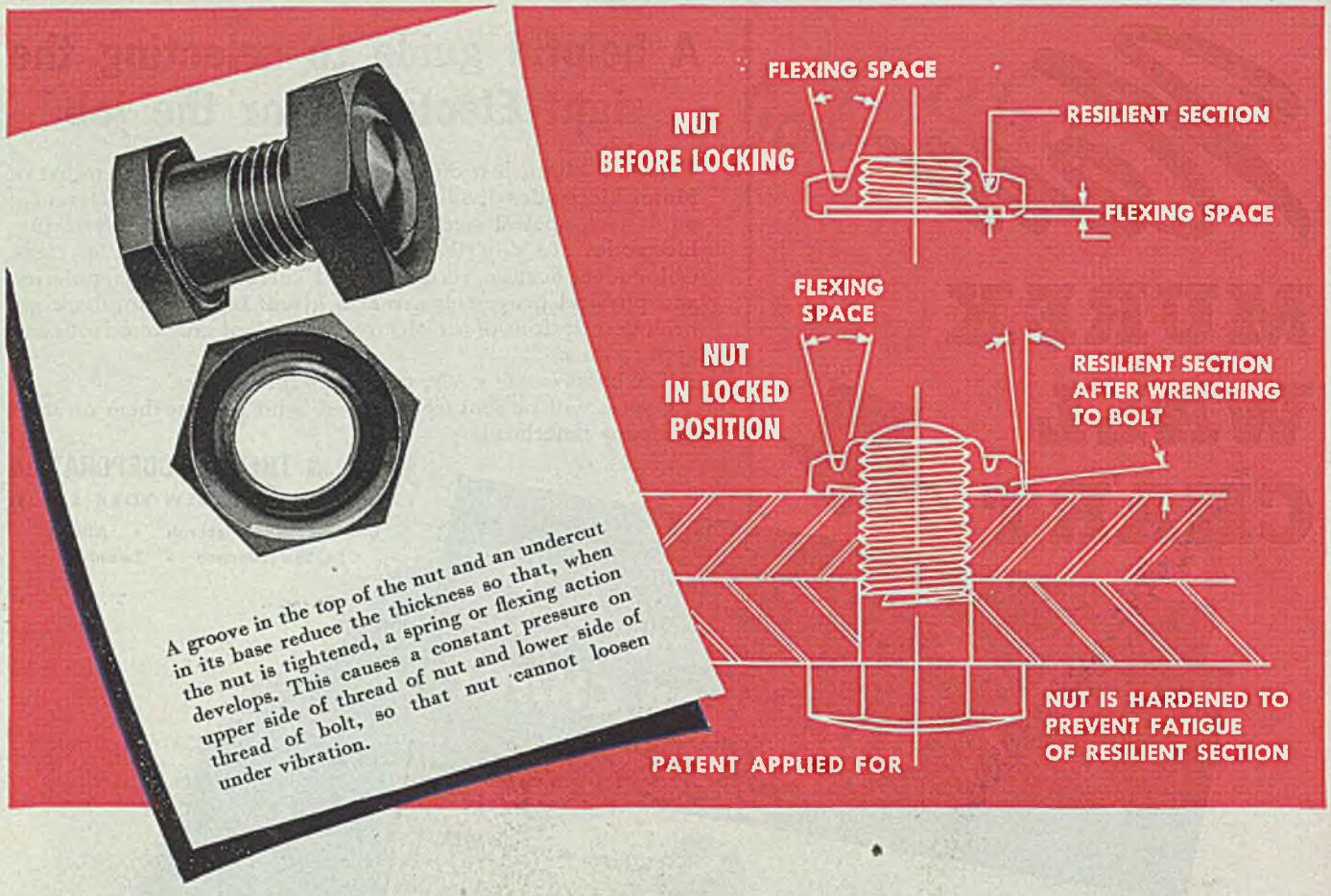


MUREX Electrodes



MAKE SURE *YOUR* PRODUCT WON'T HAVE THE "WOBBLES"

This is no ordinary bolt and nut. It is new and unique . . . a custom-made cure for the "wobbles". It illustrates how manufacturers are improving their products by consulting with National *on fasteners:*

The American Fork and Hoe Company, in redesigning their new line of "True Temper" products, needed a bolt and nut assembly for certain applications that would lock up tight, yet permit delicate adjustment for proper functioning of the tools, and be capable of easy disassembly for sharpening.

The nut had to be thin, light in weight, one-piece construction. Existing types of lock nuts were too cumbersome.

They put it up to us to find the answer. We designed a new type of lock nut (patent applied for) which, when tightened, develops a *spring* or *flexing* action that eliminates the possibility of the nut loosening in action.

Appearance was a factor, too. This was improved by making the top of the bolt slightly oval, and rounding the point so as to blend in assembly with the radii of the nut.

Let us diagnose *your* products for possible fastener improvement. It's often surprising what can be done.

National
HEADED AND THREADED PRODUCTS

THE NATIONAL SCREW & MFG. CO., CLEVELAND 4, O.

Hydraulic Press

Built for pressures up to 1000 pounds per square inch, the Hydro-squeeze gun, a portable 1½-ton capacity hydraulic press is announced by Hydraulic Machinery Inc., 12825 Ford road, Dearborn, Mich. Ball type switches are located on the unit to control a spring returned four-way valve. As long as both switch buttons are pressed, the valve solenoid is energized and oil under pressure is valved into the gun moving the ram through the working stroke of 1½ inch. When one or both buttons are released, the valve solenoid is de-energized and the ram starts the return stroke. The offset platen and ram are constructed to accommodate special adaptors for various operations, such as pressing bushings and pins, riveting, dimpling, etc.

A standard hydraulic power unit with pump, motor, tank and valves generates

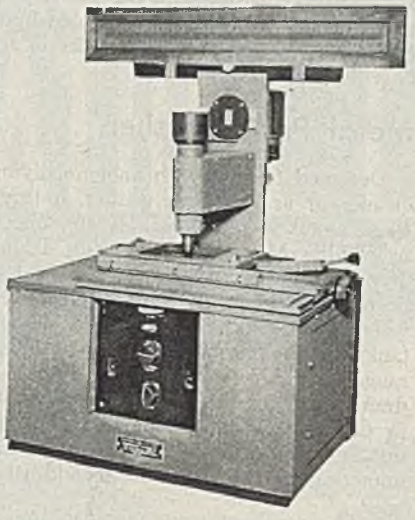
the hydraulic power for operation of the gun. Power units can be provided with sufficient capacity for powering numerous guns from a single unit. High pressure hydraulic hose connects the guns to the power unit.

Photometer

A new transmission photometer for measuring accurately the amount of light transmitted through very small areas of spectographic plates is announced by Special Products Division of General Electric Co., Schenectady, N. Y. It is for use wherever spectrographic analysis is employed, such as in the metal fields; also for microcolorimetric and microchemical analyses and for measuring light transmission through solutions.

Requiring a constant power supply of 6 volts, alternating or direct current, with an approximate capacity of 30 amperes, the photometer consists of a light source, an optical system, a galvanometer, a light-sensitive cell and a mechanical stage for accommodating the plate. The stage has a three-point ball bearing suspension and is movable in three directions. Control knobs are mounted on the front of the instrument to facilitate focal adjustment and control of the several diaphragms and filters in the optical system which govern the intensity of the light and heat reaching the light-sensitive cell and the plate.

When measuring the light transmitted through a plate, the plate is mounted on the mechanical stage and light from a 6-volt, 18-ampere projection lamp in the optical system is collected by a condenser lens and focused on a wide-aperture lens,



producing an image of the condenser lens on the plate. Magnified by an objective lens, this image is then cast upon a rectangular-shaped diaphragm located in front of the light-sensitive cell. The current output of the cell, which is the degree of light transmitted through the field of the plate, is shown on the galvanometer scale.

Rough and Finish Boring Unit

Snyder Tool & Engineering Co., 3400 East Lafayette, Detroit 7, announces a new machine for rough and finish boring truck axle housings. It is equipped with two guide-bar type, self-contained hydraulic units which provide both rotation and feed for the boring bars. The two fixtures are identical and each is equipped with adaptors for two different axle housings. These adaptors carry pilot bushings for the boring bars and the fixture end sections carry large bushings so that the tool is supported on both ends while going through the work.

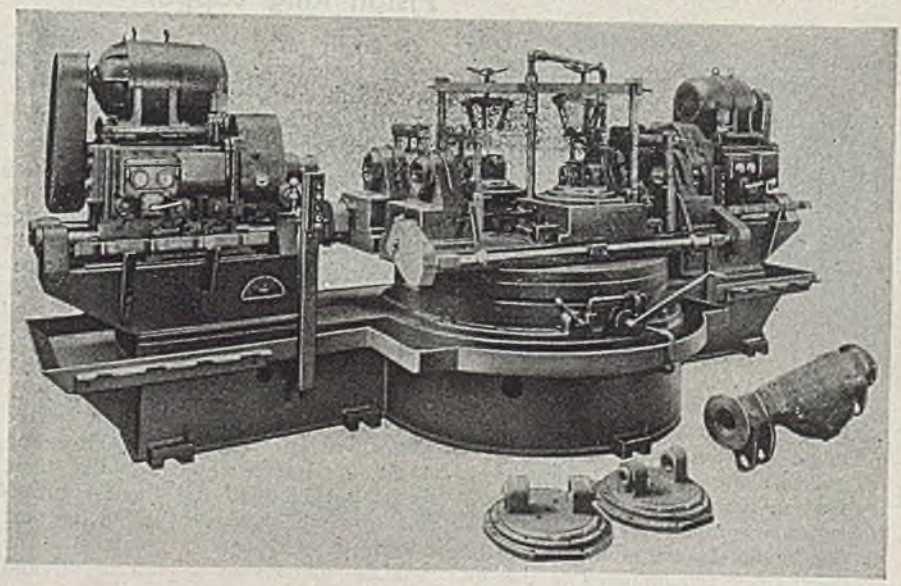
Fixtures are indexed manually on a clamp-type index table. The small handle in front actuates the index plungers while the longer handle actuates the cam shaft which elevates the table for indexing.

The part is clamped in the fixture at the center and at both ends and is moved end-wise to equalize stock removal from both ends. A horizontal shaft with set collars and pointers on the fixture is used in equalizing the stock. One part is bored in the working position while another part is being loaded in the front station or tools are being exchanged from rough boring bars to finishing bars. Electric push buttons are provided for each end of the machine so that either end may be operated independently while the other is being hooked up between driving head and tool.

Quenching Unit

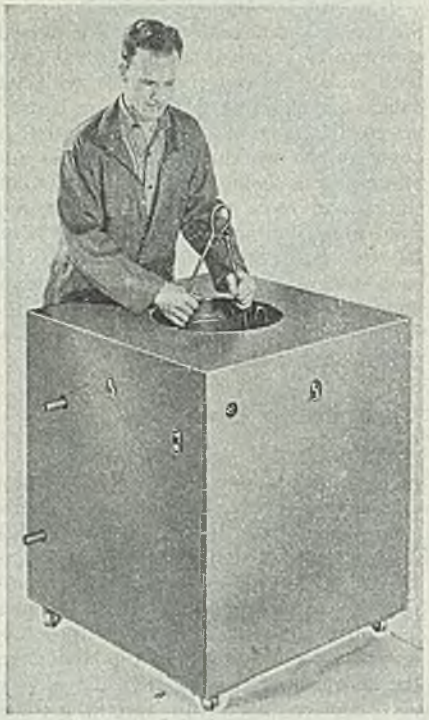
For controlled quenching where small pieces are heat treated, Bell & Gossett Co., Morton Grove, Ill., announces a new junior quencher. It has all the positive control features of the larger units. It is a completely self-contained unit, combining quench tank with cooler, strainer and all control equipment. With a turbulent velocity set up in the quencher, the heat is carried away from the surface of the piece sufficiently fast to prevent the formation of gas bubbles. Cooled, clean oil scrubs the entire surface throughout the quench period. No storage tank is necessary—enough liquid is contained in the system to handle the quenching volume required.

The quenching liquid is pumped into the quench tank through several openings around the lower perimeter. These opposing jets set up a uniformly turbulent flow from the bottom to the top of the tank, where the liquid spills over into the overflow chamber. As the liquid leaves the overflow chamber, it passes through the strainer, the pump and the cooler. The cooler consists of a copper



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

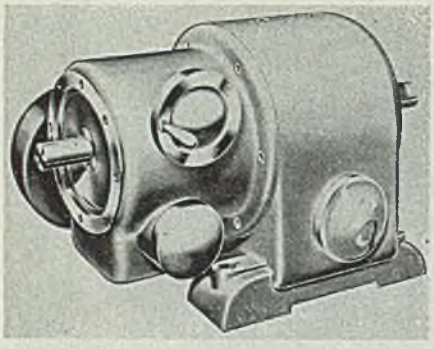
tube bundle in a steel shell and is cooled by city water flowing through the copper tubes. The temperature of the water is controlled by a thermostatic control which actuates a motorized valve installed in the water outlet. This motor-



ized valve is opened and closed to admit more or less water to the cooler as required. Quenching liquid temperature is thereby kept within a controlled range.

Variable Speed Drive

The new variable speed drive offered by Lombard Governor Corp., Ashland, Mass., features the transmission of power at different speed levels. Particularly adaptable because of its compact size and design to practically every type of variable speed transmission work, this new drive is used in the modernization



of present equipment as well as on new equipment.

Pumps, blowers, heavy stock conveyors and machinery power in the processing field are now using this type of power transmission equipment. Danger of tie-up due to the slipping of belts from the overhead drive is eliminated in this individually controlled drive. The complete unit with the motor has the size and appearance of two standard alternating current motors coupled together. Gears are totally enclosed and run in oil which reduces noise and possibility of dirt, grit and moisture getting into the gears. The unit uses the V-belt as a control medium only. Its lower gear action also offers finer hairline control.

Metal Parts Washer

Designed for use with an emulsifying cleaner or as an alkali washer, a three stage metal washing tank is announced by Phillips Mfg. Co., 3431 West Touhy avenue, Chicago 45. It consists of a heated solvent tank with two heated water rinse tanks. The heated solvent tank has a thermostatically controlled range from 135 to 250 degrees Fahr. A drain board conducts the solvent back to its tank. After immersion in the cleaning agent and draining, the parts are immersed in the first and second rinse

tanks, emerging free from oil and dirt. The water rinse is also heated with a controlled flow that keeps the temperature at approximately 180 degrees Fahr. The solvent tank is heated by strip heaters and the water rinse by immersion heaters. The walls of the heated tanks are insulated. Two safety covers hang at the side of the tank when not in use to protect the operator from contact with the tank.

Piston Ring Lapper

Formerly used only by the armed forces for aircraft engine overhauling, a piston ring lapper is now offered by C. Allen Fulmer Co., 1217 First National Bank building, Cincinnati. It eliminates guesswork in fitting piston rings, reduces "break-in" time and saves tearing down engines because rings do not seal properly. It handles all cylinder diameters encountered in aircraft engine service.

This piston ring lapper will lap full sets of rings into their cylinder barrels up to a maximum bore of 6⅜ inches. The machine has been engineered to give a half revolution of the spindle on a full outstroke, with no rotation on the return stroke. At each reciprocating cycle, the spindle "hunts" so that there is no possibility of the abrasive traveling over the same path during the next stroke of the lapping operation. The spindle operates in a bath of oil and carries a wiper seal to protect it against dirt and grit. Stroke setting stops can be set to give working strokes from 2 to 12 inches, and a reset counter tells

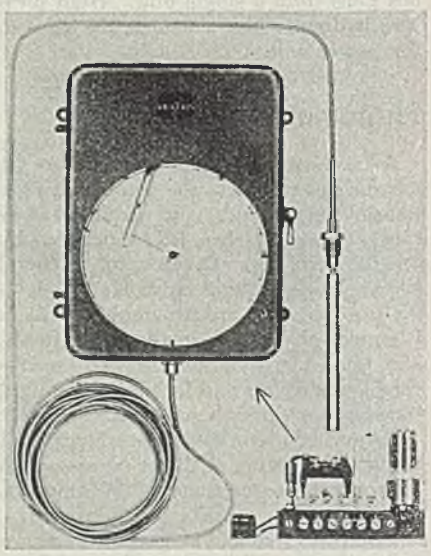
the operator the number of strokes for each operation.

Air operated, the machines are built for operation with air under pressure up to 100 pounds per square inch. They are mounted on a work bench. A hydraulically operated model is also available.

Electronic Controller

Known as Free-Vane, a new electronic type controller is announced by Bristol Co., Waterbury 91, Conn. The new line of controllers operates on the shielding effect of a vane passing between two coils in an electronic circuit. Recording and indicating models are offered for automatic control of temperature, pressure, liquid level and humidity. Low-open, high-open, low-high, low-open-high and low-normal-high types of control operation are available.

Controller for temperature is offered in ranges from minus 125 degrees Fahr. to plus 1000 degrees Fahr. for use in conjunction with motor and solenoid valves, relays, main line switches and other fuel

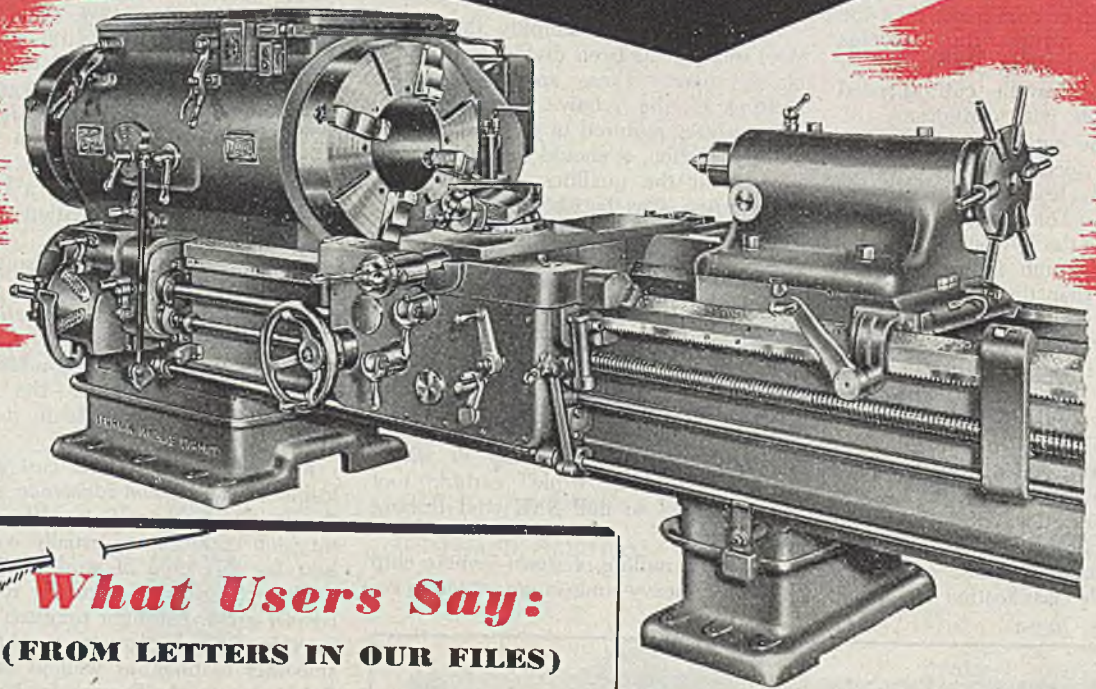


control apparatus for controlling the temperature in electric, oil, gas fired and steam heated ovens, dryers, dehydrators, oil baths, smoke houses, tanks, etc.

The pressure controller is obtainable in ranges from full vacuum to 6000 pounds per square inch and also for automatically controlling liquid level. The humidity controller operates from a wet and dry bulb type of element with separate control for each bulb. The controller is also a time program controller.

Do It BETTER!... on a HYDRATROL LATHE

Large Hollow Spindle Type



30" Heavy Duty Lathe with 13" Hole in Spindle

What Users Say:

(FROM LETTERS IN OUR FILES)

"For quite a few years we have had a large number of HYDRATROL LATHES (Large Hollow Spindle Type) in our shops here. The men working on these machines appreciate the ease of speed control afforded."

• • •

"HYDRATROL LATHES have been entirely satisfactory for turning high-strength forged tubes in record time."

LOOK around your own shop—you may find a number of machining jobs which could possibly be done *better* on a Large Hollow Spindle Type of HYDRATROL LATHE. Send us prints of these unusual, difficult, or too-costly machining jobs, for a time-and-money-saving recommendation.

Five Sizes-18" to 36"

Small . . . . . 18" up to 7 1/4" Hole
Medium . . . . . 24" up to 12" Hole
Large . . . . . 27" up to 13" Hole
Large . . . . . 30" up to 14" Hole
Large . . . . . 36" up to 16 1/2" Hole

(Standard type lathes, 16" to 36")

Lehmann **MACHINE CO.**

CHOUTEAU AT GRAND ★ SAINT LOUIS 3, MISSOURI

Selecting Carbides

(*Concluded from Page 85*)

the chatter and high frequency vibrations in the cutter drive resulting from changes in the load as the individual teeth of the cutter enter and leave the cut. This factor is doubly important with carbides, since carbide cutters usually have fewer teeth than cutters made from other cutting materials and load changes are thus more pronounced. Furthermore, vibration and chatter are more injurious to any grade of carbide than they are to the softer cutting materials.

The second major advantage of flywheels is that they help maintain a more constant cutting speed through the length of the cut. If the cut is particularly heavy in just one or two spots, then the flywheel effect carries the machine through without stalling the motor or slowing it down below the cutting speed which is desirable with carbides.

The higher the cutting speed the less important is the need for damping action and consequently less weight is needed in the flywheel. The lower the cutting speed, the larger the flywheel should be. A good rule-of-thumb is to make the flywheel bigger than the cutter, and also larger than the largest gear on the main spindle of the milling machine. Putting a lot of beef into the cutter body is also a decided help in smoothing out the cutting action because this produces an added flywheel effect.

Grade Selection: An attempt has been made to list in the chart (see Fig. 1) the major classifications of milling jobs as they affect grade selection. The qualities required in the specific carbide to be used in each classification are given, as well as the *type* of carbide best meeting those requirements. To simplify cross-reference by the user, the corresponding grade number of carbide as manufactured by Carboloy Co., is also included.

It is quite possible, of course, to think of conditions under which a different grade of carbide than the one suggested in a given classification on the chart would improve a particular job. Any chart of this kind has a natural tendency toward over-simplification. However, the user cannot go far wrong by *starting* with the suggested grade—providing other requirements have been met—and then changing if necessary to another grade if experiences on the job itself should indicate desirability of greater emphasis on some other carbide "quality".

Steel Milling: To simplify the chart, steel milling has been divided into three classifications. These are based on a shifting of the relative importance in the qualities required in the carbide. In this connection, it should be particularly noted that the qualities as given here are *relative*— as between *grade of carbides*. All carbides, regardless of the grade for instance, are more *wear* and *abrasion* resistant than are other metals commonly employed for cutting tools. Simple tungsten carbides, however, are *more* wear resistant than are the tungsten-titanium-tantalum carbides; while the "triple" carbides, in general, are *tougher* than the straight tungsten carbides. Fig. 2 shows a fly cutter setup in which slightly reground "triple" carbide tool bits are used to mill SAE stud turning tool shanks.

In rough milling of steels—where chip loading is heavy—maximum cratering resistance (as provided by carbide grades of the 78B type) is usually of primary importance. Toughness, wear resistance, and edge strength under impact loading —in that order of relative importance— are also required characteristics of the carbide suitable for such work.

In finish milling, if the cuts or feeds have to be light, a straight tungsten carbide is suggested. Reason is that the cutting edge has to resist more abrasion under such conditions than is encountered where heavier cuts or feeds are possible.

For heavier finishing cuts, option of two grades of carbide are suggested. In general, if the job comes closer to "rough milling", a grade equivalent to 78B will be more likely to produce best results.

Milling Cast and Malleable Irons: On this chart, cast and malleable irons have been divided into two groups since many of the present day irons approach steel in their machining characteristics. The so-called "steel cutting" grades of carbides frequently give better results on the latter type of irons than do the straight "iron cutting" grades. It will be noted that there is quite a similarity here to the recommendations for the finish milling of steels.

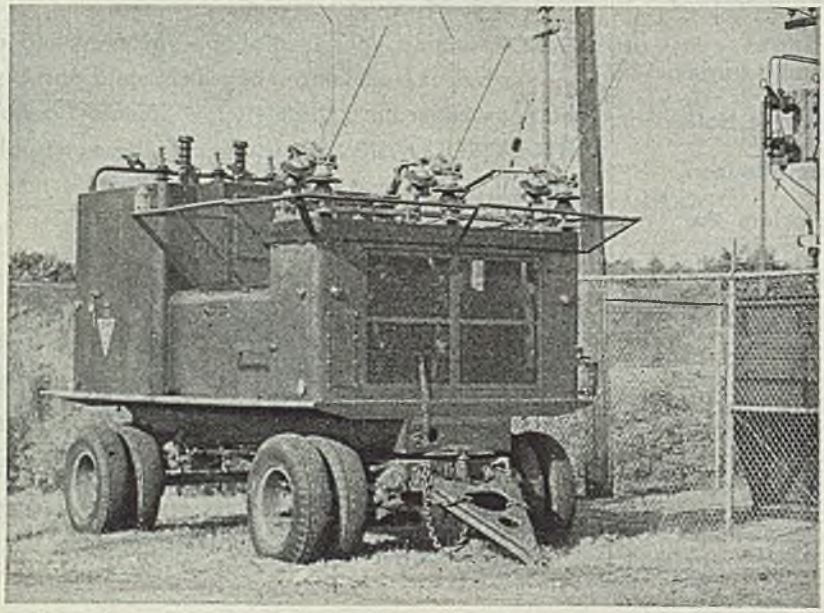
In this group of irons are also included those irons with hard spots or hard sections, inasmuch as such sections frequently control the selection of the carbide grade by making *toughness*—rather than *abrasion resistance*—the limiting factor as regards tool life in machining the work.

For milling the simpler cast and malleable irons, *abrasion resistance* is usually the limiting factor as to tool life. Straight tungsten carbides are usually considered best for this type of work. Where the work sections are particularly rough, the coarser grained straight tungsten carbides provide somewhat greater toughness. On smoother castings, as well as for taking finishing cuts, the finer grained grades of straight tungsten carbides will usually give longer tool life and will also be found to give a flatter finish.

Aluminum Alloys: For most aluminum milling, fine grained straight tungsten carbides usually work out best. Such carbides provide the ability to take and retain an extremely keen edge—a primary consideration in machining aluminum—while providing a high degree of resistance to the abrasion caused by the aluminum oxides and other abrasive materials included in many of the aluminum alloys.

In some types of aluminum milling operations — such as form milling — trouble may be experienced with the formation of a built-up edge on the tool. Here, the addition of a slight amount of tantalum to the carbide has been found to be of help.

Other Materials: On other nonferrous metals and also on nonmetallic materials, a fine grained straight tungsten carbide usually gives the best results inasmuch as in most of these materials the most important carbide qualities called for are the ability to resist abrasion and wear and the ability to take and maintain a keen cutting edge.



PORTABLE SUBSTATION: Used for transformation, switching load indication and circuit protection usually handled by outdoor substations, a Westinghouse unit on wheels can be attached to a truck and rushed to repair sites in emergencies. It is rated at 1500 kilovolt-amperes, and 23,000 volts. Flexibility is afforded by low voltage ratings of 2400, 4800, and 7200 volts

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1. GIANT STEAM HAMMERS

35000 lb. hammers striking 80,000,000 lb. blows, 50 strokes per minute, are the largest hammers in America. Complete range from 2000 lbs. to 35,000 lbs.

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Producing inestimable pressure forges the most intricate contours on a complete range from 4" size to the massive 9" units, the largest in America.

3. HUGE MECHANICAL PRESSES

The most powerful forging presses providing the greatest possible utility and production. Accommodating medium and heavy work.

YOUR requirements can best be processed in a plant having a full range of modern forging-heat treating & machining equipment, under metallurgical control.

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CHICAGO — 2400 W. MADISON.
MINNEAPOLIS — 216 HODGSON BLDG.
SEATTLE—1600 28th AVE. W.
MILWAUKEE — 759 MILWAUKEE ST.

Deep Fillet Welding

(*Concluded from Page* 88)

the electrodes necessary are not always available.

If it is desired to use deep fillet procedure with one particular type of electrode, the closed circuit amperage may be selected for the particular electrode involved and the results should prove satisfactory. Amperages should be determined by a clip-on type ammeter rather than by trying to obtain readings by machine settings. Machine settings have been found to be inaccurate due to varying input line voltages and depreciation of the machine through use.

It will be seen from the tables that the deep fillet procedure may be used with any AWS E-6020-30 type electrode to produce satisfactory results. In general, E-6020 type electrodes are preferred for nonpositioned, or horizontal fillets, and E-6030 for positioned, or flat fillets. Tables IV, V, VI and VII cover both positioned and nonpositioned applications.

Table III gives a further check by measuring inches of weld deposited with proper current setting and recommended speed, but leaving a 2-inch stub. Data are presented for horizontal as well as flat position.

Summary of Procedure

Deep fillet procedure may be summed up by stating that fillets may be produced by this method having predetermined minimum strength, by an exact easy method with less experienced operators, and with less fatigue. It is an invaluable aid to experienced operators and tends to bring general production up to a most satisfactory level. It may be used for 1-pass welding of butt plates with no edge preparation on thicknesses up to ⅜-inch and for 1-pass welding of pipe with no edge preparation and wall thickness up to ⅜-inch and 12-inch diameter. There is less distortion with the deep fillet procedure described in this article than with conventional, and the treval speed is 200 per cent greater.

Test Clamps Suited for Heavy Duty Service

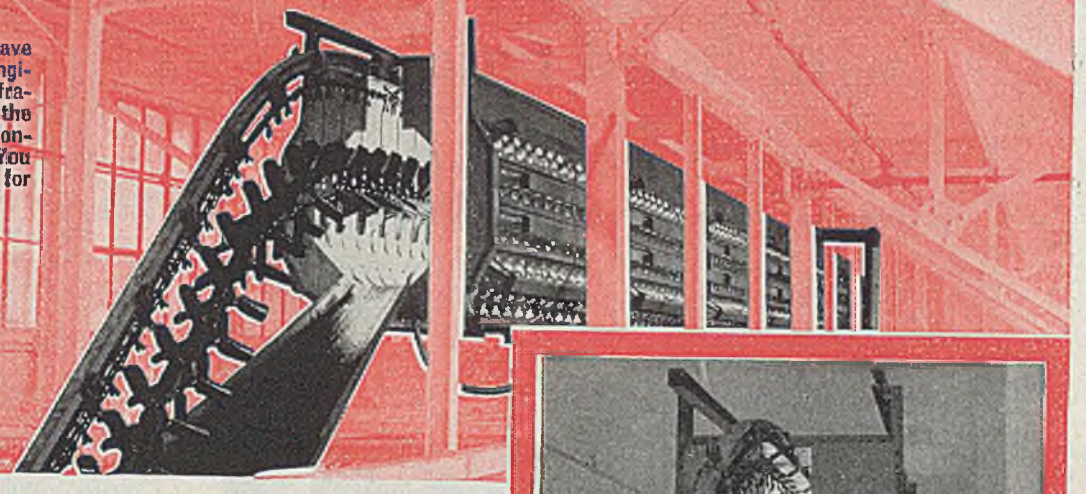
A new bulletin describes heavy duty test clamps used for making heavy duty temporary connections, for meter and motor testing, jumpers, battery charging, cable and bus-bar taps, welding, and many other shop and laboratory purposes. A twist of the large finger-tip safety knob exerts a great deal of pressure, accounting for large carrying capacity on both constant and intermittent duty. This pressure also prevents clamp from slipping once it is attached. The lugs are of generous size and arranged to swivel around the clamp, permitting wires of cables to hang in a natural position after installation.

Bulletin No. 7, superseding bulletin No. 6, is available from Trico Fuse Mfg. Co., Milwaukee 12.

ANOTHER C M. HALL *PRODUCTIONEERED* RADIA R OVEN APPLICATION

When This *Infra-Red RADIAIR Oven Went UP Fan Finishing Costs Came DOWN

*Hall RADIAIR OVENS have always incorporated an engineering combination of infra-red radiant energy and the controlled movement of convected heated air. Result: You get the most BTU value for your heating dollar.



$2880 SAVINGS A MONTH IN FLOOR SPACE ALONE MORE THAN PAID ITS WAY

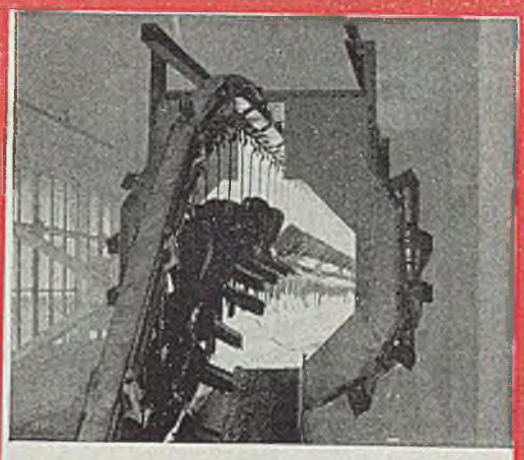
Military jeep, truck and tank production moves along at a fast clip when a contractor like Hayes Industries, Inc., produces 33 vitally needed assemblies every 60 seconds.

Maintaining ahead-of-schedule delivery calls for the finest kind of production planning. When a gas-fired "A" type oven recently loomed up as a potential production bottleneck and fire hazard, Hayes, as might be expected gave infra-red the green light. Because the C. M. Hall RADIAIR oven shown above was designed and applied as a precision production tool—a part of Hayes' in-line production process, maximum time and money saving advantages were realized from the beginning.

The Hayes' oven is typical of many unique applications made by Hall during the last four years. Meeting almost every type of war production heating requirement has brought this necessary process right into the production line . . . has carried the science of infra-red heating to a new high.

If you are concerned with low temperature preheating, dehydrating, drying or baking—keep up to date on Hall's *productioneered* applications of infra-red . . . they will be vital to industry after the war.

Send for "Infra-Red at Work." *It describes the many practical applications of this new production heating process. Learn what infra-red has to offer you. If you want fast action, just ask for a C. M. Hall representative. He'll respond promptly—and competently.*



EVERY MINUTE COUNTS!

IN ONE MINUTE 33 FANS (COUNT 'EM

PASS THROUGH THIS RADIAIR OVEN TO EQUIP MILITARY JEEP, TRUCK AND TANK ENGINES.

That's Production, with a capital "P"

PROBLEM: Former fan finishing method meant keeping 1000 gallon tank of inflammable enamel close to gas-fired oven which baked 1000 fans per hour. Problem called for increased production and elimination of fire hazard.

SOLUTION: RADIAIR OVEN was designed as part of in-line production system. Fans now go from degreaser up to ceiling where they are dipped in 400 gallon paint tank and pass through 54 ft. RADIAIR OVEN. Fans then move in cooling cycle direct to boxing department.

ADVANTAGES: Suspending RADIAIR OVEN and dipping tank alone SAVED $2880 A MONTH in vitally needed floor space and eliminated fire hazard. PRODUCTION WAS DOUBLED with capacity to spare. One man instead of three now handles conveyor line. Instant infra-red baking ELIMINATED REJECTS AND REWORK due to paint drip on fan blades. PRODUCTION COSTS CUT 17% or approximately 3c per fan. 'Nuff said—the record speaks for itself and Hall's *productioneered* method of infra-red radiant heating.

C·M·HALL Lamp Company

PIONEER DESIGNERS AND BUILDERS OF INFRA-RED RADIANT HEATING EQUIPMENT

1005 EAST HANCOCK ST. DETROIT 7, MICHIGAN

Pneumatic Power

(*Concluded from Page* 90)

tached, the return stroke of the mechanism being spring actuated. An outstanding feature of this device is its ability to operate without damage to the mechanism in case the shear is overloaded, or when cutting edges become dull.

An interesting arrangement (Fig. 4) involves the use of compressed air pumps. Two air operated pump units are employed in this case for hydrostatic testing of pressure-tight vessels. In utilizing air for this work, as compared to other conventional methods, simplicity and efficiency are combined and added safety is gained. By accurately regulating the air input, pressures of from 60 to 600 pounds can be maintained for any specified time test.

Tin Smelting Plant Produces Superior Product

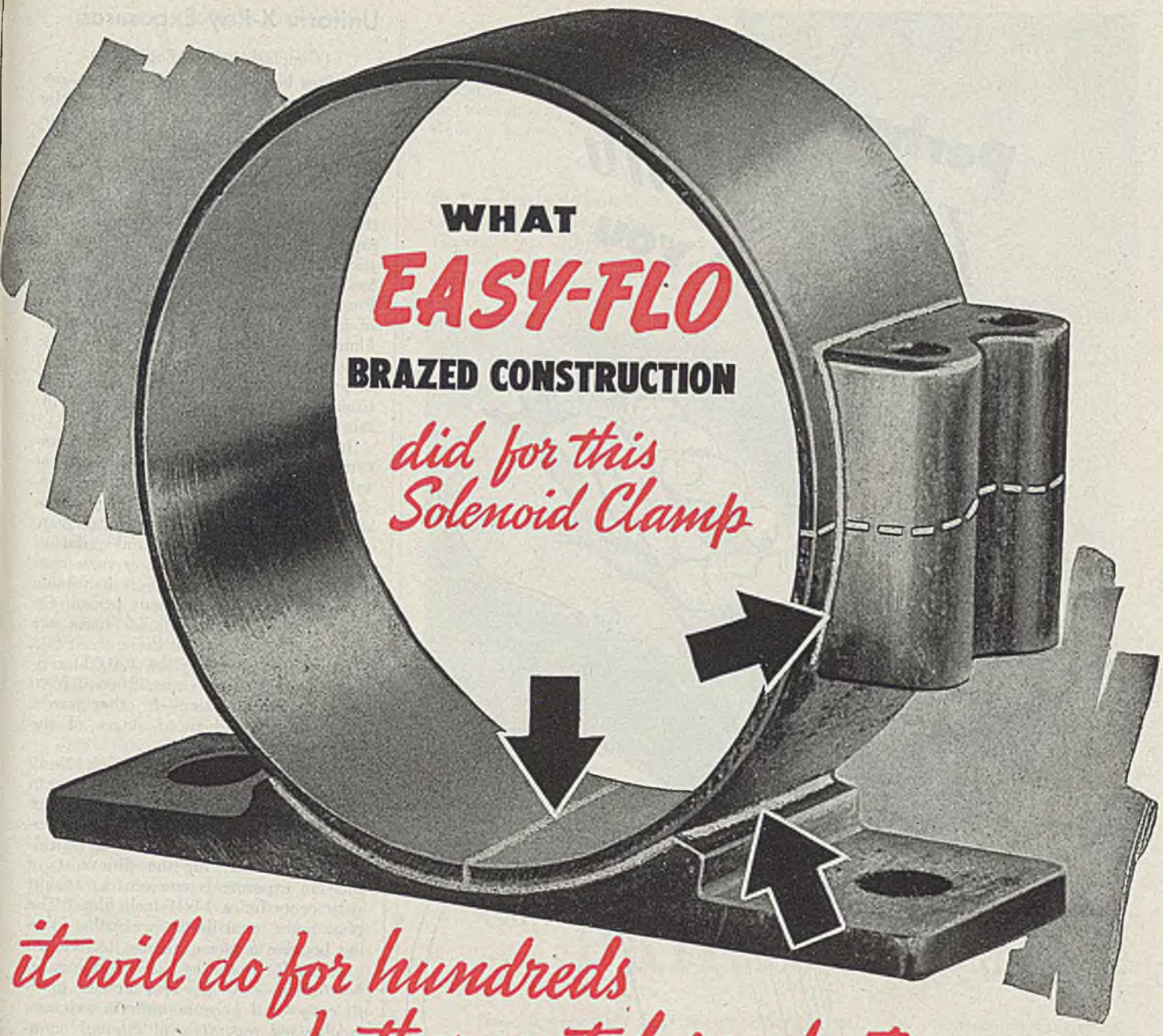
Tin smelting, from 1923 to 1940, was not industrially important in the United States. When it became apparent that we might be cut off from our regular sources of supply, however, plans were formulated for the construction of a government-owned tin smelter. It was located, after due consideration, at Texas City, Texas. Construction began in October, 1941, under the supervision of the Tin Processing Corp. Actual smelting operations began in April, 1942.

An annual capacity of 18,000 tons of fine tin to be produced from Bolivian ores was called for in the original plans, according to *Metal Progress* for December, 1944°. Later, the smelter was enlarged to a capacity of 52,000 tons of tin per year—30,000 tons to be produced from Bolivian ores and 22,000 tons from high grade alluvial ores. During the latter part of 1942 further extensions were authorized. Today the capacity of this plant is between 70,000 and 90,000 tons per year, depending upon the grade of ore available. Operations are not expected to reach full capacity, which was planned to be capable of smelting the entire United Nations supply of concentrates in the eventuality that the British smelters, formerly the chief refiners of this ore, would be destroyed by bombing.

Current annual production from this smelter is just over 30,000 long tons per year. This is approximately equal to the new supply of concentrate now available. In the first year of operation, between April and December, 1942, 15,695 long tons were produced. Production in 1943 was 20,727 long tons, and for the first six months of 1944 totaled 14,534 tons.

Major portion of tin produced is of grade A specification, but several other grades also are produced. In the first six months of 1944 about 90 per cent of production at this smelter was of highest grade however.

°In an article on "American Tin Supplies and Wartime Consumption" by Erwin Vogelsang, Director, Lead & Zinc Division, War Production Board.



it will do for hundreds of other metal products

This clamp is used on a 37 mm gun. It was formerly machined from a steel casting. Now, they simply roll a piece of sheet steel into a ring, clamp the two steel fittings to it, with cut-to-fit EASY-FLO strips **preplaced** between, and with a few minutes of heating by a torch, the job is done. The result, after cutting at the dotted line, is a clamp fully as strong as the former casting and fully as capable of taking the jarring shocks of gun firing. But here's the big point—it is **produced with substantial savings in metal, labor and cost.**

Equally profitable results have been obtained on a wide variety of other parts and products by changing to EASY-FLO brazed construction—and it is highly probable that some of the parts you are now producing by other means can be made better, faster and more economically with EASY-FLO brazing.

Bulletin 12-A will give you full EASY-FLO details. Write for your copy today.

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Agents in Principal Cities

Uniform X-Ray Exposures

(*Concluded from Page* 100)

tube fires before the rating of the X-ray tube is exceeded. The buzzer warns the operator that the safety timer has had to open the contactors and that the film is unexposed or under-exposed.

Application of the Timer: Two factors account for the initial development of the phototimer for chest photofluorography: (1) the importance of mass chest surveys in controlling civilian tuberculosis and (2) the demands of the Armed Forces in examining the large numbers of inducted men. The use of miniature films in rolls had already expedited mass surveys whether civilian or military, and only an automatic and rapid method of timing exposures was required to facilitate this type of analysis.

In spite of medical advances in recent years and in spite of the fact that tuberculosis is curable in all but advanced stages, the disease still presents a formidable problem from a civilian, a military, and an industrial point of view. The mortality rate is now constant although the disease is increasing as a result of this strenuous period. On the average, about 120,000 cases are discovered each year; of these about 60,000 are fatal because the 120,000 represents patients who are ill enough to seek medical attention—in other words, they represent advanced stages of the disease.

Since the cost of 14x17-inch X-ray film is a limiting economical factor in its mass use, a method which decreases cost was valuable. The use of miniature films on rolls represents a considerable economy, for the film cost of such an exposure is one cent as against sixty cents for a 14x17-inch film. The phototimer contributes a further saving because *a given crew of technicians can handle twice as many subjects as heretofore—a* 100 *per cent increase in efficiency—and because uniform exposure is obtained regardless of internal variations, eliminating repetitions.*

The industrial application of the electronic timer is expected to be extremely effective for these reasons. Whether similar objects are moving rapidly on a conveyor or whether a variety of irregular objects must be X-rayed, the electronic timer will provide uniform exposures quickly and efficiently.

Resistors Feature Humidity Protection

Standard wire wound resistors featuring a high degree of humidity protection, and provided with a glazed ceramic outer shell and new type of end seal, are described in a new catalogue by Resistor Division, Sprague Electric Co., North Adams, Mass. New construction is indicated by addition of the letter "T" to old designations. Standard types are said to be adaptable to any climatic condition, eliminating the need for special type and coating selections to meet different applications.

High-Temperature Solders

(*Continued from Page* 105)

served in using silver solder in a suitable crucible. This test temperature was about 1275 to 1300 degrees Fahr.

Analysis and Comment: Analyzing Curves 1, 2 and 3, it is apparent that the greatest rate of change in destruction time with temperature change occurs in the range of approximately 550 to 750 degrees Fahr., for 60/40 and 40/60 solders, and 650 to 950 degrees Fahr. for pure lead. However, this is compensated for by several factors. The time required for tin dipping is short, a matter of seconds, compared with the destruction time, especially at the lower temperatures. The nearer to the melting or liquid point of the solder that this tin dipping is performed, the better, because the above-mentioned time spread is greater. Incidentally, a pure lead solder joint is not strong mechanically; some tin appears to be beneficial to the bond strength.

No attempt was made in the Fairchild investigation to determine an optimum tin/lead ratio.

All curves clearly demonstrate that temperature increase has a tremendously non-beneficial effect upon the destruction time. An unfortunate but important outcome of this analysis is that, for a given set of conditions, wire life decreases materially with decrease in wire size (diameter).

This destruction of the copper is believed to be an alloying away or driving into solution of the copper largely by the tin in the solder and to a smaller degree by the lead. Melting points of these three metals are: Copper, 1981 degrees Fahr.; tin, 450 degrees Fahr.; lead, 621 degrees Fahr. Alloying two metals of different melting points will result in a mixture with a lower melting point than either constituent metal possesses alone. Although the melting point of the copper is high, it is believed that the presence of the two other molten metals causes the copper to be dissolved into the tin/lead alloy by this action. In effect, the molten solder is the solvent.

The second detrimental condition of wire embrittlement at high temperatures has been observed. Photo-micrographic analysis of longitudinal sections of untinned and tinned wires shows a surface to subsurface coarsening of the copper crystals in 1050 degrees Fahr. solder dipped wire. This zone does not penetrate to a great depth.

Also, a new constituent of possibly a copper-tin alloy is to be found between the solder and copper zones in the 1050 degrees Fahr. wire. This new constituent generally is hard and probably is a contributing factor to fatigue failure of wire. This condition has not been found extensively at Fairchild Camera & Instrument, and then only in a secondary sense.

Conclusions: A review of this data leads to three major conclusions:

—The life and diameter of any small to fine size copper wire in any solder is decreased with increasing molten solder temperatures.

—The higher the tin content of tin/lead

solder, the shorter is the life of a given wire in that solder for any given solder temperature. Unfortunately, hwever, an all-lead solder results in a considerably weaker solder joint than tin/lead solders.

—For a given solder composition and solder temperature, the finer the wire size (diameter) the shorter is the wire life in the solder.

Further conclusions to the tests on suitable solder are:

The all-around best solder of those tested appears to be the 40/60 combination, commonly referred to as soft solder. Other solders in this vicinity may offer even better properties. For certain other purposes, regardless of these findings, hard, or 60/40 solder may be best suited to the job.

Some form of wire weakening or loss of tensile strength, broadly classified as embrittlement, may be imparted to copper wire from tin/lead solders in the 1000 degrees Fahr. temperature range.

On the basis of these facts only, it is apparent that a low solder temperature should be used for tinning and making joints on wire sizes finer than approximately No. 30-32. Preferably, these solder temperatures should be kept either within 150 to 200 degrees Fahr. above the melting or liquid point of the solder used, or under 600 degrees Fahr. For Formex or Formvar coated wires, a low temperature insulation stripping method other than the hot tin dip method now becomes necessary. Other methods, involving high temperatures, such as the gas flame method, tend to introduce wire embrittlement and copper oxidation, and are no better.

In Summary: For the safety of the wire lead being stripped, the production assembly schedule, or the final assembled piece of precision equipment—electric motor or other appliance—it is important that the fine sizes (No. 34-46) of synthetic coated wire be stripped, tinned and joined or solder at temperatures at or under 600 degrees Fahr.

Handbook Considers Industrial Production

A 1700-page volumne, "Production Handbook," covers 25 subjects, among which are: Plant personnel and industrial relations, plant organization, production planning and control, purchasing, inspection, motion study, job estimating, machinery, and plant layout. This book, started in 1940 by L. P. Alford, late professor and chairman of the Department of Administrative Engineering of New York University, was interrupted by his death in 1942. John R. Bangs, general manager of industrial and personnel relations for Edward G. Budd Mfg. Co., undertook to complete the work in 1943. A board of more than 90 contributing and consulting editors which assisted in compiling this work included many leading authorities on industrial and production problems in the country.

This book is available from the Ronald Press Co.

Cutting Gears

(*Concluded from Page* 112)

and resumption of productivity by the machine.

First sizes of this machine to be made available by the company is the 1843, capable of handling gears up to 4 inches in diameter and 2 inches face width. This covers the range of most widely needed gears at present.

Shoulder gears can be handled easily on the machine, as its action in this respect is similar to that of a shaper cutter. Helical gears as well as spur gears can be cut on the gear shaper.

The builder of this machine believes that it represents the simplest method yet involved, regardless of speed, for rough and semi-finish cutting of involute splines.

Among advantages claimed for this design are extreme safety of operation and exceptional rigidity. Fig. 4 gives an idea of the unusual amount of strength provided. Deflections are minimized by virtue of the fact that cutting loads are completely balanced.

Special provision has been made for rapid chip clearance from the work in view of the tremendously high rate of metal removal possible. Cutting fluid supply is located in the base of the machine and is used under relatively high pressure to wash away the chips from the work.

Unusual care has been taken to provide accessibility throughout the machine for making adjustments or repairs. All control circuits, hydraulic or electric, are easily accessible. Openings in the machine base and column are of generous size to facilitate any necessary adjustments in the interior mechanism that may be required.

Ultraviolet Disinfection

A new ultraviolet germicidal unit for air disinfection employs a germicidal tube to project intensified ultraviolet rays across living or working areas above eye level. A reflector provides optimum intensity and diffusion of rays that are lethal to airborne bacteria. The unit may be recessed into the wall, suspended from the wall or ceiling.

More than 85 per cent of the ultraviolet energy output of this unit is of germicidal wave length (2537 angstroms), assisting industry to combat absenteeism caused by cross infection, according to American Sterilizer Co., Erie, Pa. This model is distributed by Graybar Electric Co. and General Electric Supply Corp.

Iron Well Casing

Over 500,000 gallons of water a day flow from an artesian well drilled at Sturgeon Bay, Wis., which is 313 feet deep and required 78 feet of wrought iron casing, 104 feet of drill pipe, and fill-in of 11,000 pounds of sand and 105 sacks of cement, according to A. M. Byers Co.

Induction Heating

(*Concluded from Page* 120)

extremely wide variety of work. As a matter of fact, the types of jobs which can be handled by the induction method are practically limitless. Parts can be given overall or localized treatment. Extremely close tolerances in area covered or in depth of penetration can be obtained through design of the coil and application of the current.

A recent example, for instance, was a job in which overall heat treatment of a small firing pin was followed by an assignment that called for hardening the teeth of a gear 6 inches in diameter. The coil used in the firing pin operation had an I.D. of approximately ½-inch and its windings extended about 3 inches, giving full coverage when the pin was inserted for treatment.

Immediately after the firing pin operation was completed the coil employed in the operation was removed and another coil, especially constructed to handle the gear job, was substituted for it. That coil consisted of a one turn copper inductor forming a ring having an I.D. of about 6⅛ inches. Whereas the firing pin job required overall heat treating, the gear job called for hardening only the teeth of the part, to a penetration of only 1/32-inch.

Design Is Standardized

Despite the wide differences in size and shape between the two parts and the altogether different treatment required, both jobs were carried out with the same basic equipment, the only change being the substitution of one coil for another.

Generally speaking, the standardization of coil design to allow the use of a single type is not practical and cannot be expected to produce the most efficient results. There are too many variations, too wide a difference in specified treatment, to allow much compromise on that point. On rare occasions, however, where the heat treating process is not a critical operation, a coil designed to heat treat one type of work has been used successfully to heat treat another.

For example, a certain manufacturer recently required heat treatment of a 2-inch bearing surface near the center of a shaft which was 12 inches long and 1 inch in diameter. The coil designed for that operation had an inside diameter of 1/16 inches and the windings extended 2 inches. A suitable work holding fixture was built which lowered the shaft through the coil to a point where the coil covered the exact area to be hardened. Rockwell tests showed the bearing surface could be hardened to the point specified in 10 seconds of exposure time.

Subsequently, the same customer specified heat treatment of the entire area of a smaller part, 2 inches long and approximately ¾-inch in diameter. The small part, of course, was of a size that permitted use of the same coil used to treat the larger shaft. Although the clearance between the work and the coil windings was more than it would have been had the coil been designed expressly for the small part, the hardening was accomplished successfully by extending the time cycle to 20 seconds.

Coils do not wear out and so long as they escape damage such as flattening, distortion of shape for coolant leaks there is no limit to the number of times they may be used.

There is one erroneous impression having to do with induction heat treating that urgently needs correction. Too many engineers and production men have the idea that induction heat treating is limited to surface applications. This is not true. The fact is that induction heat treating, while eminently fitted to jobs requiring localized hardening or close control of penetration, also is able to handle any heat treating task requiring *complete* through-and-through hardening.

Portable Brazing Unit Is Self-Contained

Brazing is an old but still not too generally used method of joining members of copper, brass, bronze, or various alloys. One handicap has been the lack of brazing apparatus that can be readily taken to the job, as in shipyards, railroad shops, etc. For the production lines of factories, the well-developed brazing furnaces are in much demand but there has been a need for portable units for joining wire cables, strap connectors, pipe, etc. This need is met by a self-contained unit of brazing sets that require only a connection to a 220-volt power source. These sets consist essentially of a transformer for providing high currents at low voltage, suitable voltage selectors, controls, and carbon-tipped tongs that can be clamped over the pieces to be joined. The high currents flowing through the carbons bring them to incandescence, quickly bringing the material to brazing temperatures, which are from 1200 to 1500 degrees Fahr.

Three sizes, 5, 10, and 20 kilovolt-amperes, comprise this group of mobile brazing elements. The 5- and the 10-kilovolt-ampere units are air-cooled. The 20-kilovolt-ampere unit is fan-cooled and has a self-contained water cooling and recirculating system used to cool the brazing cables and tongs. This cooling system permits the use of a small-size portable unit for medium brazing work. The smallest unit weighs but 30 pounds, the middle-size one, 100 pounds, and the 20 kilovolt-ampere, 250 pounds. The corresponding secondary currents are 625, 833, and 1667 amperes.

Film On Ball Bearings

A film entitled "Quality in the Making," illustrating manufacturing processes of New Departure ball bearings, approximately 20 minutes long, is available without charge to plant groups, engineering societies, and engineering colleges. Requests should be sent to the Advertising Dept., New Departure Div., General Motors Corp., Bristol, Conn.

Metalworking Trends

(*Concluded from Page* 83)

into "head-on" sooner or later right in their own shops.

Lest the reader be left with the idea that every engineer today has his eye glued to a microscope, that none ever contemplates the "long view through a telescope," let me quote the following words spoken by Robert M. Gates as he turned the presidency of ASME over to Alex D. Bailey:—"Engineers have developed for industry almost unlimited capacity to produce. Industry, however, has not yet found adequate ways to move mass of actual production—much less of potential production—continuously and economically to consumers.

"The productivity we create demands open channels for distribution. Surely engineering technique need to be applied there. Our obligation to industry includes the whole process."

Having mentioned evaluation of surface finish, it is logical now to turn to a paper which deals with a unique practice in connection with one of the important surface finishing methods—that of grinding. In this connection, W. Fay Aller, director of research, the Sheffield Corp., discussed the technique of shaping abrasive wheels by "crushing" instead of cutting them with a diamond.

He pointed out that while pedestal grinding wheels long have been dressed by that method, a cluster of loosely rotating washers being pressed against the wheel in that case, crushing as applied to accurate forming of multi-ribbed wheels for thread grinding, etc., is a much more recent conception.

Crush-Forming with Roller

The precision "crush-forming" described by Mr. Aller, involves use of an accurately made mild steel roller resembling the blank of a circular formingi tool used in screw machine work. This is of the identical profile of the work to be ground. This roller is mounted on antifriction bearings, without end play and is fixture-located in the machine so that it can slowly be forced into the periphery of the wheel—axes of crusher and wheel being exactly parallel. Crusher and wheel roll together at 250 to 300 revolutions per minute, being forced together until the form on the roll has been impressed into the periphery of the wheel.

Microphotographs show that the grains in the wheel—instead of being cut apart as by a diamond—are merely broken away by the action of the crushing roll. According to Mr. Aller the crushing leaves the wheel in better condition for cutting the work, there being no flattened grains of abrasive. Other advantages which he claimed on the basis of practical shop experience are: Quick dressing to intricate forms; more grinds per dressing; lower cost of tools for dressing; increased life of wheels because of minimum removal of abrasive per dressing, closer tolerances and reduced hazard of burning work.

Mr. Aller recommended a microscope form grinder for making master crusher rolls for forms other than threads. In using this machine the crusher blank is arbor mounted between centers and rotated at grinding speed. A 50 to 1 layout of the shape required is used on the pantograph table. The operator follows this layout with the pantograph stylus and at the same time watches the cutting action of the wheel through a microscope. Thus he is able to hold to accuracy of 0.0002-inch on the work regardless of wear of wheel.

This master crusher in turn is reproduced into working crushers on a thread and form grinder. The master crusher, in the crusher fixture, is rolled into a suitable abrasive wheel of face width equal to that of the master crusher. This wheel in turn is used to grind master reproductions, and to regrind

A surface grinder is used for form grinding flat parts. In this case a special fixture is provided for crushing the form into the wheel but the work is done in conventional fixtures, utilizing the regular table traverse. One of the parts being successfully turned out in this manner, is the impeller bucket for turbo-rotors of jet-propelled planes.

Corrosion Principles Presented in Book

"Corrosion," a 54-page publication, is a comprehensive analysis of corrosion principles for both the practical man and the technician in the metal field. It has been prepared in the belief that a working knowledge of corrosion is the best means of securing maximum equipment life and minimum maintenance costs in situations where this destructive process must be taken into consideration.

An opening section explains how corrosion processes work and discusses the known factors influencing their action: solution acidity, oxidizing agents, temperature, agitation, films, inhibitors, surface condition, stress, heat treatment, welding, concentration, cells, and galvanic actions. These discussions are illustrated with graphs, drawings and tables.

The review of testing methods following tells how service conditions are simulated in corrosion research. Included is a description of construction and use of the well-known spool-type specimen holder for determining comparative behavior of several metals and alloys simultaneously under actual operating conditions.

The applicability of Monel, nickel and Inconel in various corrosive media is analyzed in the closing section. Tables list nearly 500 typical corrosives in which these alloys have been successfully used, and report results of more than 120 specific tests under varied conditions in 44 common corrosive agents.

"Corrosion" will be sent on request to equipment designers, engineers, or other metal users by International Nickel Co., Inc., 67 Wall, New York.

It's not *how* but *what* that counts with you and with us. Our new furnace is the latest and most modern heat treating equipment on the market but what's more important is the fact that the pieces put through this furnace emerge the most uniformly heat treated parts possible to obtain in a commercial plant!

The pieces shown above give you an idea of the size and type of work best suited to this furnace. A call to our plant will quickly bring you the answer to your heat treating problems. Try us.

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New Ship Program Gives Plate Market Support

Expected decline deferred by heavy tonnage. . . Bar and sheet deliveries further extended as munitions program expands

IN MARKED contrast to recent expectations, demand for steel in the first week of 1945 has been heavy and the expected slackening has not developed, the tendency being entirely in the other direction.

In addition to the growing requirements for bars for the shell and ammunition program, placing of 226 merchant ships has been a factor. These are estimated to require about 1,200,000 tons of plates, shapes and bars, more than 940,000 tons being plates. Rolling of this material will start in February and March is expected to provide 250,000 to 280,000 tons of plates. Deliveries will extend over seven months.

Until this program appeared it had been expected that plate schedules would be the lowest since the beginning of the war. Its effect has been to freeze considerable mill capacity and as a result some platemakers now are out of the market for entire first quarter. However, sheared plate mills will be relied on to furnish all this tonnage, strip mills being continued on sheets and strip, to meet heavy needs for those products.

Ammunition and gun requirements continue to expand and bar deliveries are further extended. Small rounds and flats are available in February in some instances, but larger sections generally are promised for second quarter, with some producers sold well into June. Sheet demand reflects increasingly the shell program, directives being issued for shell case material for February and March.

In spite of considerable interference with steel production, due to heavy snows in the Lake region, the national steelmaking rate last week rebounded from the holiday low, rising 3 points to 95½ per cent of capacity. Pittsburgh regained 10 points to 89 per cent, Wheeling 6 points to 97½, Youngstown 7 points to 90, eastern Pennsylvania 1 point to 95 and Detroit 9 points from a revised rate for the holiday week, to 88 per cent. Buffalo, as a result of snow, dropped 33 points to 60 per cent, Cincinnati 2 points to 90 and Cleveland 9½ points to 75½ per cent. Rates were unchanged as follows: Chicago 99½ per cent; New England 87; St. Louis 75 and Birmingham 95.

Railroads are in the market for large lots of freight cars and steel rails. Cars placed in December numbered more than 15,500 units, largest for any month in 1944. This makes the total for the year over 52,000, compared with 41,355 in 1943 and 26,028 in 1942. Mills in the southern district report booking more than 500,000 tons of rails for 1945 delivery, largest in its history.

Pig iron melters are asking slightly more iron for first quarter than for fourth quarter and in some areas there is a tightening in supply. Some idle blast furnaces would be relighted if sufficient manpower could be found to operate them. In the Pittsburgh district sales for January already are greater than probable production and some large users are not yet covered. Heavy requirements for steelmaking are limiting output of foundry grades in many instances, though demand for the latter is limited to considerable degree by shortage of foundry labor. Foundries lost little time over the holidays, due to pressure for castings production.

With steel production maintaining its high rate demand for scrap continues strong and prices are at ceilings for practically all grades. Weather conditions over a wide area have limited activity in gathering and preparing but sufficient supply has been maintained. To afford sufficient supply of the grades used in electric furnaces, acid open hearths and steel foundries Office of Price Administration has forbidden basic open hearth operators to buy a number of grades needed by the former.

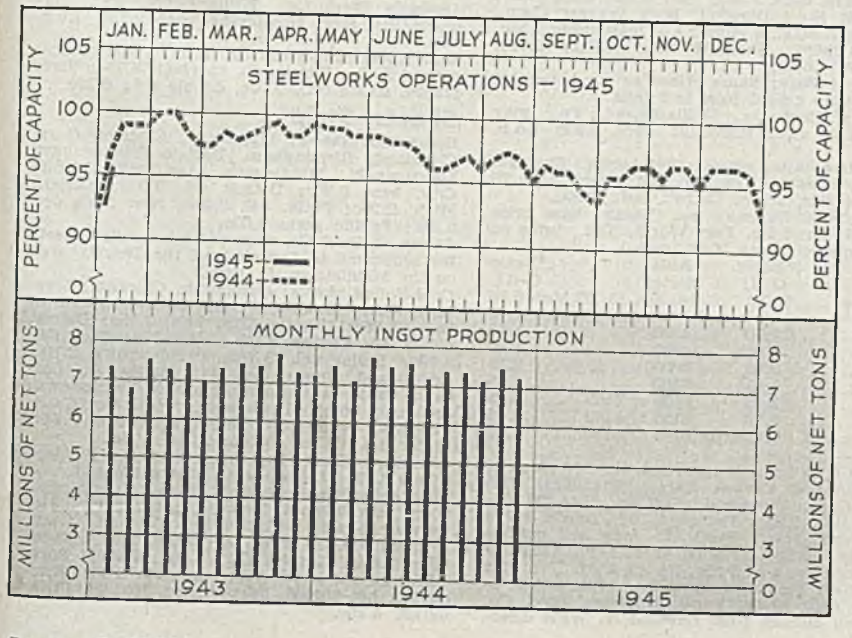
With continued strength in steelmaking scrap and no changes in ceilings on other materials composite market averages are steady at prior levels. Finished steel composite is $56.73, semifinished steel $6, steelposite is $56.73, semifinished steel $36, steelscrap $19.17.

DISTRICT STEEL RATES

Percentage of Ingot Capacity Engaged in Leading Districts

	Week Ended Jan. 6	Change	Same Week 1944	Same Week 1943
Pittsburgh	89	+10	95	98.5
Chicago	99.5	None	102.5	100
Eastern Pa.	95	+1	96	95
Youngstown	90	+7	89	97
Wheeling	97.5	+6	96	70
Cleveland	75.5	—9.5	90	93
Buffalo	60	—33	88	93
Birmingham	95	None	95	95
New England	87	None	95	100
Cincinnati	90	—2	87	73
St. Louis	75	None	85.5	93
Detroit	88	+9	92	92
Average	95.5	+3	°96.5	°97.5

°Based on steelmaking capacities as of these dates.



COMPOSITE MARKET AVERAGES

	Jan. 6	Dec. 30	Dec. 23	One Month Ago June, 1944	Three Months Ago April, 1944	One Year Ago July, 1943	Five Years Ago July, 1939
Finished Steel	$56.73	$56.73	$56.73	$56.73	$56.73	$56.73	$56.73
Semifinished Steel	36.00	36.00	36.00	36.00	36.00	36.00	36.15
Steelmaking Pig Iron	23.05	23.05	23.05	23.05	23.05	23.05	22.05
Steelmaking Scrap	19.17	19.17	19.17	16.40	19.17	19.17	17.95

Finished Steel Composite:—Average of industry-wide prices on sheets, strips, bars, plates, shapes, wire nails, tin plate, standard and line pipe. Semifinished Steel Composite:—Average of industry-wide prices on billets, slabs, sheet bars, skelp and wire rods. Steelmaking Pig Iron Composite:—Average of basic pig iron prices at Bethlehem, Birmingham, Buffalo, Chicago, Cleveland, Neville Island, Granite City and Youngstown. Steelworks Scrap Composite:—Average of No. 1 heavy melting steel prices at Pittsburgh, Chicago and eastern Pennsylvania. Finished steel, net tons; others, gross tons.

COMPARISON OF PRICES

Representative Market Figures for Current Week; Average for Last Month, Three Months and One Year Ago

Finished Material	Jan. 6, 1944	Nov., 1944	Sept., 1944	Dec., 1943
Steel bars, Pittsburgh	2.15c	2.15c	2.15c	2.15c
Steel bars, Chicago	2.15	2.15	2.15	2.15
Steel bars, Philadelphia	2.47	2.47	2.47	2.47
Shapes, Pittsburgh	2.10	2.10	2.10	2.10
Shapes, Philadelphia	2.215	2.215	2.215	2.215
Shapes, Chicago	2.10	2.10	2.10	2.10
Plates, Pittsburgh	2.10	2.10	2.10	2.10
Plates, Philadelphia	2.15	2.15	2.15	2.15
Plates, Chicago	2.10	2.10	2.10	2.10
Sheets, hot-rolled, Pittsburgh	2.10	2.10	2.10	2.10
Sheets, cold-rolled, Pittsburgh	3.05	3.05	3.05	3.05
Sheets, No. 24 galv., Pittsburgh	3.50	3.50	3.50	3.50
Sheets, hot-rolled, Gary	2.10	2.10	2.10	2.10
Sheets, cold-rolled, Gary	3.05	3.05	3.05	3.05
Sheets, No. 24 galv., Gary	3.50	3.50	3.50	3.50
Bright bess., basic wire, Pittsburgh	2.60	2.60	2.60	2.60
Tin plate, per base box, Pittsburgh	$5.00	$5.00	$5.00	$5.00
Wire nails, Pittsburgh	2.55	2.55	2.55	2.55

Semifinished Material				
Sheet bars, Pittsburgh, Chicago	$34.00	$34.00	$34.00	$34.00
Slabs, Pittsburgh, Chicago	34.00	34.00	34.00	34.00
Rerolling billets, Pittsburgh	34.00	34.00	34.00	34.00
Wire rods, No. 5 to ⅜-inch, Pitts.	2.00	2.00	2.00	2.00

Pig Iron	Jan. 6, 1944	Nov., 1944	Sept., 1944	Dec., 1943
Bessemer, del. Pittsburgh	$25.19	$25.19	$25.19	$25.19
Basic, Valley	23.50	23.50	23.50	23.50
Basic, eastern del. Philadelphia	25.34	25.34	25.34	25.34
No. 2 fdry., del. Pitts., N.&S. Sides	24.69	24.69	24.69	24.69
No. 2 foundry, Chicago	24.00	24.00	24.00	24.00
Southern No. 2, Birmingham	20.38	20.38	20.38	20.38
Southern No. 2 del. Cincinnati	24.30	24.30	24.30	24.30
No. 2 fdry., del. Phila.	25.84	25.84	25.84	25.84
Malleable, Valley	24.00	24.00	24.00	24.00
Malleable, Chicago	24.00	24.00	24.00	24.00
Lake Sup., charcoal, del. Chicago	37.34	37.34	37.34	37.34
Gray forge, del. Pittsburgh	24.19	24.19	24.19	24.19
Ferromanganese, del. Pittsburgh	140.33	140.33	140.33	140.33

Scrap				
Heavy melting steel, No. 1 Pittsburgh	$20.00	$19.75	$16.95	$20.00
Heavy melt. steel, No. 2, E. Pa.	18.75	18.75	14.50	18.75
Heavy melting steel, Chicago	18.75	18.75	17.55	18.75
Rails for rolling, Chicago	22.25	22.25	22.25	22.25
No. 1 cast, Chicago	20.00	20.00	20.00	20.00

Coke				
Connellsville, furnace, ovens	$7.00	$7.00	$7.00	$6.50
Connellsville, foundry ovens	7.75	7.75	7.75	7.75
Chicago, by-product fdry., del.	13.35	13.35	13.35	13.35

STEEL, IRON RAW MATERIAL, FUEL AND METALS PRICES

Following are maximum prices established by OPA Schedule No. 6 issued April 16, 1941, revised June 20, 1941 and Feb. 4, 1942. The schedule covers all iron or steel ingots, all semifinished iron or steel products, all finished hot-rolled, cold-rolled iron or steel products and any iron or steel product which is further finished by galvanizing, plating, coating, drawing, extruding, etc., although only principal established basing points for selected products are named specifically. Seconds and off-grade products are also covered. Exceptions applying to individual companies are noted in the table.

Semifinished Steel

Gross ton basis except wire rods, skelp.

Carbon Steel Ingots: F.o.b. mill base, rerolling qual., stand. analysis, $31.00.

(Empire Sheet & Tin Plate Co., Mansfield, O., may quote carbon steel ingots at $33 gross ton, f.o.b. mill. Kaiser Co. Inc. $43, f.o.b. Pacific ports.)

Alloy Steel Ingots: Pittsburgh, Chicago, Buffalo, Bethlehem, Canton, Massillon; uncrop., $45.

Rerolling Billets, Blooms, Slabs: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Sparrows Point, Birmingham, Youngstown, $34; Detroit, del. $36; Duluth (bll) $36; Pac. Ports, (bll) $46. (Andrews Steel Co., carbon slabs $41; Continental Steel Corp., billets $34, Kokomo, to Acme Steel Co.; Northwestern Steel & Wire Co., $41, Sterling, Ill.; Laclede Steel Co. $34, Alton or Madison, Ill.; Wheeling Steel Corp. $36 base, billets for lend-lease, $34, Portsmouth, O., on slabs on WPB directives. Granite City Steel Co. $47.50 gross ton slabs from D.P.C. mill. Geneva Steel Co., Kaiser Co. Inc., $58.64, Pac. Ports).

Forging Quality Blooms, Slabs, Billets: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham, Youngstown, $40. Detroit, del. $42; Duluth, billets, $42; forg. bll. f.o.b. Pac. Ports, $52.

(Andrews Steel Co. may quote carbon forging billets $50 gross ton at established basing points; Follansbee Steel Corp., $49.50 f.o.b. Toronto, O. Geneva Steel Co., Kaiser Co. Inc., $64.64, Pacific ports.)

Open Hearth Shell Steel: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Youngstown, Birmingham, base 1000 tons one size and section; 3-12 in., $52; 12-18 in., excel., $54.00; 18 in. and over $56. Add $2.00 del. Detroit; $3.00 del. Eastern Mich. (Kaiser Co. Inc., $76.64, f.o.b. Los Angeles.)

Alloy Billets, Slabs, Blooms: Pittsburgh, Chicago, Buffalo, Bethlehem, Canton, Massillon, $54; del. Detroit $56, Eastern Mich. $57.

Sheet Bars: Pittsburgh, Chicago, Cleveland, Buffalo, Canton, Sparrows Point, Youngstown, $34. (Wheeling Steel Corp. $37 on lend-lease sheet bars, $38 Portsmouth, O., on WPB directives; Empire Sheet & Tin Plate Co., Mansfield, O., carbon sheet bars, $39, f.o.b. mill.)

Skelp: Pittsburgh, Chicago, Sparrows Point, Youngstown, Coatesville, lb., 1.90c.

Wire Rods: Pittsburgh, Chicago, Cleveland, Birmingham, No. 5—⅜ in. inclusive, per 100 lbs., $2. Do., over ⅜—47-in., incl., $2.15; Galveston, base, 2.25c and 2.40c, respectively. Worcester add $0.10; Pacific Ports $0.50. (Pittsburgh Steel Co., $0.20 higher.)

Bars

Hot-Rolled Carbon Bars and Bar-Size Shapes under 3": Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham, base 20 tons one size, 2.15c; Duluth, base 2.25c; Mahoning Valley 2.22½c; Detroit, del. 2.25c; Eastern Mich. 2.30c; New York del. 2.49c; Phila. del. 2.47c; Gulf Ports, dock 2.52c; Pac. ports, dock 2.80c. (Calumet Steel Division, Borg Warner Corp., and Joslyn Mfg. & Supply Co. may quote 2.35c, Chicago base; Sheffield Steel Corp., 2.75c, f.o.b. St. Louis.)

Rail Steel Bars: Same prices as for hot-rolled carbon bars except base is 5 tons.

(Sweet's Steel Co., Williamsport, Pa., may quote rail steel merchant bars 2.33c f.o.b. mill.)

Hot-Rolled Alloy Bars: Pittsburgh, Chicago, Canton, Massillon, Buffalo, Bethlehem, base 20 tons one size, 2.70c; Detroit, del., 2.80c.

(Texas Steel Co. may use Chicago base price as maximum f.o.b. Fort Worth, Tex., price on sales outside Texas, Oklahoma.)

AISI Series	(*Basic O-H)	AISI Series	(*Basic O-H)
1300	$0.10	4100 (.15-.25 Mo)	0.70
		(.20-.30 Mo)	0.75
2300	1.70	4300	1.70
2500	2.55	4600	1.20
3000	0.50	4800	2.15
3100	0.85	5100	0.35
3200	1.35	5130 or 5152	0.45
3400	3.20	6120 or 6152	0.95
4000	0.45-0.55	6145 or 6150	1.20

*Add 0.25 for acid open-hearth; 0.50 electric.

Cold-Finished Carbon Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, base 20,000-39,999 lbs., 2.65c; Detroit 2.70c; Toledo 2.80c. (Keystone Drawn Steel Co. may sell outside its usual market area on Proc. Div., Treasury Dept. contracts at 2.65c, Spring City, Pa., plus freight on hot-rolled bars from Pittsburgh to Spring City. New England Drawn Steel Co. may sell outside New England on WPB directives at 2.65c, Mansfield, Mass., plus freight on hot-rolled bars from Buffalo to Mansfield.)

Cold-Finished Alloy Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, base 3.35c; Detroit, del. 3.45c; Eastern Mich. 3.50c.

Reinforcing Bars (New Billet): Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Sparrows Point, Buffalo, Youngstown, base 2.15c; Detroit del. 2.25c; Eastern Mich. and Toledo 2.30c; Gulf ports, dock 2.50c; Pacific ports, dock 2.55c.

Reinforcing Bars (Rail Steel): Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Buffalo base 2.15c; Detroit, del. 2.25c; Eastern Mich. and Toledo 2.30c; Gulf ports, dock 2.50c.

(Sweet's Steel Co., Williamsport, Pa., may quote rail steel reinforcing bars 2.33c, f.o.b. mill.)

Iron Bars: Single refined, Pitts. 4.40c; double refined 5.40c; Pittsburgh, staybolt, 5.75c; Terre Haute, single ref., 5.00c, double ref., 6.25c.

Sheets, Strip

Hot-Rolled Sheets: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Buffalo, Youngstown, Sparrows Pt., Middletown, base 2.10c; Granite City, base 2.20c; Detroit del. 2.20c; Eastern Mich. 2.25c; Phila. del. 2.27c; New York del. 2.34c; Pacific ports 2.65c.

(Andrews Steel Co. may quote hot-rolled sheets for shipment to Detroit and the Detroit area on the Middletown, O. base.)

Cold-Rolled Sheets: Pittsburgh, Chicago, Cleveland, Gary, Buffalo, Youngstown, Middletown, base, 3.05c; Granite City, base 3.15c; Detroit del. 3.15c; Eastern Mich. 3.20c; New York del. 3.39c; Phila. del. 3.37c; Pacific ports 3.70c.

Galvanized Sheets, No. 24: Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Youngstown, Sparrows Point, Middletown, base 3.50c; Granite City, base 3.60c; New York del. 3.74c; Phila. del. 3.67c; Pacific ports 4.05c.

(Andrews Steel Co. may quote galvanized sheets 3.75c at established basing points.)

Corrugated Galv. Sheets: Pittsburgh, Chicago, Gary, Birmingham, 29 gage, per square 3.31c.

Culvert Sheets: Pittsburgh, Chicago, Gary, Birmingham, 16 gage, not corrugated, copper alloy 3.60c; Granite City 3.70c; Pacific Ports 4.25c; copper iron 3.90c, pure iron 3.95c; zinc-coated, hot-dipped, heat-treated, No. 24, Pittsburgh, 4.25c.

Enameling Sheets: 10-gage; Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Middletown, base, 2.75c; Granite City, base 2.85c; Detroit, del. 2.85c; eastern, Mich. 2.90c; Pacific ports 3.40c; **20-gage;** Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Middletown, base 3.35c; Detroit del. 3.45c; eastern Mich. 3.50c; Pacific ports 4.00c.

Electrical Sheets No. 24:

	Pittsburgh Base	Pacific Ports	Granite City
Field grade	3.20c	3.95c	3.30c
Armature	3.55c	4.30c	3.65c
Electrical	4.05c	4.80c	4.15c
Motor	4.95c	5.70c	5.05c
Dynamo	5.65c	6.40c	5.75c
Transformer			
72	6.15c	6.90c	.....
65	7.15c	7.90c	.....
58	7.65c	8.40c	.....
52	8.45c	9.20c	.....

Hot-Rolled Strip: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Middletown, base 1 ton and over, 12 inches wide and less 2.10c; Detroit del. 2.20c; Eastern Mich. 2.25c; Pacific ports 2.75c. (Joslyn Mfg. Co. may quote 2.30c, Chicago base.)

Cold Rolled Strip: Pittsburgh, Cleveland, Youngstown, 0.25 carbon and less 2.80c; Chicago, base 2.90c; Detroit, del. 2.90c; Eastern Mich. 2.95c; Worcester base 3.00c.

Commodity C. R. Strip: Pittsburgh, Cleveland, Youngstown, base 3 tons and over, 2.95c; Chicago 3.05c; Detroit del. 3.05c; Eastern Mich. 3.10c; Worcester base 3.35c.

Cold-Finished Spring Steel: Pittsburgh, Cleveland bases, add 20c for Worcester; .26-.50 Carb., 2.80c; .51-.75 Carb., 4.30c; .76-1.00 Carb., 6.15c; over 1.00 Carb., 8.35c.

Tin, Terne Plate

Tin Plate: Pittsburgh, Chicago, Gary, 100-lb. base box, $5.00; Granite City $5.10.

Electrolytic Tin Plate: Pittsburgh, Gary, 100-lb. base box, 0.50 lb. tin, $4.50; 0.75 lb. tin $4.65.

Tin Mill Black Plate: Pittsburgh, Chicago, Gary, base 29 gage and lighter, 3.05c; Granite City, 3.15c; Pacific ports, boxed 4.05c.

Long Ternes: Pittsburgh, Chicago, Gary, No. 24 unassorted 3.80c; Pacific ports 4.55c.

Manufacturing Ternes: (Special Coated) Pittsburgh, Chicago, Gary, 100-base box $4.30; Granite City $4.40.

Roofing Ternes: Pittsburgh base per package 112 sheets; 20 x 28 in., coating I.C. 8-lb. $12.00; 15-lb. $14.00; 20-lb. $15.00; 25-lb. $16; 30-lb. $17.25; 40-lb. $19.50.

Plates

Carbon Steel Plates: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Sparrows Point, Coatesville, Claymont, 2.10c; New York, del. 2.29c; Phila., del. 2.15c; St. Louis, 2.34c; Boston, del. 2.42-67c; Pacific ports, 2.65c; Gulf Ports, 2.45c.

(Granite City Steel Co. may quote carbon plates 2.35c f.o.b. mill; 2.65c f.o.b. D.P.C. mill; Kaiser Co. Inc., 3.20c, f.o.b. Los Angeles. Central Iron & Steel Co. 2.50c f.o.b. basing points; Geneva Steel Co., Provo, Utah, 3.20c, f.o.b. Pac. ports.)

Floor Plates: Pittsburgh, Chicago, 3.35c; Pacific ports, 4.00c.

Open-Hearth Alloy Plates: Pittsburgh, Chicago, Coatesville, 3.50c; Gulf ports 3.95c; Pacific ports 4.15c.

Wrought Iron Plates: Pittsburgh, 3.80c.

Shapes

Structural Shapes: Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Bethlehem, 2.10c; New York, del. 2.27c; Phila., del. 2.215c; Pacific ports, 2.75c.

(Phoenix Iron Co., Phoenixville, Pa., may quote carbon steel shapes at 2.35c at established basing points and 2.50c, Phoenixville, for export; Sheffield Steel Corp., 2.55c f.o.b. St. Louis. Geneva Steel Co., 3.25c, Pac. ports); Kaiser Co. Inc., 3.20c f.o.b. Los Angeles.)

Steel Sheet Piling: Pittsburgh, Chicago, Buffalo, 2.40c.

Wire Products, Nails

Wire: Pittsburgh, Chicago, Cleveland, Birmingham (except spring wire) to manufacturers in carloads (add $2 for Worcester, $1 for Duluth).

Bright basic, bessemer wire 2.60c
Spring wire 3.20c
(Pittsburgh Steel Co., 0.20c higher.)

Wire Products to the Trade:

Standard and Cement-coated wire nails, and staples, 100-lb. keg, Pittsburgh, Chicago, Birmingham, Cleveland, Duluth $2.55; Pacific ports 3.05c
Annealed fence wire, 100-lb., Pittsburgh, Chicago, Cleveland 3.05c
Galvanized fence wire, 100 lb., Pittsburgh, Chicago, Cleveland 3.40c
Woven fence, 15½ gage and heavier, per base column ..... .67c
Barbed wire, 80-rod spool, Pittsburgh, Chicago, Cleveland, Birmingham, column 70; twisted barbless wire, column 70.

Tubular Goods

Welded Pipe: Base price in carloads, threaded and coupled to consumers about $200 per net ton. Base discounts on steel pipe Pittsburgh and Lorain, O.; Gary, Ind. 2 points less on lap weld, 1 point less on butt weld. Pittsburgh base only on wrought iron pipe.

Butt Weld

Steel In.	Blk.	Galv.	Iron In.	Blk.	Galv.
⅛	56	33	½	24	3½
¼ & ⅜	59	40½	¾	30	10
½	63½	51	1-1¼	34	16
¾	66½	55	1½	38	18½
1-3	68½	57½	2	37½	18

Lap Weld

Steel In.	Blk.	Galv.	Iron In.	Blk.	Galv.
2	61	49¼	1¼	23	3½
2½-3	64	52½	1½	28¼	10
3½-6	66	54½	2	30½	12
7-8	65	52½	2½, 3½	31½	14½
9-10	64½	52	4	33½	18
11-12	63½	51	4½-8	32½	17
			9-12	28½	12

Boiler Tubes: Net base prices per 100 feet f.o.b. Pittsburgh in carload lots, minimum wall, cut lengths 4 to 24 feet, inclusive.

O.D. Sizes	B.W.G.	—Seamless— Hot Rolled	Cold Drawn	—Lap Weld— Steel	Charcoal Iron
1"	13	$ 7.82	$ 9.01	.....	.....
1¼"	13	9.26	10.67	.....	.....
1½"	13	10.23	11.72	$ 9.72	$23.71
1¾"	13	11.64	13.42	11.06	22.93
2"	13	13.04	15.03	12.38	19.35
2¼"	13	14.54	16.76	13.79	21.63
2¼"	12	16.01	18.45	15.16	.....
2½"	12	17.54	20.21	16.58	26.57
2¾"	12	18.59	21.42	17.54	29.00
3"	12	19.50	22.48	18.35	31.38
3½"	11	24.63	28.37	23.15	39.81
4"	10	30.54	35.20	28.66	49.90
4½"	10	37.35	43.04	35.22	.....
5"	9	46.87	54.01	44.25	73.93
6"	7	71.96	82.93	68.14	.....

Rails, Supplies

Standard rails, over 60-lb., f.o.b. mill, gross ton, $40.00. Light rails (billet), Pittsburgh, Chicago, Birmingham, gross ton, $40.00.

°Relaying rails, 35 lbs. and over, f.o.b. railroad and basing points, $28-$30.

Supplies: Track bolts, 4.75c; heat treated, 5.00c. Tie plates, $43 net ton, base, Standard spikes, 3.00c.

°Fixed by OPA Schedule No. 46, Dec. 15, 1941.

Tool Steels

Tool Steels: Pittsburgh, Bethlehem, Syracuse, base, cents per lb.; Reg. carbon 14.00c; extra carbon 18.00c; special carbon 22.00c; oil-hardening 24.00c; high car.-chr. 43.00c.

Tung	Chr.	Van.	Moly.	Pitts. base per lb.
18.00	4	1	...	67.00c
1.5	4	1	8.5	54.00c
.....	4	2	8	54.00c
5.50	4	1.50	4	57.50c
5.50	4.50	4	4.50	70.00c

Stainless Steels

Base, Cents per lb.—f.o.b. Pittsburgh

Type	Bars	Plates	Sheets	H. R. Strip	C. R Strip
CHROMIUM NICKEL STEEL					
302	24.00c	27.00c	34.00c	21.50c	28.00c
303	26.00	29.00	36.00	27.00	33.00
304	25.00	29.00	36.00	23.50	30.00
308	29.00	34.00	41.00	28.50	35.00
309	36.00	40.00	47.00	37.00	47.00
310	49.00	52.00	53.00	48.75	56.00
312	36.00	40.00	49.00	.....	.....
°316	40.00	44.00	48.00	40.00	48.00
†321	29.00	34.00	41.00	29.25	38.00
‡347	33.00	38.00	45.00	33.00	42.00
431	19.00	22.00	29.00	17.50	22.50
STRAIGHT CHROMIUM STEEL					
403	21.50	24.50	29.50	21.25	27.00
°°410	18.50	21.50	26.50	17.00	22.00
416	19.00	22.00	27.00	18.25	23.50
††420	24.00	28.50	33.50	23.75	36.50
430	19.00	22.00	29.00	17.50	22.50
‡‡430F	19.50	22.50	29.50	18.75	24.50
440A	24.00	28.50	33.50	23.75	36.50
442	22.50	25.50	32.50	24.00	32.00
443	22.50	25.50	32.50	24.00	32.00
446	27.50	30.50	36.50	35.00	52.00
501	8.00	12.00	15.75	12.00	17.00
502	9.00	13.00	16.75	13.00	18.00
STAINLESS CLAD STEEL (20%)					
304	.....	§§18.00	19.00	.....	.....

°With 2-3% moly. †With titanium. ‡With columbium. °°Plus machining agent. ††High carbon. ‡‡Free machining. §§Includes annealing and pickling.

Basing Point Prices are (1) those announced by U. S. Steel Corp. subsidiaries for first quarter of 1941 or in effect April 16, 1941 at designated basing points or (2) those prices announced or customarily quoted by other producers at the same designated points. Base prices under (2) cannot exceed those under (1) except to the extent prevailing in third quarter of 1940.

Extras mean additions or deductions from base prices in effect April 16, 1941.

Delivered prices applying to Detroit, Eastern Michigan, Gulf and Pacific Coast points are deemed basing points except in the case of the latter two areas when water transportation is not available, in which case nearest basing point price, plus all-rail freight may be charged.

Domestic Ceiling prices are the aggregate of (1) governing basing point price, (2) extras and (3) transportation charges to the point of delivery as customarily computed. **Governing basing point** is basing point nearest the consumer providing the lowest delivered price.

Seconds, maximum prices: flat-rolled rejects 75% of prime prices, wasters 75%, waste-wasters 65% except plates, which take waster prices; tin plate $2.80 per 100 lbs.; terne plate $2.25; semifinished 85% of primes; other grades limited to new material ceilings.

Export ceiling prices may be either the aggregate of (1) governing basing point or emergency basing point (2) export extras (3) export transportation charges provided they are the f.a.s. seaboard quotations of the U. S. Steel Export Co. on April 16, 1941.

Bolts, Nuts

F.o.b. Pittsburgh, Cleveland, Birmingham, Chicago. Discounts for carloads additional 5%, full containers, add 10%

Carriage and Machine

½ x 6 and smaller ..... 65½ off
Do., ⅝ and ⅝ x 6-in. and shorter ... 63½ off
Do., ¾ to 1 x 6-in. and shorter ..... 61 off
1⅛ and larger, all lengths ..... 59 off
All diameters, over 6-in. long ..... 59 off
Tire bolts ..... 50 off
Step bolts ..... 56 off
Plow bolts ..... 65 off

Stove Bolts

In packages with nuts separate 71-10 off; with nuts attached 71 off; bulk 80 off on 15,000 of 3-inch and shorter, or 5000 over 3-in.

Nuts

	U.S.S.	S.A.E.
Semifinished hex		
⅞-inch and less	62	64
1-1-inch	59	60
1⅛-1½-inch	57	58
1⅝ and larger	56	

Hexagon Cap Screws

Upset 1-in., smaller ..... 64 off
Milled 1-in., smaller ..... 60 off

Square Head Set Screws

Upset, 1-in., smaller ..... 71 off
Headless, ¼-in., larger ..... 60 off
No. 10, smaller ..... 70 off

Piling

Pittsburgh, Chicago, Buffalo 2.40c

Rivets, Washers

F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham

Structural 3.75c
⅞-inch and under ..... 65-5 off
Wrought Washers, Pittsburgh, Chicago, Philadelphia, to jobbers and large nut, bolt manufacturers l.c.l. ... $2.75-3.00 off

Metallurgical Coke

Price Per Net Ton

Beehive Ovens

Connellsville, furnace ..... °7.00
Connellsville, foundry 7.50- 8.00
Connellsville, prem. fdry. 7.75- 8.10
New River, foundry 8.50- 8.75
Wise county, foundry 7.25- 7.75

By-Product Foundry

Wise county, furnace 6.75- 7.25
Kearney, N. J., ovens 12.65
Chicago, outside delivered 12.60
Chicago, delivered 13.35
Terre Haute, delivered 13.10
Milwaukee, ovens 13.35
New England, delivered 14.25
St. Louis, delivered ..... †13.35
Birmingham, delivered 10.50
Indianapolis, delivered 13.10
Cincinnati, delivered 12.85
Cleveland, delivered 12.80
Buffalo, delivered 13.00
Detroit, delivered 13.35
Philadelphia, delivered 12.88

°Operators of hand-drawn ovens using trucked coal may charge $7.75, effective Nov. 29, 1943.
†13.85 from other than Ala., Mo., Tenn.

Coke By-Products

Spot, gal., freight allowed east of Omaha

Pure and 90% benzol 15.00c
Toluol, two degree 28.00c
Solvent naphtha 27.00c
Industrial xylol 27.00c

Per lb. f.o.b. works

Phenol (car lots, returnable drums) 12.50c
Do., less than car lots 13.25c
Do., tank cars 11.50c

Eastern Plants, per lb.

Naphthalene flakes, balls, bbls., to jobbers 8.00c

Per ton, bulk, f.o.b. port

Sulphate of ammonia $29.20

WAREHOUSE STEEL PRICES

Base delivered price, cents per pound, for delivery within switching limits, subject to established extras.

	Hot rolled bars	Structural shapes	Plates	Floor plates	Hot rolled sheets (10 gage base)	Hot rolled bands (12 gage and heavier)	Hot rolled hoops (14 gage and lighter)	Galvanized flat sheets (24 gage base)	Cold-rolled sheets (17 gage base)	Cold finished bars	Cold-rolled strip	NE hot bars 8600 series	NE hot bars 9400 series
Boston	4.044[1]	3.912[1]	3.912[1]	5.727[1]	3.774[1]	4.106[1]	5.106[1]	5.224[14]	4.744[14]	4.144[21]	4.715	6.012[23]	6.012[23]
New York	3.853[1]	3.758[1]	3.768[1]	5.574[1]	3.590[1]	3.974[1]	3.974[1]	5.010[13]	4.613[14]	4.103[21]	4.774	.....	.....
Jersey City	3.853[1]	3.747[1]	3.768[1]	5.574[1]	3.590[1]	3.974[1]	3.974[1]	5.010[13]	4.613[14]	4.103[21]	4.774	.....	.....
Philadelphia	3.822[1]	3.666[1]	3.605[1]	5.272[1]	3.518[1]	3.922[1]	4.272[1]	5.018[13]	4.872[25]	4.072[21]	4.772	5.816[23]	5.866[23]
Baltimore	3.802[1]	3.759[1]	3.594[1]	5.252[1]	3.394[1]	3.902[1]	4.252[1]	4.894[1]	4.852[25]	4.052[21]	.....	.....	.....
Washington	3.941[1]	3.930[1]	3.796[1]	5.341[1]	3.596[1]	4.041[1]	4.891[1]	5.196[17]	4.841[25]	4.041[21]	.....	.....	.....
Norfolk, Va.	4.065[1]	4.002[1]	3.971[1]	5.465[1]	3.771[1]	4.165[1]	4.515[1]	5.371[17]	4.965[24]	4.165[21]	.....	.....	.....
Bethlehem, Pa.*	.....	3.45[1]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Claymont, Del.*	.....	.....	3.45[1]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Coatesville, Pa.*	.....	.....	3.45[1]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Buffalo (city)	3.35[1]	3.40[1]	3.63[1]	5.26[1]	3.35[1]	3.819[1]	3.819[1]	4.75[13]	4.40[13]	3.75[21]	4.669	5.60[23]	5.75[23]
Buffalo (country)	3.25[1]	3.30[1]	3.30[1]	4.90[1]	3.25[1]	3.81[1]	3.50[1]	4.65[13]	4.30[13]	3.65[21]	4.35	5.60[23]	5.75[23]
Pittsburgh (city)	3.35[1]	3.40[1]	3.40[1]	5.00[1]	3.35[1]	3.60[1]	3.60[1]	4.75[13]	4.40[24]	3.75[21]	.....	.....	.....
Pittsburgh (country)	3.25[1]	3.30[1]	3.30[1]	4.90[1]	3.25[1]	3.50[1]	3.50[1]	4.65[13]	4.30[24]	3.65[21]	.....	.....	.....
Cleveland (city)	3.35[1]	3.538[1]	3.40[1]	5.188[1]	3.35[1]	3.60[1]	3.60[1]	4.877[13]	4.40[24]	3.75[21]	4.45[21]	5.60[26]	5.65[23]
Cleveland (country)	3.25[1]	.....	3.30[1]	.....	3.25[1]	3.50[1]	3.50[1]	.....	4.30[24]	3.65[21]	4.35[21]	.....	.....
Detroit	3.450[1]	3.661[1]	3.609[1]	5.281[1]	3.450[1]	3.700[1]	3.700[1]	5.000[13]	4.500[24]	3.800[21]	4.659	5.98[23]	5.98[23]
Omaha (city, delivered)	4.115[1]	4.165[1]	4.165[1]	5.765[1]	3.865[1]	4.215[1]	4.215[1]	5.608[13]	5.443[24]	4.443[21]	.....	.....	.....
Omaha (country, base)	4.015[1]	4.065[1]	4.065[1]	5.665[1]	3.765[1]	4.115[1]	4.115[1]	5.508[13]	.....	.....	.....	.....	.....
Cincinnati	3.611[1]	3.891[1]	3.661[1]	5.291[1]	3.425[1]	3.675[1]	3.675[1]	4.825[13]	4.475[24]	4.011[21]	4.711	6.10	6.20
Youngstown, O.*	.....	.....	.....	.....	.....	.....	.....	4.40[13]	.....	.....	.....	.....	.....
Middletown, O.*	.....	.....	.....	.....	3.25[1]	3.50[1]	3.50[1]	4.65[13]	.....	.....	.....	.....	.....
Chicago (city)	3.50[1]	3.55[1]	3.55[1]	5.15[1]	3.25[1]	3.60[1]	3.60[1]	5.231[13]	4.20[24]	3.75[21]	4.65	5.75[23]	5.85[23]
Milwaukee	3.687[1]	3.687[1]	3.687[1]	5.287[1]	3.387[1]	3.737[1]	3.737[1]	5.272[13]	4.337[24]	3.887[21]	4.787	5.987[23]	6.087[23]
Indianapolis	3.58[1]	3.63[1]	3.63[1]	5.23[1]	3.518[1]	3.768[1]	3.768[1]	4.918[13]	4.568[24]	3.98[21]	4.78	6.03[23]	6.13[23]
St. Paul	3.76[2]	3.81[2]	3.81[2]	5.41[2]	3.51[2]	3.86[2]	3.86[2]	5.257[13]	4.46[24]	4.861[21]	5.102	6.09[26]	6.19[26]
St. Louis	3.647[1]	3.697[1]	3.697[1]	5.297[1]	3.397[1]	3.747[1]	3.747[1]	5.172[13]	4.347[24]	4.081[21]	4.931	6.181[23]	6.281[23]
Memphis, Tenn.	4.015[5]	4.065[5]	4.065[5]	5.78[5]	3.965[5]	4.215[5]	4.215[5]	5.265[13]	4.78[24]	4.33[21]	.....	.....	.....
Birmingham	3.50[1]	3.55[1]	3.55[1]	5.903[1]	3.45[1]	3.70[1]	3.70[1]	4.75[13]	4.352[24]	4.54	5.215	.....	.....
New Orleans (city)	4.10[4]	3.90[4]	3.90[4]	5.85[4]	4.058[4]	4.20[4]	4.20[4]	5.25[26]	5.079[13]	4.60[21]	5.429	.....	.....
Houston, Tex.	3.75[5]	4.25[5]	4.25[5]	5.50[5]	3.768[5]	4.318[5]	4.318[5]	5.813[26]	4.10[13]	3.65[22]	.....	.....	.....
Los Angeles	4.40[4]	4.65[4]	4.95[4]	7.20[4]	5.00[4]	4.95[4]	6.75[4]	6.00[13]	7.20[6]	5.588[21]	5.618	5.85[23]	5.95[23]
San Francisco	4.15[7]	4.35[7]	4.65[7]	6.35[7]	4.55[7]	4.50[7]	5.75[7]	6.35[13]	7.30[25]	5.338[21]	7.338	8.304[23]	8.404[23]
Portland, Oreg.	4.45[27]	4.45[27]	4.75[27]	6.50[27]	4.65[27]	4.75[27]	6.80[27]	5.75[13]	6.60[13]	5.538[15]	.....	.....	.....
Tacoma	4.35[6]	4.45[6]	4.75[6]	6.50[6]	4.65[6]	4.25[6]	5.45[6]	5.95[13]	7.60[13]	5.788[21]	.....	.....	8.00[23]
Seattle	4.35[6]	4.45[6]	4.75[6]	6.50[6]	4.65[6]	4.25[6]	5.45[6]	5.95[13]	7.05[13]	5.788[21]	.....	.....	8.00[23]

*Basing point cities with quotations representing mill prices, plus warehouse spread.

NOTE—All prices fixed by Office of Price Administration in Amendments Nos. 10 to 18 to Revised Price Schedule No. 49. Deliveries outside above cities computed in accordance with regulations.

BASE QUANTITIES

[1]—400 to 1999 pounds; [2]—400 to 14,999 pounds; [3]—any quantity; [4]—800 to 1999 pounds; [5]—400 to 8999 pounds; [6]—800 to 9999 pounds; [7]—400 to 39,999 pounds; [8]—under 2000 pounds; [9]—under 4000 pounds; [10]—500 to 1499 pounds; [11]—one bundle to 39,999 pounds; [12]—150 to 2249 pounds; [13]—150 to 1499 pounds; [14]—three to 24 bundles; [15]—450 to 1499 pounds; [16]—one bundle to 1499 pounds; [17]—one to nine bundles; [18]—one to six bundles; [20]—100 to 749 pounds; [22]—300 to 1999 pounds; [21]—1500 to 39,999 pounds; [22]—1500 to 1999 pounds; [23]—1000 to 39,999 pounds; [24]—400 to 1499 pounds; [25]—1000 to 1999 pounds; [26]—under 25 bundles. Cold-rolled strip, 2000 to 39,999 pounds, base; [27]—300 to 4999 pounds.

Ores

Lake Superior Iron Ore

Gross ton, 51½% (Natural)

Lower Lake Ports

Old range bessemer	$4.75
Mesabi nonbessemer	4.45
High phosphorus	4.35
Mesabi bessemer	4.60
Old range nonbessemer	4.60

Eastern Local Ore

Cents, units, del. E. Pa.

Foundry and basic 56-63% contract	13.00

Foreign Ore

Cents per unit, o.i.f. Atlantic ports

Manganiferous ore, 45-55% Fe., 6-10% Mang.	Nom.
N. African low phos.	Nom.
Spanish, No. African basic, 50 to 60%	Nom.
Brazil iron ore, 68-69% f.o.b. Rio de Janeiro	7.50-8.00

Tungsten Ore

Chinese wolframite, per short ton unit, duty paid	$24.00

Chrome Ore

(Equivalent OPA schedules):

Gross ton f.o.b. cars, New York, Philadelphia, Baltimore, Charleston, S. C., Portland, Ore., or Tacoma, Wash.

(S/S paying for discharging; dry basis; subject to penalties if guarantees are not met.)

Indian and African	
48% 2.8:1	$41.00
48% 3:1	43.50
48% no ratio	31.00
South African (Transvaal)	
44% no ratio	$27.40
45% no ratio	28.30
48% no ratio	31.00
50% no ratio	32.80
Brazilian—nominal	
44% 2.5:1 lump	38.65
48% 3:1 lump	43.50
Rhodesian	
45% no ratio	28.80
48% no ratio	31.00
48% 3:1 lump	43.50
Domestic (seller's nearest rail)	
48% 3:1	52.80
less $7 freight allowance	

Manganese Ore

Sales prices of Metals Reserve Co., cents per gross ton unit, dry, 48%, at New York, Philadelphia, Baltimore, Norfolk, Mobile and New Orleans, 85.0c; Fontana, Calif., Provo, Utah, and Pueblo, Colo., 91.0c; prices include duty on imported ore and are subject to premiums, penalties and other provisions of amended M.P.R. No. 248, effective as of May 15. Price at basing points which are also points of discharge of imported manganese ore is f.o.b. cars, shipside, at dock most favorable to the buyer.

Molybdenum

Sulphide conc., lb., Mo. cont., mines	$0.75

NATIONAL EMERGENCY STEELS (Hot Rolled)

(Extras for alloy content)

Designation	Chemical Composition Limits, Per Cent — Carbon	Mn.	Si.	Cr.	Ni.	Mo.	Basic open-hearth Electric furnace Bars per 100 lb.	Billets per GT	Bars per 100 lb.	Billets per GT
NE 1330	.28-.33	1.60-1.90	.20-.35	.....	.....	.....	$ .10	$ 2.00	.....	.....
NE 8613	.12-.17	.70- .90	.20-.35	.40-.60	.40-.70	.15-.25	.65	13.00	1.15	23.00
NE 8720	.18-.23	.70- .90	.20-.35	.40-.60	.40-.70	.20-.30	.70	14.00	1.20	24.00
NE 9255	.50-.60	.70- .95	1.80-2.20	.....	.....	.....	.40	8.00	.....	.....
NE 9261	.55-.65	.70-1.00	1.80-2.20	.10-.25	.....	.....	.65	13.00	.....	.....
NE 9262	.55-.65	.70-1.00	1.80-2.20	.25-.40	.....	.....	.65	13.00	.....	.....
NE 9415	.13-.18	.80-1.10	.20-.35	.30-.50	.30-.60	.08-.15	.75	15.00	1.25	25.00
NE 9425	.23-.28	.90-1.20	.20-.35	.30-.50	.30-.60	.08-.15	.75	15.00	1.25	25.00
NE 9442	.40-.45	1.00-1.30	.20-.35	.30-.50	.30-.60	.08-.15	.80	16.00	1.30	26.00

Extras are in addition to a base price of 2.70c, per pound on finished products and $54 per gross ton on semifinished steel major basing points and are in cents per pound and dollars per gross ton. No prices quoted on vanadium alloy.

Pig Iron

Prices (in gross tons) are maximums fixed by OPA Price Schedule No. 10, effective June 10, 1941. Exceptions indicated in footnotes. Allocation regulations from WPB Order M-17, expiring Dec. 31, 1942. Base prices bold face, delivered light face. Federal tax on freight charges, effective Dec. 1, 1942, not included in following prices.

	Foundry	Basic	Bessemer	Malleable
Bethlehem, Pa., base	$25.00	$24.50	$26.00	$25.50
Newark, N. J., del.	26.53	26.03	27.53	27.03
Brooklyn, N. Y., del.	27.50	.....	.....	28.00
Birdsboro, Pa., base	25.00	24.50	26.00	25.50
Birmingham, base	†20.38	†19.00	25.00	.....
Baltimore, del.	25.61	.....	.....	.....
Boston, del.	25.12	.....	.....	.....
Chicago, del.	24.22	.....	.....	.....
Cincinnati, del.	24.06	22.68	.....	.....
Cleveland, del.	24.12	23.24	.....	.....
Newark, N. J., del.	26.15	.....	.....	.....
Philadelphia, del.	25.46	24.58	.....	.....
St. Louis, del.	24.12	23.24	.....	.....
Buffalo, base	24.00	23.00	25.00	24.50
Boston, del.	25.50	25.00	26.50	26.00
Rochester, del.	25.53	.....	26.53	26.03
Syracuse, del.	26.08	.....	27.08	26.58
Chicago, base	24.00	23.50	24.50	24.00
Milwaukee, del.	25.10	24.60	25.60	25.10
Muskegon, Mich., del.	27.19	.....	.....	27.19
Cleveland, base	24.00	23.50	24.50	24.00
Akron, Canton, O., del.	25.39	24.89	25.89	25.39
Detroit, base	24.00	23.50	24.50	24.00
Saginaw, Mich., del	26.31	25.81	26.81	26.31
Duluth, base	24.50	24.00	25.00	24.50
St. Paul, del.	26.63	26.13	27.13	26.63
Erie, Pa., base	24.00	23.50	25.00	24.50
Everett, Mass., base	25.00	24.50	26.00	25.50
Boston, del.	25.50	25.00	26.50	26.00
Granite City, Ill., base	24.00	23.50	24.50	24.00
St. Louis, del.	24.50	24.00	.....	24.50
Hamilton, O., base	24.00	23.50	.....	24.00
Cincinnati, del.	24.44	24.61	.....	25.11
Neville Island, Pa., base	24.00	23.50	24.50	24.00
§Pittsburgh, del. No. & So. sides	24.69	24.19	25.19	24.69
Provo, Utah, base	22.00	21.50	.....	.....
Sharpsville, Pa., base	24.00	23.50	24.50	24.00
Sparrows Point, base	25.00	24.50	.....	.....
Baltimore, del.	25.99	.....	.....	.....
Steelton, Pa., base	.....	24.50	.....	25.50
Swedeland, Pa., base	25.00	24.50	26.00	25.50
Philadelphia, del.	25.84	25.34	.....	26.34
Toledo, O., base	24.00	23.50	24.50	24.00
Youngstown, O., base	24.00	23.50	24.50	24.00
Mansfield, O., del.	25.94	25.44	25.44	25.94

Base grade, silicon 1.75-2.25%; add 50 cents for each additional 0.25% silicon, or portion thereof; deduct 50 cents for silicon below 1.75% on foundry iron. †For phosphorus 0.70% or over deduct 38 cents. §For McKees Rocks, Pa., add .55 to Neville Island base; Lawrenceville, Homestead, McKeesport, Ambridge, Monaca, Aliquippa, .84; Monessen, Monongahela City .97 (water); Oakmont, Verona 1.11; Brackenridge 1.24.

Note: Add 50 cents per ton for each 0.50% manganese or portion thereof over 1.00%.

Nickel differentials: Under 0.50%, no extra; 0.50% to 0.74% incl., $2 per ton; for each additional 0.25% nickel, $1 per ton.

High Silicon, Silvery

5.00-6.50 per cent (base)	$29.50		
6.51-7.00	$30.50	9.01- 9.50	$35.50
7.01-7.50	31.50	9.51-10.00	36.50
7.51-8.00	32.50	10.01-10.50	37.50
8.01-8.50	33.50	10.51-11.00	38.50
8.51-9.00	34.50	11.01-11.50	39.50

F.o.b. Jackson county, O., per gross ton, Buffalo base prices are $1.25 higher. Prices subject to additional charge of 50 cents a ton for each 0.50% manganese in excess of 1.00%.

Bessemer Ferrosilicon

Prices same as for high silicon silvery iron, plus $1 per gross ton. (For higher silicon irons a differential over and above the price of base grades is charged as well as for the hard chilling iron, Nos. 5 and 6.)

Charcoal Pig Iron

Northern

Lake Superior Furn.	$34.00
Chicago, del.	37.34

Southern

Semi-cold blast, high phos., f.o.b. furnace, Lyles, Tenn.	$28.50
Semi-cold blast, low phos., f.o.b. furnace, Lyles, Tenn.	33.00

Gray Forge

Neville Island, Pa.	$23.50
Valley base	23.50

Low Phosphorus

Basing points: Birdsboro, Pa., $29.50; Steelton, Pa., and Buffalo, N. Y., $29.50 base; $30.74, del., Philadelphia. Intermediate phos., Central Furnace, Cleveland, $26.50.

Switching Charges: Basing point prices are subject to an additional charge for delivery within the switching limits of the respective districts.

Silicon Differentials: Basing point prices are subject to an additional charge not to exceed 50 cents a ton for each 0.25 silicon in excess of base grade (1.75 to 2.25%).

Phosphorus Differential: Basing point prices are subject to a reduction of 38 cents a ton for phosphorus content of 0.70% and over.

Manganese Differentials: Basing point prices subject to an additional charge not to exceed 50 cents a ton for each 0.50% manganese content in excess of 1.0%.

Ceiling Prices are the aggregate of (1) governing basing point (2) differentials (3) transportation charges from governing basing point to point of delivery as customarily computed. Governing basing point is the one resulting in the lowest delivered price for the consumer.

Exceptions to Ceiling Prices: Pittsburgh Coke & Iron Co., (Sharpsville, Pa. furnace only) and Struthers Iron & Steel Co. may charge 50 cents a ton in excess of basing point prices for No. 2 Foundry, Basic Bessemer and Malleable. Mystic Iron Works, Everett, Mass., may exceed basing point prices by $2 per ton, effective May 20, 1943. Chester, Pa., furnace of Pittsburgh Coke & Iron Co. may exceed basing point prices by $2.25 per ton, effective July 27, 1942. E. & G. Brooke Co., Birdsboro, Pa., allowed $1 above basing point.

Refractories

Per 1000 f.o.b. Works, Net Prices

Fire Clay Brick

Super Quality

Pa., Mo., Ky.	$64.00

First Quality

Pa., Ill., Md., Mo., Ky.	51.30
Alabama, Georgia	51.30
New Jersey	53.00
Ohio	43.00

Second Quality

Pa., Ill., Md., Mo., Ky.	46.50
Alabama, Georgia	38.00
New Jersey	49.00
Ohio	36.00

Malleable Bung Brick

All bases	$59.80

Silica Brick

Pennsylvania	$51.30
Joliet, E. Chicago	58.90
Birmingham, Ala.	51.30

Ladle Brick

(Pa., O., W. Va., Mo.)

Dry press	$31.00
Wire cut	29.00

Magnesite

Domestic dead-burned grains, net ton f.o.b. Chewelah, Wash., net ton, bulk	22.00
net ton, bags	26.00

Basic Brick

Net ton, f.o.b. Baltimore, Plymouth Meeting, Chester, Pa.

Chrome brick	$54.00
Chem. bonded chrome	54.00
Magnesite brick	76.00
Chem. bonded magnesite	65.00

Fluorspar

Metallurgical grade, f.o.b. Ill., Ky., net ton, carloads CaF_2 content, 70% or more, $33; 65 but less than 70%, $32; 60 but less than 65% $31; less than 60%, $30. (After Aug. 29 base price any grade $30.)

Ferroalloy Prices

Ferromanganese (standard) 78-82% c.l. gross ton, duty paid, eastern, central and western zones, $135; add $6 for packed c.l., $10 for ton, $13.50 less-ton; f.o.b. cars, New Orleans, $1.70 for each 1%, or fraction contained manganese over 82% or under 78%; delivered Pittsburgh, $140.33.

Ferromanganese (Low and Medium Carbon); per lb. contained manganese; eastern zone, low carbon, bulk, c.l., 23c 2000 lb. to c.l., 23.40c; medium, 14.50c and 15.20c; central, low carbon, bulk, c.l., 23.30c; 2000 lb. to c.l., 24.40c; medium, 14.80c and 16.20c; western, low carbon, bulk, c.l., 24.50c, 2000 lb. to c.l., 25.40c; medium, 15.75c and 17.20c; f.o.b. shipping point, freight allowed.

Spiegeleisen: 19-21% carlots per gross ton, Palmerton, Pa. $36; 16-19%, $35.

Electrolytic Manganese: 99.9% plus, less ton lots, per lb. 37.6 cents.

Chromium Metal: 97% min. chromium, max. .50% carbon, eastern zone, per lb. contained chromium bulk, c.l., 79.50c, 2000 lb. to c.l. 80c; central, 81c and 82.50c; western, 82.25c and 84.75c; f.o.b. shipping point, freight allowed.

Ferrocolumbium: 50-60%, per lb. contained columbium in gross ton lots, contract basis, R.R. freight allowed, eastern zone, $2.25; less-ton lots $2.30. Spot prices 10 cents per lb. higher.

Ferrochrome: High carbon, eastern zone, bulk, c.l., 13c, 2000 lb. to c.l., 13.90c; central, add .40c and .65c; western, add 1c and 1.85c—high nitrogen, high carbon ferrochrome: Add 5c to all high carbon ferrochrome prices; all zones; low carbon eastern, bulk, c.l., max. 0.06% carbon, 23c, 0.10% 22.50c, 0.15% 22c, 0.20% 21.50c, 0.50% 21c, 1.00% 20.50c, 2.00% 19.50c; 2000 lb. to c.l., 0.06% 24c, 0.10% 23.50c, 0.15% 23c, 0.20% 22.50c, 0.50% 22c, 1.00% 21.50c, 2.00% 20.50c; central, add .4c for bulk, c.l. and .65c for 2000 lb. to c.l.; western, add 1c for bulk, c.l. and 1.85c for 2000 lb. to c.l.; carload packed differential .45c; f.o.b. shipping point, freight allowed. Prices per lb. contained Cr high nitrogen, low carbon ferrochrome: Add 2c to low carbon ferrochrome prices; all zones. For higher nitrogen carbon add 2c for each .25% of nitrogen over 0.75%.

Special Foundry ferrochrome: (Chrom. 62-66%, car. approx. 5-7%) Contract, carload, bulk, 13.50c, packed 13.95c, ton lots 14.40c, less, 14.90c, eastern, freight allowed, per pound contained chromium; 13.90c, 14.35c, 15.05c and 15.55c central; 14.50c, 14.95c, 16.25c and 16.75c, western; spot up .25c.

S.M. Ferrochrome, high carbon: (Chrom. 60-65%, sil. 4-6%, mang. 4-6% and carbon 4-6%.) Contract, carlot, bulk, 14.00c, packed, 14.45c, ton lots 14.90c, less 15.40c, eastern, freight allowed; 14.40c, 14.85c, 15.55c and 16.05c, central; 15.00c, 15.45c, 16.75c and 17.25c, western; spot up .25c; per pound contained chromium.

S.M. Ferrochrome, low carbon: (Chrom. 62-66%, sil. 4-6%, mang. 7%) Contract, carload, bulk 13.50c, 4-6% and carbon 1.25% max.) Contract, carlot, bulk, 20.00c, packed 20.45c, ton lots 21.00c, less ton lots 22.00c, eastern, freight allowed, per pound contained chromium; 20.40c, 20.85c, 21.65c and 22.65c, central; 21.00c, 21.45c, 22.85c and 23.85c, western; spot up .25c.

SMZ Alloy: (Silicon 60-65%, Mang. 5-7%, zir. 5-7% and iron approx. 20%) per lb. of alloy. Contract carlots 11.50c, ton lots 12.00c, less 12.50c, eastern zone, freight allowed; 12.00c. 12.85c and 13.35c central zone; 14.05c, 14.60c and 15.10c, western; spot up .25c.

Silcaz Alloy: (Sil. 35-40%, cal. 9-11%, alum. 6-8%, Zir. 3-5%, tit. 9-11% and boron 0.55-0.75%), per lb. of alloy. Contract, carlots 25.00c, ton lots 26.00c, less ton lots 27.00c, eastern, freight allowed; 25.50c, 26.75c and 27.75c, central; 27.50c, 28.90c and 29.90c, western; spot up .25c.

Silvaz Alloy: (Sil. 35-40% van. 9-11%, alum. 5-7%, zir. 5-7%, tit. 9-11% and boron 0.55-0.75%), per lb. of alloy. Contract, carlots 58.00c, ton lots 59.00c, less 60.00c, eastern, freight allowed; 58.50c, 59.75c and 60.75c, central; 60.50c, 61.90c and 62.90c, western; spot up ¼c.

CMSZ Alloy 4: (Chr. 45-49%, mang. 4-6%, sil. 18-21%, zir. 1.25-1.75%, and car. 3.00-4.50%). Contract, carlots, bulk, 11.00c and packed 11.50c; ton lots 12.00c; less 12.50c, eastern, freight allowed; 11.50c and 12.00c, 12.75c, 13.25c, central; 13.50c and 14.00c, 14.75c, 15.25c, western; spot up .25c.

CMSZ Alloy 5: (Chr. 50-56%, mang. 4-6%, sil. 13.50-16.00%, zir. .75-1.25%, car. 3.50-5.00%) per lb. of alloy. Contract, carlots, bulk, 10.75c, packed 11.25c, ton lots 11.75c, less 12.25c, eastern, freight allowed; 11.25c, 11.75c and 12.50c, central; 13.25c and 13.75c, 14.50c and 15.00c, western, spot up .25c.

Ferro-Boron: (Bor. 17.50% min., sil. 1.50% max., alum. 0.50% max. and car. 0.50% Max.) per lb. of alloy. Contract ton lots, $1.20, less ton lots $1.30, eastern, freight allowed; $1.2075 and $1.3075 central; $1.229 and $1.329, western; spot add 5c.

Manganese-Boron: (Mang. 75% approx., boron 15-20%, iron 5% max., sil. 1.50% max. and carbon 3% max.), per lb. of alloy. Contract, ton lots, $1.89, less, $2.01, eastern, freight allowed; $1.903 and $2.023 central, $1.935 and $2.055 western, spot up 5c.

Nickel-Boron: (Bor. 15-18%, alum. 1% max., sil. 1.50% max., car. 0.50% max., iron 3% max., nickel, balance), per lb. of alloy. Contract, 5 tons or more, $1.90, 1 ton to 5 tons, $2.00, less than ton $2.10, eastern, freight allowed; $1.9125, $2.0125 and $2.1125, central; $1.9445, $2.0445 and $2.1445, western; spot same as contract.

Chromium-Copper: (Chrom. 8-11%, cu. 88-90%, iron 1% max., sil. 0.50% max.) contract, any quantity, 45c, eastern, Niagara Falls, N. Y., basis, freight allowed to destination, except to points taking rate in excess of St. Louis rate, to which equivalent of St. Louis rate will be allowed; spot, up 2c.

Vanadium Oxide: (Fused: Vanadium oxide 85-88%, sodium oxide, approx. 10% and calcium oxide approx. 2%, or Red Cake: Vanadium oxide 85% approx., sodium oxide, approx. 9% and water approx.

2.5%) Contract, any quantity, $1.10 eastern, freight allowed, per pound vanadium oxide contained; contract, carlots, $1.105, less carlots, $1.108, central; $1.118 and $1.133, western; spot add 5c to contracts in all cases.

Calcium metal; cast: Contract, ton lots or more $1.80, less, $2.30. eastern zone, freight allowed, per pound of metal; $1.809 and $2.309, Central, $1.849 and $2.349, western; spot up 5c.

Calcium-Manganese-Silicon: (Cal. 16-20%, mang. 14-18% and sil. 53-59%), per lb. of alloy. Contract, carlots, 15.50c, ton lots 16.50c and less 17.00c, eastern, freight allowed; 16.00c, 17.35c and 17.85c, central; 18.05c, 19.10c and 19.60c western; spot up .25c.

Calcium-Silicon: (Cal. 30-35%, sil. 60-65% and iron 3.00% max.), per lb. of alloy. Contract, carlot, lump 13.00c, ton lots 14.50c, less 15.50c, eastern, freight allowed; 13.50c, 15.25c and 16.25c central; 15.55c, 17.40c and 18.40c, western; spot up .25c.

Briquets, Ferromanganese: (Weight approx. 3 lbs. and containing exactly 2 lbs. mang.), per lb. of briquets. Contract, carlots, bulk .0605c, packed .063c, tons .0655c, less .068c, eastern, freight allowed; .063c, .0655c, .0755c and .078c, central; .066c, .0685c, .0855c and .088c, western; spot up .25c.

Briquets: Ferrochrome, containing exactly 2 lb. cr., eastern zone, bulk, c.l., 8.25c per lb. of briquets, 2000 lb. to c.l., 8.75c; central, add .3c for c.l. and .5c for 2000 lb. to c.l.; western, add .70c for c.l., and .2c for 2000 lb. to c.l.; **silicomanganese,** eastern, containing exactly 2 lb. manganese and approx. ½ lb. silicon, bulk, c.l., 5.80c, 2000 lbs. to c.l., 6.30c; central, add .25c for c.l. and 1c for 2000 lb. to c.l.; western, add .5c for c.l., and 2c for 2000 lb. to c.l.; **ferrosilicon,** eastern, approx. 5 lb., containing exactly 2 lb. silicon, or weighing approx. 2½ lb. and containing exactly 1 lb. of silicon, bulk, c.l., 3.35c, 2000 lb. to c.l., 3.80c; central, add 1.50c for c.l., and .40c for 2000 lb. to c.l.; western, add 3.0c for c.l. and .45c for 2000 to c.l.; f.o.b. shipping point, freight allowed.

Ferromolybdenum: 55-75% per lb. contained molybdenum, f.o.b. Langeloth and Washington, Pa., furnace, any quantity 95.00c.

Ferrophosphorus: 17-19%, based on 18% phosphorus content, with unitage of $3 for each 1% of phosphorus above or below the base; gross tons per carload f.o.b. sellers' works, with freight equalized with Rockdale, Tenn.; contract price $58.50, spot $62.25.

Ferrosilicon: Eastern zone, 90-95%, bulk, c.l., 11.05c, 2000 lb. to c.l., 12.30c; 80-90%, bulk c.l., 8.90c, 2000 lb. to c.l., 9.95c; 75%, bulk, c.l., 8.05c, 2000 lb. to c.l., 9.05c; 50%, bulk c.l., 6.65c and 2000 lb. to c.l., 7.85c; central 90-95%, bulk, c.l., 11.20c, 2000 lb. to c.l., 12.80c; 80-90%, bulk, c.l., 9.05c, 2000 to c.l., 10.45c; 75%, bulk, c.l., 8.20c, 2000 lb. to c.l., 9.65c; 50% bulk, c.l., 7.10c, 2000 lb. to c.l., 9.70c; western, 90-95%, bulk, c.l., 11.65c, 2000 lb. to c.l., 15.60c; 80-90%, bulk, c.l., 9.55c, 2000 lb. to c.l., 13.50c; 75%, bulk, c.l., 8.75c, 2000 to c.l., 13.10c; 50%, bulk, c.l., 7.25c, 2000 to c.l., 8.75c; f.o.b. shipping point, freight allowed. Prices per lb. contained silicon.

Silicon Metal: Min. 97% silicon and max. 1% iron, eastern zone, bulk, c.l., 12.90c, 2000 lb. to c.l., 13.45c; central, 13.20c and 13.90c; western, 13.85c and 16.80c; min. 96% silicon and max. 2% iron, eastern, bulk, c.l., 12.50c, 2000 lb. to c.l., 13.10c; central, 12.80c and 13.55c; western, 13.45c and 16.50c; f.o.b. shipping point, freight allowed. Prices per lb. contained silicon.

Manganese Metal: (96 to 98% manganese, max. 2% iron), per lb. of metal, eastern zone, bulk, c.l., 36c, 2000 lb. to c.l., 38c, central, 36.25c, and 39c; western, 36.55c and 41.05c; 95 to 97% manganese, max. 2.50% iron, eastern, bulk, c.l., 34c; 2000 c.l., 35c; central, 34.25c and 36c; western, 34.55c and 38.95c; f.o.b. shipping point, freight allowed.

Ferrotungsten: Carlots, per lb. contained tungsten, $1.90.

Tungsten Metal Powder: 98-99% per lb. any quantity $2.55-2.65.

Ferrotitanium: 40-45%, R.R. freight allowed, per lb. contained titanium; ton lots $1.23; less-ton lots $1.25; eastern. Spot up 5 cents per lb.

Ferrotitanium: 20-25%, 0.10 maximum carbon; per lb. contained titanium; ton lots $1.35; less-ton lots $1.40; eastern. Spot 5 cents per lb. higher.

High-Carbon Ferrotitanium: 15-20% contract basis, per gross ton, f.o.b. Niagara Falls, N. Y., freight allowed to destination east of Mississippi River and North of Baltimore and St. Louis, 6-8% carbon $142.50; 3-5% carbon $157.50.

Carbortam: Boron 0.90 to 1.15%, net ton to carload, 8c lb. F.O.B. Suspension Bridge, N. Y., frt. allowed same as high-carbon ferrotitanium.

Bortam: Boron 1.5-1.9%, ton lots 45c lb., less ton lots 50c lb.

Ferrovanadium: 35-55%, contract basis, per lb. contained vanadium, f.o.b. producers plant with usual freight allowances; open-hearth grade $2.70; special grade $2.80; highly-special grade $2.90.

Zirconium Alloys: 12-15%, per lb. of alloy, eastern, contract, carlots, bulk, 4.60c, packed 4.80c, ton lots 4.80c, less tons 5c, carloads bulk, per gross ton $102.50; packed $107.50; ton lots $108; less-ton lots $112.50. Spot ¾c per ton higher.

Zirconium Alloy: 35-40%, Eastern, contract basis, carloads in bulk or package, per lb. of alloy 14.00c; gross ton lots 15.00c; less-ton lots 16.00c. Spot ¼-cent higher.

Alsifer: (Approx. 20% aluminum, 40% silicon, 40% iron) contract basis f.o.b. Niagara Falls, N. Y., per lb. 5.75; ton lots 6.50c. Spot ½ cent higher.

Simanal: (Approx. 20% each silicon, manganese, aluminum) Contract basis, freight allowed, per lb. of alloy; carlots 8.75c; ton lots 9.25c, less ton lots, 9.75c.

Boresil: 3 to 4% boron, 40 to 45% Si., $6.25 lb. cont. Bo., f.o.b. Philo, O., freight not exceeding St. Louis rate allowed.

OPEN MARKET PRICES, IRON AND STEEL SCRAP

Following prices are below-ceiling quotations developed by editors of STEEL in the various centers. For complete OPA ceiling price schedule refer to page 156 of Sept. 4, 1944, issue of STEEL.

PHILADELPHIA:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$18.75
No. 2 Heavy Melt. Steel	18.75
No. 1 Bundles	18.75
No. 2 Bundles	18.75
No. 3 Bundles	16.75
Machine Shop Turnings	13.75
Mixed Borings, Turnings	13.75
Shoveling Turnings	15.75
No. 2 Busheling	15.00
Billet, Forge Crops	21.25
Bar Crops, Plate Scrap	21.25
Cast Steel	21.25
Punchings	21.25
Elec. Furnace Bundles	19.75
Heavy Turnings	18.25

Cast Grades

(F.o.b. Shipping Point)

Heavy Breakable Cast	16.50
Charging Box Cast	19.00
Cupola Cast	20.00
Unstripped Motor Blocks	17.50
Malleable	22.00
Chemical Borings	16.51

NEW YORK:

(Dealers' buying prices.)

No. 1 Heavy Melt. Steel	$15.33
No. 2 Heavy Melt. Steel	15.33
No. 2 Hyd. Bundles	15.33
No. 3 Hyd. Bundles	13.33
Chemical Borings	14.33
Machine Turning	10.33
Mixed Borings, Turnings	10.33
No. 1 Cupola	20.00
Charging Box	19.00
Heavy Breakable	16.50
Unstrip Motor Blocks	17.50
Stove Plate	19.00

CLEVELAND:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$19.50
No. 2 Heavy Melt. Steel	19.50
No. 1 Comp. Bundles	19.50
No. 2 Comp. Bundles	19.50
No. 1 Busheling	19.50
Mach. Shop Turnings	13.50-14.00
Short Shovel Turnings	15.50-16.00
Mixed Borings, Turnings	13.50-14.00
No. 1 Cupola Cast	20.00
Heavy Breakable Cast	16.50
Cast Iron Borings	15.50
Billet, Bloom Crops	24.50
Sheet Bar Crops	22.00
Plate Scrap, Punchings	22.00
Elec. Furnace Bundles	20.50

BOSTON:

(F.o.b. shipping points)

No. 1 Heavy Melt. Steel	$14.06*
No. 2 Heavy Melt. Steel	14.06*
No. 1 Bundles	14.06*
No. 2 Bundles	14.06*
No. 1 Busheling	14.06*
Machine Shop Turnings	9.06
Mixed Borings, Turnings	9.06
Short Shovel, Turnings	11.06
Chemical Borings	14.80
Low Phos. Clippings	16.56
No. 1 Cast	20.00
Clean Auto Cast	20.00
Stove Plate	19.00
Heavy Breakable Cast	16.50

*Inland base ceiling; at ports switching district price 99 cents, Boston, to $1.09, Providence, higher.

PITTSBURGH:

(Delivered consumer's plant)

Railroad Heavy Melting	$21.00*
No. 1 Heavy Melt. Steel	20.00*
No. 2 Heavy Melt. Steel	20.00*
No. 1 Comp. Bundles	20.00*
No. 2 Comp. Bundles	20.00*
Mach. Shop Turnings	13.00
Short Shovel, Turnings	16.00
Mixed Borings, Turnings	13.00
No. 1 Cupola Cast	20.00*
Heavy Breakable Cast	16.50*
Cast Iron Borings	14.00
Billet, Bloom Crops	25.00*
Sheet Bar Crops	22.50*
Plate Scrap, Punchings	22.50*
Railroad Specialties	24.50*
Scrap Rail	21.50*
Axles	26.00*
Rail 3 ft. and under	23.50*
Railroad Malleable	21.00*

*Ceiling price.

VALLEY:

(Delivered consumer's plant)

No. 1 R.R. Hvy. Melt.	$21.00
No. 1 Heavy Melt. Steel	20.00
No. 1 Comp. Bundles	20.00
Short Shovel Turnings	17.00
Cast Iron Borings	16.00
Machine Shop Turnings	15.00
Low Phos. Plate	21.00-22.00

MANSFIELD, O.:

(Delivered consumer's plant)

Machine Shop Turnings	11.00

BIRMINGHAM:

(Delivered consumer's plant)

Billet, Forge Crops	$17.00
Structural, Plate Scrap	16.00-16.50
Scrap Rails, Random	15.00-15.50
Rerolling Rails	17.50-18.00
Angle, Splice Bars	16.50-17.00
Solid Steel Axles	14.50-15.00
Cupola Cast	21.00
Stove Plate	16.50-17.00

CHICAGO:

(Delivered consumer's plant)

No. 1, R.R. Hvy. Melt.	$19.75
No. 1 Heavy Melt. Steel	18.75
No. 2 Heavy Melt. Steel	18.75
No. 1 Ind. Bundles	18.75
No. 2 Dlr. Bundles	18.75
No. 3 Galv. Bundles	16.75
Machine Turnings	11.50-12.00
Mix. Borings, Sht. Turn.	12.00-12.50
Short Shovel Turnings	12.50-13.00
Cast Iron Borings	12.00-12.50
Scrap Rails	20.25
Cut Rails, 3 feet	22.25
Cut Rails, 18-inch	23.50
Angles, Splice Bars	22.25
Plate Scrap, Punchings	21.25
Railroad Specialties	22.75
No. 1 Cast	20.00
R.R. Malleable	22.00

(Cast grades f.o.b. shipping point, railroad grades f.o.b. tracks)

BUFFALO:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$19.25*
No. 2 Heavy Melt. Steel	19.25*
No. 1 Bundles	19.25*
No. 2 Bundles	19.25*
No. 1 Busheling	19.25
Machine Turnings	11.00-11.50
Short Shovel. Turnings	16.00-16.50
Heavy Breakable Cast	16.00-16.50
Mixed Borings, Turn.	12.00-12.50
Cast Iron Borings	12.00-12.50
Low Phos.	21.75*

*Ceiling price.

DETROIT:

(Dealers' buying prices)

Heavy Melting Steel	$17.32*
No. 1 Busheling	17.32*
Hydraulic Bundles	17.32*
Flashings	17.32*
Machine Turnings	9.50-10.00
Short Turnings	13.00-13.50
Cast Iron Borings	12.00-12.50
Low Phos. Plate	19.82*
No. 1 Cast	20.00*
Heavy Breakable Cast	13.50-14.00

*Ceiling price.

ST. LOUIS:

(Delivered consumer's plant)

Heavy Melting	$17.50
No. 1 Locomotive Tires	17.50-18.00
Misc. rails	19.00
Railroad Springs	19.50-20.00
Bundled Sheets	13.00-13.50
Axle Turnings	14.00-14.50
Machine Turnings	7.50- 8.00
Rerolling Rails	21.00
Steel Car Axles	21.00-21.50
Steel Rails, 3 ft.	21.50
Steel Angle Bars	18.50-19.00
Cast Iron Wheels	20.00
No. 1 Machinery Cast	20.00
Railroad Malleable	20.00-20.50
Breakable Cast	16.50
Stove Plate	18.00
Grate Bars	15.25
Brake Shoes	15.25
(Cast grades f.o.b. shipping point)	
Stove Plate	18.00

CINCINNATI:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$18.50
No. 2 Heavy Melt. Steel	18.50
No. 1 Comp. Bundles	18.50
No. 2 Comp. Bundles	18.50
Machine Turnings	8.50- 9.00
Shoveling Turnings	10.50-11.00
Cast Iron Borings	10.50-11.00
Mixed Borings, Turnings	9.50-10.00
No. 1 Cupola Cast	20.00
Breakable Cast	16.50
Low Phosphorus	21.00-21.50
Scrap Rails	20.50-21.00
Stove Plate	16.00-16.50

LOS ANGELES:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$14.00
No. 2 Heavy Melt. Steel	13.00
No. 1, 2 Deal. Bundles	12.00
Machine Turnings	4.50
Mixed Borings, Turnings	4.00
No. 1 Cast	20.00

SAN FRANCISCO:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$15.50
No. 2 Heavy Melt. Steel	14.50
No. 1 Busheling	15.50
No. 1, No. 2 Bundles	13.50
No. 3 Bundles	9.00
Machine Turnings	6.00
Billet, Forge Crops	15.50
Bar Crops, Plate	15.50
Cast Steel	15.50
Cut Structural, Plate, 1", under	18.00
Alloy-free Turnings	7.50
Tin Can Bundles	14.50
No. 2 Steel Wheels	16.00
Iron, Steel Axles	23.00
No. 2 Cast Steel	15.00
Uncut Frogs, Switches	16.00
Scrap Rails	16.00
Locomotive Tires	16.00

NONFERROUS METAL PRICES

Copper: Electrolytic or Lake from producers in carlots 12.00c, Del. Conn., less carlots 12.12½c, refinery; dealers may add ⅝c for 5000 lbs. to carload; 1000-4999 lbs. 1c; 500-999 1½c; 0-499 2c. Casting, 11.75c, refinery for 20,000 lbs., or more, 12.00c less than 20,000 lbs.

Brass Ingot: Carlot prices, including 25 cents per hundred freight allowance; add ¼c for less than 20 tons; 85-5-5-5 (No. 115) 13.00c; 88-10-2 (No. 215) 16.50c; 80-10-10 (No. 305) 15.75c; Navy G (No. 225) 16.75c; Navy M (No. 245) 14.75c; No. 1 yellow (No. 405) 10.00c; manganese bronze (No. 420) 12.75c.

Zinc: Prime western 8.25c, select 8.35c, brass special 8.50c, intermediate 8.75c, E. St. Louis, for carlots. For 20,000 lbs. to carlots add 0.15c; 10,000-20,000 0.25c; 2000-10,000 0.40c; under 2000 0.50c.

Lead: Common 6.35c, chemical, 6.40c, corroding, 6.45c, E. St. Louis for carloads; add 5 points for Chicago, Minneapolis-St. Paul, Milwaukee-Kenosha districts; add 15 points for Cleveland-Akron-Detroit area, New Jersey, New York state, Texas, Pacific Coast, Richmond, Indianapolis-Kokomo; add 20 points for Birmingham, Connecticut, Boston-Worcester-Springfield, New Hampshire, Rhode Island.

Primary Aluminum: 99% plus, ingots 15.00c del., pigs 14.00c del.; metallurgical 94% min. 13.50c del. Base 10,000 lbs. and over; add ½c 2000-9999 lbs.; 1c less than 2000 lbs.

Secondary Aluminum: All grades 12.50c per lb. except as follows: Low-grade piston alloy (No. 122 type) 10.50c; No. 12 foundry alloy (No. 2 grade) 10.50c; chemical warfare service ingot (92½% plus) 10.00c; steel deoxidizers in notch bars, granulated or shot, Grade 1 (95-97½%) 11.00c, Grade 2 (92-95%) 9.50c to 9.75c, Grade 3 (90-92%) 8.50c to 8.75c, Grade 4 (85-90%) 7.50c to 8.00c; any other ingot containing over 1% iron, except PM 754 and hardness, 12.00c. Above prices for 30,000 lb. or more; add ¼c 10,000-30,000 lb.; ½c 1000-10,000 lbs.; 1c less than 1000 lbs. Prices include freight at carload rate up to 75 cents per hundred.

Magnesium: Commercially pure (99.8%) standard ingots (4-notch, 17 lbs.), 20.50c lb., add 1c for special shapes and sizes. Alloy ingots, incendiary bomb alloy, 23.40c; 50-50 magnesium-aluminum, 23.75c; ASTM B93-41T, Nos. 2, 3, 4, 12, 13, 14, 17, 23.00c; Nos. 4X, 11, 13X, 17X, 25.00c; ASTM B107-41T, or B-90-41T, No. 8X, 23.00c; No. 18, 23.50c; No. 18X, 25.00c. Selected magnesium crystals, crowns, and muffs, including all packing screening, barrelling, handling, and other preparation charges, 23.50c. Prices for 100 lbs. or more; for 25-100 lbs., add 10c; for less than 25 lbs., 20c. Incendiary bomb alloy, f.o.b. plant, any quantity; carload freight allowed all other alloys for 500 lbs. or more.

Tin: Prices ex-dock, New York in 5-ton lots. Add 1 cent for 2240-11,199 lbs., 1½c 1000-2239. 2½c 500-999, 3c under 500. Grade A, 99.8% or higher (includes Straits), 52.00c; Grade B, 99.8% or higher, not meeting specifications for Grade A, with 0.05 per cent maximum arsenic, 51.87½c; Grade C, 99.65-99.79% incl. 51.62½c; Grade D, 99.50-99.64% incl., 51.50c; Grade E, 99-99.49% incl. 51.12½c; Grade F, below 99% (for tin content), 51.00c.

Antimony: American, bulk carlots f.o.b. Laredo, Tex., 99.0% to 99.8% and 99.8% and over but not meeting specifications below, 14.50c; 99.8% and over (arsenic, 0.05%, max. and other impurities, 0.1%, max.) 15.00c. On producers' sales add ¼c for less than carload to 10,000 lb.; ½c for 9999-224-lb.; and 2c for 223 lb. and less; on sales by dealers, distributors and jobbers add ½c, 1c, and 3c, respectively.

Nickel: Electrolytic cathodes, 99.5%, f.o.b. refinery 35.00c lb.; pig and shot produced from electrolytic cathodes 36.00c; "F" nickel shot or ingot for additions to cast iron, 34.00c; Monel shot 28.00c.

Mercury: OPA ceiling prices per 76-lb. flask f.o.b. point of shipment or entry. Domestic produced in Calif., Oreg., Wash., Idaho, Nev., Ariz., $191; produced in Texas, Ark. $193. Foreign, produced in Mexico, duty paid, $193. Open market, spot, New York, nominal for 50 to 100 flasks; $118 to $120 in smaller quantities.

Arsenic: Prime, white, 99%, carlots, 4.00c lb.

Beryllium-Copper: 3.75-4.25% Be., $17 lb. contained Be.

Cadmium: Bars, ingots, pencils, pigs, plates, rods, slabs, sticks and all other "regular" straight or flat forms 90.00c lb., del.; anodes, balls, discs and all other special or patented shapes 95.00c lb. del.

Cobalt: 97-99%, $1.50 lb. for 550 lb. (bbl.); $1.52 lb. for 100 lb. (case); $1.57 lb. under 100 lb.

Indium: 99.9%, $7.50 per troy ounce.

Gold: U. S. Treasury, $35 per ounce.

Silver: Open market, N. Y. 44.75c per ounce.

Platinum: $35 per ounce.

Iridium: $165 per troy ounce.

Palladium: $24 per troy ounce.

Rolled, Drawn, Extruded Products

(Copper and brass product prices based on 12.00c, Conn., for copper. Freight prepaid on 100 lbs. or more.)

Sheet: Copper 20.87c; yellow brass 19.48c; commercial bronze, 90% 21.07c, 95% 21.28c; red brass, 80% 20.15c, 85% 20.36c; phosphor bronze, Grades A and B 5% 36.25c; Everdur, Herculoy, Duronze or equiv. 26.00c; naval brass 24.50c; manganese bronze 28.00c; Muntz metal 22.75c; nickel silver 5% 26.50c.

Rods: Copper, hot-rolled 17.37c, cold-rolled 18.37c; yellow brass 15.01c; commercial bronze 90% 21.32c, 95% 21.53c; red brass 80% 20.40c, 85% 20.61c; phosphor bronze Grade A, B 5% 36.50c; Everdur, Herculoy, Duronze or equiv. 25.50c; Naval brass 19.12c; manganese bronze 22.50c; Muntz metal 18.87c; nickel silver 5% 26.50c.

Seamless Tubing: Copper 21.37c; yellow brass 22.23c; commercial bronze 90% 23.47c; red brass 80% 22.80c, 85% 23.01c.

Extruded Shapes: Copper 20.87c; architectural bronze 19.12c; manganese bronze 24.00c, Muntz metal 20.12c; Naval brass 20.37c.

Angles and Channels: Yellow brass 27.96c; commercial bronze 90% 29.57c, 95% 29.78c; red brass 80% 28.65c, 85% 28.86c.

Copper Wire: Soft, f.o.b. Eastern mills, carlots 15.37½c, less-carlots 15.87½c; weatherproof, f.o.b. Eastern mills, carlots 17.00c, less-carlots 17.50c; magnet, delivered, carlots 17.50c, 15,000 lbs. or more 17.75c, less carlots 18.25c.

Aluminum Sheets and Circles: 2s and 3s, flat, mill finish, base 30,000 lbs. or more; del.; sheet widths as indicated; circle diameters 9" and larger:

Gage	Width	Sheets	Circles
.249"-7	12"-48"	22.70c	25.20c
8-10	12"-48"	23.20c	25.70c
11-12	26"-48"	24.20c	27.00c
13-14	26"-48"	25.20c	28.50c
15-16	26"-48"	26.40c	30.40c
17-18	26"-48"	27.90c	32.90c
19-20	24"-42"	29.80c	35.30c
21-22	24"-42"	31.70c	37.20c
23-24	3"-24"	25.60c	29.20c

Lead Products: Prices to jobbers; full sheets 9.50c; cut sheets 9.75c; pipe 8.15c, New York; 8.25c, Philadelphia, Baltimore, Rochester and Buffalo; 8.75c, Chicago, Cleveland, Worcester, Boston.

Zinc Products: Sheet f.o.b. mill, 13.15c; 36,000 lbs. and over deduct 7%. Ribbon and strip 12.25c, 3000-lb. lots deduct 1%, 6000 lbs. 2% 9000 lbs. 3%, 18,000 lbs. 4%, carloads and over 7%. Boiler plate (not over 12") 3 tons and over 11.00c; 1-3 tons 12.00c; 500-2000 lbs. 12.50c; 100-500 lbs. 13.00c; under 100 lbs. 14.00c. Hull plate (over 12") add 1c to boiler plate prices.

Plating Materials

Chromic Acid: 99.75%, flake, del., carloads 16.25c; 5 tons and over 16.75c; 1-5 tons 17.25c; 400 lbs. to 1 ton 17.75c; under 400 lbs. 18.25c.

Copper Anodes: Base 2000-5000 lbs., del.; oval 17.62c; untrimmed 18.12c; electro-deposited 17.37c.

Copper Carbonate: 52-54% metallic cu, 250 lb. barrels 20.50c.

Copper Cyanide: 70-71% cu, 100-lb. kegs or bbls. 34.00c f.o.b. Niagara Falls.

Sodium Cyanide: 96%, 200-lb. drums 15.00c; 10,000-lb. lots 13.00c f.o.b. Niagara Falls.

Nickel Anodes: 500-2999 lb. lots; cast and rolled carbonized 47.00c; rolled, depolarized 48.00c.

Nickel Chloride: 100-lb. kegs or 275-lb. bbls. 18.00c lb., del.

Tin Anodes: 1000 lbs. and over 58.50c, del.; 500-999 59.00c; 200-499 59.50c; 100-199 61.00c.

Tin Crystals: 400 lb. bbls. 39.00c f.o.b. Grasselli, N. J.; 100-lb. kegs 39.50c.

Sodium Stannate: 100 or 300-lb. drums 36.50c, del.; ton lots 33.50c.

Zinc Cyanide: 100-lb. kegs or bbls. 33.00c, f.o.b. Niagara Falls.

Scrap Metals

Brass Mill Allowances: Prices for less than 15,000 lbs. f.o.b. shipping point. Add ⅝c for 15,000-40,000 lbs.; 1c for 40,000 lbs. or more.

	Clean Heavy	Rod Ends	Clean Turnings
Copper	10.250	10.250	9.500
Tinned Copper	9.625	9.625	9.375
Yellow Brass	8.625	8.375	7.875
Commercial bronze			
90%	9.375	9.125	8.625
95%	9.500	9.250	8.750
Red Brass, 85%	9.125	8.875	8.375
Red Brass, 80%	9.125	8.875	8.375
Muntz metal	8.000	7.750	7.250
Nickel Sil., 5%	9.250	9.000	4.625
Phos. br., A, B, 5%	11.000	10.750	9.750
Herculoy, Everdur or equivalent	10.250	10.000	9.250
Naval brass	8.250	8.000	7.500
Mang. bronze	8.250	3.000	7.500

Other than Brass Mill Scrap: Prices apply on material not meeting brass mill specifications and are f.o.b. shipping point; add ¾c for shipment of 60,000 lbs. of one group and ½c for 20,000 lbs. of second group shipped in same car. Typical prices follow:

(Group 1) No. 1 heavy copper and wire, No. 1 tinned copper, copper borings 9.75c; No. 2 copper wire and mixed heavy copper, copper tuyeres 8.75c.

(Group 2) soft red brass and borings, aluminum bronze 9.00c; copper-nickel and borings 9.25c; car boxes, cocks and faucets 7.75c; bell metal 15.50c; babbit-lined brass bushings 13.00c.

(Group 3) zincy bronze borings, Admiralty condenser tubes, brass pipe 7.50c; Muntz metal condenser tubes 7.00c; yellow brass 6.25c; manganese bronze (lead 0.00%-0.40%) 7.25c, (lead 0.41%-1.00%) 6.25c; manganese bronze borings (lead 0.00-0.40%) 6.50c, (lead 0.41-1.00%) 5.50c.

Aluminum Scrap: Prices f.o.b. point of shipment, respectively for lots of less than 1000 lbs.; 1000-20,000 lbs. and 20,000 lbs. or more, plant scrap only. Segregated solids: S-type alloys (2S, 3S, 17S, 18S, 24S, 32S, 52S) 9.00c, 10.00c, 10.50c; All other high grade alloys 8.50c, 9.50c, 10.00c; low grade alloys 8.00c, 9.00c, 9.50c. Segregated borings and turnings: Wrought alloys (17S, 18S, 32S, 52S) 7.50c, 8.50c, 9.00c; all other high grade alloys 7.00c, 8.00c, 8.50c; low grade alloys 6.50c, 7.50c, 8.00c. Mixed plant scrap, all solids, 7.50c, 8.50c, 9.00c; borings and turnings 5.50c, 6.50c, 7.00c.

Lead Scrap: Prices f.o.b. point of shipment. For soft and hard lead, including cable lead, deduct 0.55c from basing point prices for refined metal.

Zinc Scrap: New clippings, old zinc 7.25c f.o.b. point of shipment; add ½-cent for 10,000 lbs. or more: New die-cast scrap, radiator grilles 4.95c, add ½c 20,000 or more. Unsweated zinc dross, die cast slab 5.80c any quantity.

Nickel, Monel Scrap: Prices f.o.b. point of shipment; add ½c for 2000 lbs. or more of nickel or cupro-nickel shipped at one time and 20,000 lbs. or more of Monel. Converters (dealers) allowed 2c premium.

Nickel: 98% or more nickel and not over ½% copper 26.00c; 90-98% nickel, 26.00c per lb. nickel contained.

Cupro-nickel: 90% or more combined nickel and copper 26.00c per lb. contained nickel, plus 8.00c per lb. contained copper; less than 90% combined nickel and copper 26.00c for contained nickel only.

Monel: No. 1 castings, turnings 15.00c; new clipping 20.00c; soldered sheet 18.00c.

Sheets, Strip . . .

Sheet & Strip Prices, Page 140

Sheet and strip demand continue to tighten steadily and deliveries are being further extended on all grades, galvanized being most in demand. Other grades are being substituted, to be painted for weather protection. Galvanized deliveries now are mainly in second half. Other grades may be obtained a little earlier but delivery is steadily pushing forward.

New York — Sheet schedules have stiffened as a result of further orders, including directives for cold-rolled material for rolling in February and March for the Signal Corps. General delivery promises on cold-rolled and hot-rolled sheets fall largely in May and June, which is about the range of a week ago, although schedules are tighter for that period.

Galvanized sheet schedules are the most extended of all. While a little tonnage can still be had in May and June, most sellers quote third quarter and beyond. Electrical sheet schedules are moving steadily forward, with most offerings falling in May, and there is a stiffening in stainless steel sheets, for again this type of material is under strict limitations. Sheet demand locally is only fair, with few outstanding orders reported here.

Chicago — Galvanized sheets stand as the tightest of all sheet products, with hot-rolled a close second. Unable to get adequate supply of galvanized to satisfy its requirements, the Navy is now seeking a substantial tonnage of corrugated pickled sheets, apparently to be weatherproofed by painting. One local mill would be able to supply only cold-rolled, and these only if the government lends assistance in obtaining manpower.

Pittsburgh — In addition to new programs and new products which will require a heavy tonnage of sheets in first half, reinstatement of older programs is complicating the situation. New and heavy tonnages for drums, blitz cans, landing mats and miscellaneous containers, on which sheet mills here believed they had produced their last order, have been building up with all mills and will eliminate any vestige of civilian goods orders which had been placed under Z-1 during fourth quarter. The sheet situation is so tight and demand so heavy that a reduction in tin plate quotas for the first quarter now is expected. Galvanized production during the first two quarters will be the heaviest since the beginning of the war, with the possibility that early production will come from plants now idle. There is still talk that some lines will be expanded to meet heavy demand for corrugated sheets needed in construction programs by both the Army and Navy.

Cincinnati—Backlogs of district sheet mills extend into May on hot-rolled, cold-rolled and galvanized and mill interests look to a rapid filling of books for entire first half. Reports in the trade indicate more sheets will be required for a landing mat program, which had been curtailed late last year. Attention to reconversion plans and to Z-1 allotments has faded. Absenteeism due to holidays and severe weather conditions was light. Shortage of fuel gas and a high river stage are current threats to output but are expected to cause only light, if any, loss in tonnage.

Boston — Narrow cold strip bookings are up sharply; first quarter schedules are filled and some high carbon and alloy grades are in May. Notably for small arms and ammunition, heavier orders reflect generally increased war programs. Clip steel buying is stronger, also strip for rifle magazines and other parts and components. Chain steel requirements bolster alloy bookings. Operations in shops fabricating clips are being increased. Delivery on substantial part of new tonnage is urgent, with directives likely, displacing some tonnage previously scheduled. Acme Steel Co., Chicago, has contracts for steel strapping, against a recent 1800-ton Navy inquiry, delivery New York or San Francisco on f.o.b., Chicago, basis. A New Britain, Conn., mill bid on part.

Cleveland—Continuation of the relatively recent upturn in war requirements for hot and cold-rolled sheets has further extended delivery promises into second quarter. December bookings were up 15 to 20 per cent and no decline in demand is expected throughout January. Galvanized sheets are being promised for late third quarter delivery in some instances, and additional directives are expected to be superimposed on the already heavy backlog. Most of the increased requirements is for shell containers, cartridge clips, steel barrels. Cold-rolled sheets are in somewhat less demand than hot-rolled. Sellers report order cancellations have been practically nil for some weeks now.

Philadelphia — The shell program is being reflected to increasing degree in sheets, with directives now coming through for cartridge case steel and hot-rolled pickled grades for rocket components. Landing mat requirements are also reflected. Most sellers of hot-rolled sheets have little to offer before June and recently there has been a substantial spurt in cold-rolled sheets. Some producers can offer tonnage for June and even a little in May, but promises fall increasingly into third quarter. Some producers now are booked solidly to September. Recently buying has included substantial tonnage for the Signal Corps, with directives in some cases for February and March. Locally there has been some fair buying of enameling stock by stovemakers.

Bars . . .

Bar Prices, Page 140

Deliveries of steel bars continue to tighten with needs for ammunition promising further pressure in the next few weeks. Barmakers receiving additional tonnage for this purpose are hard pressed to regain labor allowed to go elsewhere when the munitions cut was made last year. While March delivery can be made in some instances, most orders now obtain no better than second quarter, in some instances June and July. From February on needs for shell steel are scheduled to grow steadily.

Chicago — Armament need appears so urgent that requirements of production may have to be augmented by warehouse and surplus stocks as well as mill supply. Beginning in February, output of shell steel billets will increase steadily. The obligation of one producer will rise in February about 20 per cent over January, and the increase by April by 40 to 45 per cent over January. Forgers have comfortable backlogs, due not only to general conditions but also to lack of manpower, which narrows output. Deliveries on carbon bars have moved from March and April to June and July. Popular sizes of alloy bars, however, are in easier position with delivery possible in March.

New York — Bar schedules continue to stiffen, and while some producers can still offer late March on certain sizes, promises fall generally in second quarter and beyond. Some producers have little to offer in any specification for April delivery. In general the larger the sizes the more extended the delivery promises. But even this situation may change in some degree as requirements for the light shell program broaden. One factor in retarding expansion of this program at present is lack of manpower. Facilities are available but time is required for manufacturers of this type of munition to reassemble the forces they had at the time they received heavy cutbacks several months ago.

Boston — Broadening demand for bars, largely for ordnance and ammunition components, covers most grades of carbon in more smaller and medium sizes, notably cold-finished; deliveries are lengthening and second quarter schedules are filling on more sizes predominating in this area. Alloy orders are also slightly heavier, and, while deliveries are more extended, most wanted grades are still available for this quarter. Forge shops, booking additional orders, are placing more bar tonnage; operations in most cases are up to manpower limitations. As with foundries, labor is the choke point in forge shop consumption. In few directions have bar fabricators failed to share in larger war volume. Aircraft engine and component assembly plants are placing more tonnage, but conservatively.

Cleveland—Demand for hot and cold-rolled alloy bars has made a marked increase in recent weeks, with some producers reporting bookings through Dec. 20 equal to that for the full month of November which in turn was double that of October. Deliveries on hot-rolled bars are now extended 9 to 12 weeks, in contrast to 3 to 6 weeks but a short time back. Sharply augmented heavy shell program is expected to tax mills' production schedules for some months. Forge shops and cold-rollers report sharp increase in order backlogs and have increased operations where feasible. Railroads are also taking an increasing tonnage of both carbon and alloy steel bars. The expected increase in requirements for NE steels from machine tool builders has not yet developed but the industry's expanding order backlog indicates renewed buying as production schedules are expanded.

Philadelphia — Gun and ammunition requirements continue to expand, forcing bar schedules further ahead. Narrow flats and extremely small rounds can still be had in March but larger sizes generally fall well into second quarter, with some producers having little to offer before June. Alloy bar schedules also have stiffened. Hot alloy grades still can be had in February, but one large producer, whose schedules only recently ran four to six weeks, now is quoting nine to twelve weeks. There is an expansion in schedules generally, ascribed mainly to livelier demand from airplane manufacturers and others, who are bringing stocks to better balance, not only because of increasing needs, but because of the possibility of tightening

in certain alloy supplies later on. This possibility, it is pointed out, is indicated in renewal of certain end-use limitations in stainless steel sheets, a general effort again being made to confine use of this material to most critical requirements.

Plates . . .

Plate Prices, Page 141

Renewed shipbuilding demand is affording a lift to plate demand, though not sufficient to change the general downward movement from the high levels of last year. A Maritime Commission program for 226 ships will require about 940,000 tons of plates, spread over seven months, beginning in February. A new landing craft program for first half, involving about 2,000,000 tons of plates is reported under consideration. These needs are understood not to involve a change in converting continuous strip mills back to sheets and strip but will be handled by regular plate mills.

New York — Approximately 940,000 tons of plates will be required for the new maritime program, involving 226 ships. Rolling will begin in February, with the program extending over seven months. Heaviest demand will fall in March, with requirements tapering from then on.

This program, which developed suddenly and was quite unexpected in the trade, will naturally bolster plate specifications, but nevertheless will not change the overall downward trend in plate tonnage. Strip mills which have already been taken off plate production will not receive any of the new tonnage, it is reliably indicated; in fact, the present shift of plate tonnage from the strip mills to the regular sheared producers will continue. Also there will be no overloading of mills to meet requirements of the new program. It is estimated that the "demand" requirements for the new program in March, representing the peak amount, will be around 280,000 tons.

Various yards along the Atlantic, Gulf and West Coasts, will participate in the construction of the new ships, with the United States Maritime Commission expected to make a definite announcement shortly as to distribution.

Chicago—Talk is heard here of a new landing craft program which may require as much as 2,000,000 tons of plates during first half this year. Likewise, the current tanker program will place a heavier burden on plates. It appears probable, however, that eastern mills will absorb the major portion of the new load, since most construction will be scheduled for eastern seaboard and mill loads in that area have been lightest of late. It is understood an inquiry has been received from Sweden for 25,000 tons, including bars as well as plates. Narrow sheared plates reflect the renewed war activity most; one mill here reporting its deliveries have moved from April to June. Wider sheared plates remain in March, as do universal plates.

Philadelphia — Distribution of about 940,000 tons of plates for a new program of 226 merchant ships is under way, with most, if not all, scheduled for sheared plate producers, thus providing strip mills greater freedom in meeting heavy demand for sheets. Most of the new plate tonnage comes at a time when until recently it appeared that plate schedules would be at by far the

lowest point since prior to the war. Rolling of these plates will start in February, reaching a peak in March and tapering over the next five months. Available schedule space is being frozen to meet these requirements, with probability that 250,000 to 280,000 tons will be rolled in March. In view of indicated needs for this work some producers are now out of the market for entire first quarter.

Despite requirements of this plate program the general overall trend in plates is still downward, with continuing diversion of plates away from strip mills.

The present program represents an increase of 40 ships over those originally announced recently, due principally to increase in number of tankers. Sixty of this type now are to be included, with Sun Shipbuilding Co. to launch 20. Announcement of distribution of ships for this program reveals heavy participation of East and West Coast yards, with Gulf Coast yards sharing substantially.

Cleveland — Directives for relatively prompt delivery on plates have tended to increase somewhat in recent weeks, reflecting heavier requirements from the Maritime Commission which include 226 cargo vessels. Mill deliveries in most instances are now extended into March in contrast with February around the close of last year. Sellers state that overall plate requirements have tended to level off at well below the peak reached last year, but the downward trend is less than expected. Some producers have benefited more than others in the partial changeover from the rolling of plates to that of sheets, based on the companies' emphasis on sheet production in the prewar period. Considerable work is being carried out this winter in repair and general maintenance of lake ore carriers and cargo vessels. Plate tonnage for most of this work, however, was ordered early in the fall.

Tin Plate . . .

Tin Plate Prices, Page 141

Pittsburgh — Although there has been no official word as to any change in the status of first quarter tin plate quotas, rumors continue here that there will be a revision due to increasingly difficult sheet production schedules. Some reports indicate the total will be reduced, while others seem to indicate there will be no actual cut in the quota but mills will just be unable to produce the required volume of tin plate to meet the permitted 900,000 tons during first quarter. It now seems fairly definite that there will be further delay in revising M-81 so as to permit wider use of electrolytic plate, particularly for general line cans. Some sources here see a possible hold-up of such revisions until after the present sheet situation can clear up and more time becomes available on the mills.

Chicago—Report is that tin plate production is to be cut from 300,000 tons per month currently to 275,000 tons per month starting in March. The latter is approximately the rate of fourth quarter last year. For one local producer, this will mean a cut of 6600 tons per month in its directive. Steel thus diverted will go into galvanized sheets. Its books on tin mill products are now closed for March acceptance. Deliveries now stand in April. For another company, the steel diverted from tin plate may go into increased rail output.

Tubular Goods . . .

Tubular Goods Prices, Page 141

Pittsburgh—Demand for virtually all sizes of seamless mechanical tubing is on the increase and load directives have been reinstated on warehouses after new military orders threatened to displace all warehouse tonnage. The entire tubular goods picture is now tight and it is expected that some changes in oil country regulation will be issued soon to reduce the volume of these items now carried in inventory. Merchant pipe demand continues fairly light although there has been some pressure for galvanized pipe recently in the face of a possible tightening of galvanized supply later this year. Backlogs of pressure tubing have been reduced somewhat in line with reduction in the shipping program. Of interest in the market last week was the announcement by Jones & Laughlin Steel Corp., Pittsburgh, of the acquisition of the electric welded tube producing plant of Talon Inc., at Oil City, Pa. This represents the initial venture of J. & L. into the field of electric welded tubing.

Wire . . .

Wire Prices, Page 141

New York — Much CMP wire tonnage scheduled by mills is reshuffled by placing of additional urgent war orders covered by directives. Some volume is set back indefinitely, while other CMP orders are retained in part but protected by directives. Spring wire for bedding and furniture requirements suffers further setbacks. Some CMP tonnage displaced is for important war needs indirectly but is less urgent than that placed in revised schedules. Integrated mills in some cases have 80 per cent of production going to the general trade tied to directives. The tightest situation during the war period prevails in numerous finishing departments. Higher prices expected to be permitted on various steel products are likely to affect some wire items in the form of revised extras, such as coppering and tinning, while many conjecture an increase on some types of nails.

Rails, Cars . . .

Track Material Prices, Page 141

New York — Substantial domestic freight car orders at the close of last year brought the December total up to more than 15,500, exceeding the previous record for the year of 13,240 in February. On the basis of present returns, the total for the year is 52,039, compared with 41,355 for 1943, 26,028 for 1942 and 121,499 for 1941. Final returns for the year may increase the present total slightly.

Chicago — Pressure continues for increased production of rail in 1945. In the case of one local producer, there is some prospect that the steel resulting from cutback in tin plate production may be diverted to rails. An Illinois locomotive manufacturer reports a 90 per

cent reduction in its Army locomotive program.

Birmingham, Ala. — Mills in this district have booked for 1945 the largest volume of railroad business in its history. Approximately 500,000 tons of steel rails have been placed. A recent freight car order has been received from the Seaboard Air Line, for 500 box cars, to the local plant of the Pullman Car Mfg. Co.

Structural Shapes . . .

Structural Shape Prices, Page 141

Chicago — Structural fabricators have comfortable backlogs for several months, due not only to increased orders for war items, but also to lack of manpower, which holds current output below schedule. A number of building projects, which came out for inquiry recently, when it appeared that steel would be available for pre-reconversion construction, have been abandoned temporarily. Standard structural shapes can be had for March delivery from mills, and small sizes in April.

Philadelphia — Structural activity generally is light although shape deliveries are becoming more extended, with little tonnage available before April, one producer quoting May on wide-flange sections. This reflects mainly encroachments of the shell program, not only on facilities but also on available steel. One producer estimates he could turn out 30 per cent more shapes were steel to be had for the purpose. Further shipwork is also having a bearing and is likely to provide structural shops with increasing subassembly work for some time. Orders are expected to be announced shortly for 8000 tons of structurals for 200 hangars for Army engineers, in two lots of 4000 tons each.

Boston — Although deliveries are more extended, more mills now promising April, structural shape buying and inquiry are light. Tightness is due to demands of the shell program on semi-finished steel and equipment rather than heavy inquiry for shapes. Shipyards account for most volume, which is off because of inventory adjustments. New buying by warehouses has also slackened, but most have orders with mills to the extent of allotments through first quarter. Railroad buying and bridge inquiry are at a standstill; an active bridge in New Hampshire will be reinforced concrete. While a few shops are well filled with work, most fabricators are seeking tonnage. This is bringing out lower competitive quotations, notably among light iron shops.

Cleveland—Mills generally are promising late March delivery on standard shapes, and fabricated material can usually be obtained six weeks later. Demand for plain shapes for military construction and ships continues heavy. Shipwork in particular has held up better than expected. Recent awards include: 600 tons, plant addition, for General Paint Co., Warren, O., to Austin Co., Cleveland; and 180 tons, Fairmount pumping station, Cleveland, to H. F. Jergens Co. Considerable tonnage is expected to be involved in the state highway bridge, Youngstown, for which Wilbur Watson & Associates are drawing plans.

Reinforcing Bars . . .

Reinforcing Bar Prices, Page 141

Chicago — Reinforcing steel demand has shrunk still further. Not only has

little tonnage been placed recently, but new inquiry has fallen sharply. In some cases, projects out for bids are being withdrawn since it has become clear that war production will have right of way for some time. In other cases, after jobs are awarded to contractors, steel can not be bought because allotments are lacking.

Seattle—Demand for reinforcing is of minor importance. Several hospital structures and other large buildings are either under construction or projected, requiring small tonnages. Northwest Steel Rolling Mills has taken 100 tons for a nurses' home at Seattle and bids are called Jan. 10 for a $375,000 nurses' home at Tacoma. Mercer Steel Co. has the award for reinforcing involved in a wooden naval air station hangar at Klamath Falls, Oreg. Denver opened bids Dec. 28 for 2265 steel bars, one-inch and ¾-inch, 60 feet long. Local rolling mills are turning out large tonnages of merchant bars required in shipbuilding or handled through the jobbing trade.

Pig Iron . . .

Pig Iron Prices, Page 143

Labor continues the limiting factor in pig iron, both in foundries and at blast furnaces. Some tightness in supply of iron has developed in the Pittsburgh district, where idle furnaces could be started if workers could be obtained. January buying is somewhat heavier than late last year, with some melters not yet covered for first quarter.

Pittsburgh — The local situation in merchant iron continues to grow tighter, with demand for iron in January already considerably above production and with some regular buyers not yet booked for January shipments. In addition to foundry iron, there has been a substantial volume of new buying of basic iron on the part of steel mills in this area, who reportedly are unable to assemble enough manpower to put additional furnaces in blast. The volume of steelmaking iron required is so much larger than the normal merchant market that even a relatively small shortage in steelmaking iron burdens the local merchant producers and creates an almost impossible delivery situation. The addition of one blast furnace on 100 per cent merchant iron would relieve the situation and possibly throw the balance the other way. This is reflected in the pig iron situation as reported from other districts where merchant producers are actively soliciting new business. Apparently the tightest situation exists in both eastern and western Pennsylvania and surrounding areas. Because of price ceilings it is impossible for most manufacturers to bring in iron from any great distance.

Philadelphia — Pig iron demand continues pressing, especially for basic, although needs so far have been met with occasional tonnages having to be allocated.

New York — Continued pressure for pig iron is resulting in increasing speculation as to possibility of a return to formal allocation, a procedure which was lifted Feb. 1, almost a year ago. However, there are no definite indications that there will be such a return and thought of some trade leaders is that the present tightness, which is particularly noticeable in steelmaking grades, is due more to adverse weather conditions in certain sections of the country than to increase in demand.

Boston — Pig iron is potentially tigh

er, as reflected in lower furnace reserves and absence of tonnage for trans-shipment normally held at canal point, western New York. Consumer inventories range from 45 to 60 days; substantial number of smaller melters are closer to the inside period. However, no serious concern is held as to lack of iron in near future. Melt is steady, but unchanged. This will continue until manpower in foundries is expanded and to date there is slight improvement. Unless improved, this portends sluggishness in reconversion among larger consumers once restrictions are removed, centering largely among shops producing textile mill equipment and pulp-paper mill machinery. Largely for repairs and replacement rather than new machinery, the latter group stands to meet demand for expenditures approximating $200 million in early postwar years.

Cleveland — Pig iron output was reduced sharply here last week as Republic Steel Corp. was forced to bank four of its five units at the Corrigan McKinney plant, due to complete shutdown of coke ovens resulting from temporary shortage of coking coal and gas. By the close of the week all units were again in operation. For a period of about 48 hours the shutdown involved the entire steel plant and finishing operations. Unless the bituminous coal supply shows substantial improvement some pig iron melters expect to run into difficulty meeting merchant iron requirements. On a nationwide basis 22 blast furnaces are idle, against eight this time last year. An additional six units are being relined. Many other furnaces are operating well under capacity. Chief reasons the 22 furnaces are idle include tight manpower situation, high cost units, coke shortage, and until recently the somewhat easier demand. Producer stocks of pig iron are slightly above 650,000 tons, and vary between 15 and 30 days supply. Consumers' stocks are said to average about 45 days supply.

Cincinnati—Foundries are specifying more heavily for pig iron, with aim to build up inventory if more manpower is not available to expand the melt. Demand for castings is heavy. The melt sagged somewhat during the holidays when traffic hazards kept some workers off the job. Manpower conditions, however, have been restored to recent normals. Contracting for first quarter has been completed and buying now is desultory.

Scrap . . .

Scrap Prices, Page 144

Widespread snow over a great part of the industrial area has slowed collection and preparation of scrap and some tightness has developed, though supply still is sufficient for the high rate of steel production. Prices are firm at ceilings on most grades, with others rising somewhat. Melters are accepting all offerings. OPA has issued further restrictive orders to provide better supply for electric and acid open-hearth furnaces.

Pittsburgh — Prices are unchanged, with the entire district covered with snow and working conditions impossible. Yard operations have been practically suspended for the past three weeks at many points, and the flow of miscellaneous material has been hampered. Industrial and railroad scrap are moving much more normally, although even here there has been some diffi-

culty. On the whole, there is nothing alarming in the present situation. Mills are all in the market for whatever is offered, but the usual seasonal factors are working and since inventories normally decline through December, January and February, due to weather and other causes, declining stockpiles do not now give any great concern. The cast scrap market is in bad shape, with little being offered and foundries being pushed for more production on war contracts. Trouble here is that normal sources of cast scrap arise from wear and obsolescence, and there is relatively little of that now.

Cincinnati—Delivered prices on turnings and borings were moved upward in sympathy with heavier grades, which were proved out in December sales to a district mill. The consumer market has been dull for several weeks but some contracts are expiring soon, and a more active market is anticipated in January. Dealer reserves are low, and slippery roads virtually halted collection of country tonnage. Undertone of the market continues strong, and ceilings appear well established.

Cleveland—Increased steel demand for munitions and prolongation of the European war has changed the entire steel scrap supply outlook for the winter months. In some centers the situation is rapidly reaching the acute stage, particularly where heavy snow and sub-zero weather have sharply reduced preparation of scrap in dealers' yards. At present there is a dearth of good open-hearth scrap, but this condition is expected to ease when weather conditions permit, for all grades are now back at ceilings. Amount of production scrap from fabricating plants has also tended downward in recent weeks. One mill interest states that ingot operations will soon have to be curtailed unless volume of incoming scrap is materially increased. To date no allocation of scrap is reported, but it is considered a likely development soon. Steel plants have the advantage of easing the scrap shortage somewhat by increasing the proportion of pig iron in the open-hearth mix to 65 per cent if necessary.

St. Louis—Trading in scrap has been quiet through the holiday season and movement has been light because of this and weather conditions. Prices are unchanged.

Philadelphia — Scrap buying is brisk with movement limited by lack of labor at dealer yards. Meanwhile, prices of machine shop turnings and mixed borings and turnings have been advanced to the ceiling of $13.75, delivered, and shoveling turnings to $15.75. Billet and forge crops and No. 2 busheling are unchanged at less than ceilings. Basic open-hearth operators are following the recent WPB ruling in refusing to accept further shipments of electric furnace and foundry steel scrap, so that these grades may be diverted in adequate quantities to acid open-hearth and electric furnace operations and to steel foundries.

Detroit — Severe cold on top of holiday celebrations found yard help so seriously depleted early last week that most were forced to suspend operations. Prices on borings and turnings are up $1 to $1.50 per ton, but still are somewhat under ceiling levels. Report is heard some upstate automotive alloy turnings were allocated and took the full ceiling price plus the differential for nickel content. Reinstitution of restrictions on mill buying of electric furnace and foundry scrap is seen as a natural consequence of prices returning to ceilings.

Boston — Steelmaking grades are back at ceilings, including No. 2 bundles and machine shop turnings, which for a time resisted recovery. Alloys, although slightly firmer, are now the only easier grades. Allocations, notably industrial and shipyard scrap, are more frequent. On close to 2000 tons, No. 1 heavy melting, January accumulation at the South Portland, Me., yard, full ceiling, $14.85, was offered. At Boston navy yard, full port differential, $15.05, was bid for No. 2 heavy melting. Demand for basic open hearth material is brisk with inquiry for cast and foundry steel scrap in excess of visible supply.

Close to 3500 tons of shipyard scrap including the Portland, Me., offering, also Portsmouth, N. H., and Boston, were allocated after some bids at ceiling prices were submitted.

Chicago — With open-hearth electric furnace scrap holding at ceiling, disposition of consumers is to purchase only as required. Volume of buying currently, therefore, is only fair. Only price changes noted are in borings and turnings, which in the past ten days have risen $1 to $1.50 a ton. However, this represents largely broker-dealer transactions to fulfill old commitments, rather than new orders. Several days ago Carnegie-Illinois Steel Corp. purchased 20,000 tons of heavy melting steel from West Coast shipyards. It is understood ceiling was paid and shipments will be

made over the next 60 days. OPA's order prohibiting open-hearth consumers from accepting further shipments of electric furnace and foundry scrap apparently arose from situations in other districts, for thus far no dislocation of grades had occurred here, although conceivably it could happen later. Cast scrap continues scarce and holds at ceiling. Railroad specialties are not moving as actively as formerly, due partly to the ceiling level. Dealer yards operations are hampered by snows and subzero weather, forcing consumers to rely principally on industrial scrap.

New York — Brokers are now paying ceiling prices of $10.33 for machine shop turnings and mixed borings and turnings. Except for busheling and forge crops practically all grades are now at ceiling. Demand is active for heavy melting steel and cast grades, with sellers pressed to meet requirements and failing badly in case of cast grades.

Iron Ore . . .

Iron Ore Prices, Page 142

Consumption of Lake Superior iron ore in November totaled 6,882,696 gross tons, compared with 7,319,948 tons in October, 1944, and 7,409,213 tons in November, 1943, according to the Lake Superior Iron Ore Association, Cleveland. For the year 1944 to Dec. 1 consumption totaled 80,156,816 tons, compared with 81,518,593 tons in the corresponding period in 1943.

As of Dec. 1, 1944, ore on hand at furnaces and on Lake Erie docks totaled 44,721,674 gross tons, compared with 45,342,562 tons a month earlier and 49,371,030 tons a year earlier. On Dec. 1, 1944, 163 furnaces were active in the United States and six in Canada, compared with 176 and seven a year earlier. Idle furnaces numbered 24 in the United States and four in Canada, compared with nine and two a year earlier.

Warehouse . . .

Warehouse Prices, Page 142

Chicago—Rising tide of war goods production is making itself felt more sharply each week in demand upon steel distributors. The holidays showed no decrease, instead inquiries increased. Steel is moving from warehouses into essential production channels faster than it is being replaced by mill shipments, with the result that inventories are shrinking and unbalance becoming more pronounced.

Boston—Steel buying from warehouse reflects increasing war program contracts; year-end slackening in volume has been of minor proportions with indication rebound will gain momentum as the quarter progresses. Inquiry is well distributed, light gage sheets, bars and shapes active. Galvanized sheet stocks are not adequate to meet demand and most wire and hot strip products are tight. Lengthening deliveries, plates for the moment excepted, combined with other factors, not the least of which are consumer inventory restrictions under CMP, tend to channel orders to distributors. Warehouses are now selling better than 1,000,000 tons of general steel products per quarter. Importance of warehouse in efficient and prompt distribution of steel for war is increasingly recognized, as indicated by larger volume made available. During the first two quarters after war started average volume moved by warehouses was 780,000 tons a quarter. Jobbers still complain they could sell more of certain steels if available, galvanized sheets, to mention but one product, but the fact is close to 300,000 tons of general steel products a quarter has been added to the warehouse share since early 1942.

Seattle — Jobbing houses report the largest turnover in their history during 1944, accomplished in spite of shortages and delayed deliveries. Demand for all items continues strong and while inventories have been increased in some lines, stocks are well below normal. Galvanized sheets are the most critical, orders being placed now for October delivery. Plates have eased and are in better supply.

Cincinnati — Orders for steel from warehouse already show an upturn from the slight dip late in December, due to inventory season and reactions from the holidays. December tonnage failed to equal the level attained in two preceding months. Stocks are in fair condition except in structurals, sheets and some bars. Plates recently have been in better supply but demands are heavy and may quickly exhaust inventories again. Cold weather has aggravated manpower problems in cutting operations.

Nonferrous . . .

Nonferrous Prices, Page 145

New York — Anticipating another peak demand for copper and copper base alloy products through first quarter, prep-

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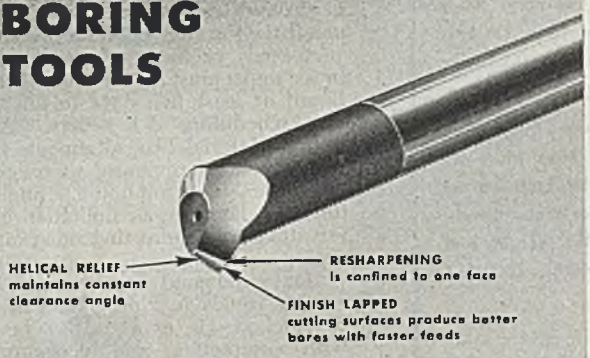

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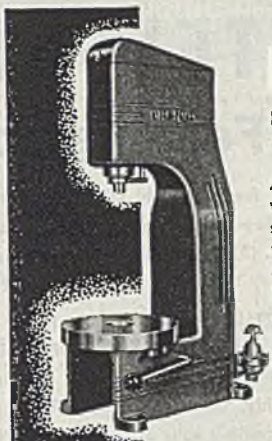

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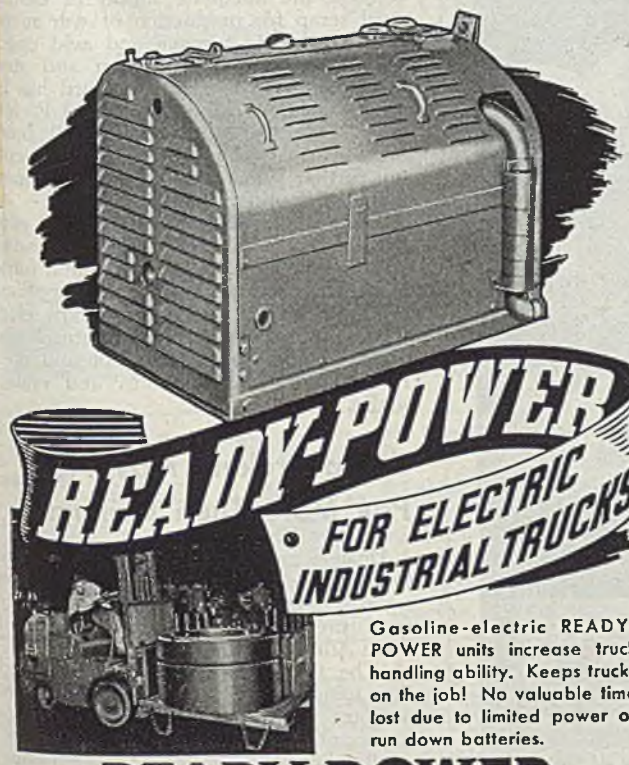

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arations are being made for 150,000 tons per month consumption, depending on manpower available. Stockpile will be drawn on to offset any delay in foreign arrivals and some expect this heavy demand to continue well through first half at least. Supplementing planned heavier imports from South America, about 10,000 tons per month will come in from Canada during the next few months. Further tightening controls for increased production of ammunition, brass mills must notify War Production Board at least five days in advance before scheduling Z-1 orders. All Controlled Material Plan allotments for brass are also being reviewed to reduce civilian orders to a minimum. Shelved are further relaxations in limitation and conservation orders affecting brass mill products.

Heavy demand for brass is also reversing trends in zinc. Increase in size of stockpile is expected to be halted, with production and consumption in close balance. Zinc surpluses have been piling up for months but indications are that some of this surplus will be required.

Most civilian users of lead have been restricted to 60 per cent of the base period, first half of 1944. Estimated requirements for this year are 1,150,000 tons, with estimated supply 970,000 tons. New restrictions are expected to lower overall consumption 15 to 20 per cent, thus closing the gap between requirements and supply.

No relaxations are expected in the use of tin. In fact, they are being tightened by use of less tin in many tin-bearing products, including solder and tin plate.

Electric Furnace Scrap Barred to Basic Melters

To assure adequate supply of carbon steel scrap for production of war materials in electric furnace and acid open-hearth steel plants and iron and steel foundries, War Production Board has issued Direction No. 1 to General Preference Order M-24, restricting all basic open-hearth steel producers from accepting further shipments of electric furnace and steel foundry scrap.

Grades that basic open-hearth consumers are prohibited from purchasing are the following: Billet, bloom and forge crops; bar crops and plate scrap; cast steel; punchings and plate scrap; electric furnace bundles; cut structural and plate scrap, all sizes; two-foot and one-foot foundry steel; springs and crankshafts.

Scrap Brokers May Not Pay More Than Ceilings

Dealers or brokers may not pay more than ceiling prices where steel and iron scrap is purchased for shipment directly from producer to consumer, Office of Price Administration has announced.

The main function of the steel and iron scrap broker is to act as the intermediary between the producer or preparer and the consumer, arranging shipments directly from the former to the latter. The steel and iron scrap price regulation exempts dealer transactions from price control to permit flexibility in the dealer function of preparing sorting and storing scrap.

STRUCTURAL SHAPES . . .

STRUCTURALS PLACED

500 tons, plant for American Gas & Electric Co., Atlantic City, N. J., to Lehigh Structural Steel Co., Allentown, Pa.

300 tons, building for North Carolina Pulp Co., Plymouth, N. C., to Bethlehem Fabricators, Bethlehem, Pa.

100 tons, for Vultee-Consolidated Aircraft Co., Allentown, Pa., to Lehigh Structural Steel Co., Allentown, Pa.

STRUCTURALS PENDING

1500 tons, new car shops, Brainerd, Minn., for Northern Pacific railroad; bids Dec. 27.

235 tons, 200-foot through truss span bridge; bids in to Alaska Railroad, Seattle.

REINFORCING BARS . . .

REINFORCING STEEL PLACED

8000 tons, Naval Ordnance plant, Camden, Ark., Fraser-Brace Engineering Co., New York, consulting engineers. Through Winston Bros., C. F. Hagland & Sons, Missouri Valley Bridge & Iron Co., Sollitt Construction Co., joint contractors. Tonnage split as follows: Jones & Laughlin Steel Corp., 3700 tons; Truscon Steel Co., 3100 tons, Ceco Steel Products Co., 1200 tons. Delivery over 5-month period.

800 tons, Veterans' Hospital, Lebanon, Pa., to Capital Steel Co., New York, through John A. Johnson Contracting Corp., Brooklyn, N. Y.

400 tons, grain elevator, Columbus, O., for Farmers Co-operative Association, to Pollack Steel Co., Cincinnati; MacDonald Engineering Co., Chicago, contractor.

375 tons, grain elevator, Farm Bureau Cooperative, Bexley, O., to Pollak Steel Co., Cincinnati, through McDonald Engineering Co., Chicago, contractor.

200 tons, Panther-Panco Rubber Co., Chelsea, Mass., to Bethlehem Steel Co., Bethlehem, Pa., through McCutheon, contractor.

100 tons, Virginia Mason Nurses' Home, Seattle, to Northwest Steel Rolling Mills, Seattle.

REINFORCING STEEL PENDING

350 tons, stick powder plant, E. I. du Pont de Nemours & Co., Charlestown, Ind.

180 tons, gear shop, General Electric Co., Grafton, Mass.

160 tons, Invitation 22,628-A, Bureau of Reclamation, Mountain Home, Idaho.

100 tons, car shops, Northern Pacific railroad, Brainerd, Minn.

Unstated, veterans hospital, Dwight, Ill., for U. S. Veterans Administration; bids Jan. 16.

PLATES . . .

PLATES PENDING

100 tons or more, 2,000,000-gallon elevated water tank, district commissioners, Washington; Chicago Bridge & Iron Co., Chicago low; $139,450, bid A; $142,450, bid C; no bid on proposal B, Dec. 29.

RAILS, CARS . . .

RAILROAD CAR AWARDS

Atchison, Topeka & Santa Fe, 500 fifty-ton box cars, to Mt. Vernon Car Mfg. Co., Mt. Vernon, Ill.

Baltimore & Ohio, 500 box cars, to Greenville Steel Car Co., Greenville, Pa.

Chicago & Eastern Illinois, 500 fifty-ton hopper cars, to Pullman-Standard Car Mfg. Co., Chicago.

New York, New Haven & Hartford, 500 box cars, to Pullman-Standard Car Mfg. Co. Chicago.

Seaboard Airline, 800 cars, 500 fifty-ton box cars, to Pullman-Standard Car Mfg. Co. Chicago, and 300 fifty-ton flat cars to Bethlehem Steel Co., Bethlehem, Pa.

Southern Pacific, 500 fifty-ton box cars, to M