



100-volt X-ray unit reduces period of inspection from 60 hours to 16 minutes. Page 122

STEEL

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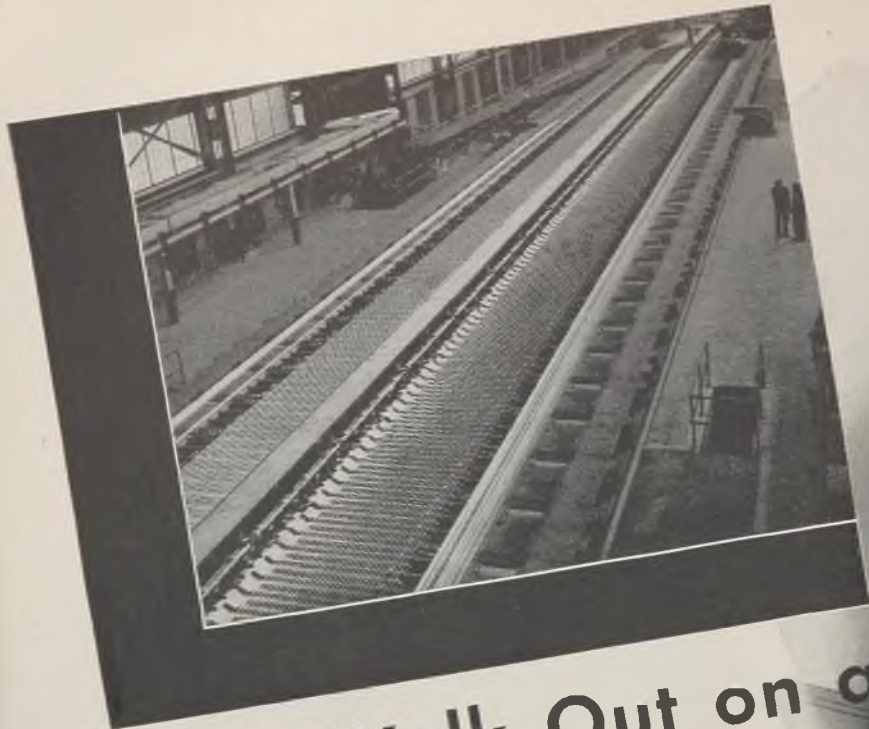
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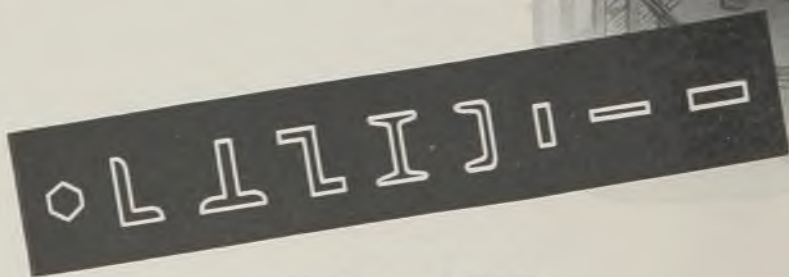
How to Walk Out on a Fire

Below are some of the common Merchant Shapes you'll find in the common Fire Escape. . . Which, even if it moves indoors, will be an essential part of several billion dollars' worth of new apartments, hotels, factories, lofts, warehouses, theatres, hospitals . . . in the Postwar era.

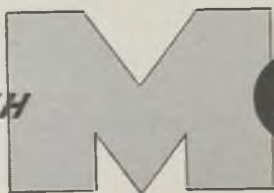
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For the Security of All

In "Republic Reports," monthly publication for its employees, Republic Steel Corp. presents figures on its operations from 1930 to 1943, inclusive. During this 14-year period, the corporation produced goods valued at \$3,308,000,000. If we assume that this volume of sales equals one dollar and break down all other figures proportionately, we obtain the following simplified picture of Republic's experience:

Of the sales dollar, 51.6 cents were spent for raw materials and manufacturing expenses, 32.8 cents went for wages to employees, 4.5 cents represented the allowance for obsolescence and depletion and 7.4 cents were paid out in federal, state and local taxes. These disbursements totaled 96.3 cents of the sales dollar, leaving only 3.7 cents for the owners and for the future needs of the business. Of this remainder, 3.3 cents went to the owners in interest and dividends and only 4 mills were available for future needs.

All of the operations reflected in the foregoing figures, namely the employment of 65,000 persons who in 14 years turned out goods valued at \$3,308,000,000, were made possible by the investment of \$339,000,000 in the company by 100,000 people. In relation to the sales dollar, these owners invested 10.2 cents and during the course of 14 years they received a return of 3.3 cents, or 32.3 per cent on their investment. This represents an average annual return of 2.3 per cent.

Those in charge of government policies affecting business and union labor leaders who are charging industry with making exorbitant profits and accumulating excessive reserves will do well to study the records of Republic Steel and other corporations realistically. They should consider the figures over an extended period, and not for one or two "good" years.

Then they should ask themselves several questions. First, as a congressman, government administrative officer or union labor leader, can I say honestly that an average return of 2.3 per cent on invested money over a 14-year period represents an exorbitant profit? Must I not admit that it is a reasonable, if not an inadequate, profit?

Secondly, as one interested in the future welfare of the nation or as one zealous of the security of labor, can I say honestly that 4 mills of the sales dollar are too much to lay aside for the inevitable rainy day?

Should I not move heaven and earth to see that that 4 mills are increased many-fold—for the security of the nation?

TOO MANY DOG FIGHTS: Writing in "Mirrors of Motordom", A. H. Allen calls attention to the heavy toll the war is exacting among industrial executives. In his view, the combination of near-confiscatory taxes on incomes in the upper brackets, complicated government regulations, unsatisfactory labor relations, scarcity of efficient employees, brow-beating by bureaucrats and politicians and extra responsibilities of many kinds is wearing

down many executives to the point of exhaustion.

We think he states the case with moderation and restraint. It is not only true that many able leaders in industry have suffered keenly from the high tension of wartime responsibilities, but it also can be said that hundreds of exceptionally capable men have died prematurely under the strain.

Not all of this toll is a necessary concomitant of war. This nation has fought wars successfully with-

(OVER)

out the internal feuding, suspicions, carping criticisms, cynicisms and hatreds which characterize many phases of government administration in this war.

A little more of the milk of human kindness, a bit more credit where credit is due and a lot more of good old-fashioned sportsmanship among those high in government councils would raise the morale of the American people in every walk of life no end.

—p. 97

• • •

AIR FIT TO BREATHE: An electronic dust precipitator has been installed to remove oil mist from the atmosphere surrounding high-speed grinding machines. The revolving wheels whip up the coolant into clouds which condense on walls, pipes and machines, break down electrical insulation, cause annoying working conditions and sometimes introduce a fire hazard. In removing the mist at its source, the precipitator not only eliminates these objections but it also recovers the coolant for further use.

This particular installation is interesting because it is indicative of the increasing attention being given to controlled atmosphere in industrial operations. Recent improvements in equipment for air conditioning; removing dust and other impurities; and controlling temperature, humidity, atmospheric pressure, etc. tend to promise a situation in the not-too-distant future wherein there will be no excuse for many of the obnoxious atmospheres which for years have been considered a necessary evil in industry.

—p. 129

• • •

AMBITIOUS ENGINEERS: At its annual meeting in Philadelphia last week, the American Society of Tool Engineers reported a membership of 15,777. This rates it as one of the leading technical societies in the country. Its growth stems largely from the remarkable performance of tool engineers in the war effort.

If you can get a society official to talk confidentially, he will startle you with his vision. He will tell you tool engineering is in its infancy, that so far engineers have had to "plan around" existing machine tools and that they hope for the day when they can influence the design of machines so that their planning will embrace machines as well as tools and accessories.

Progressive machine tool builders likewise have ambitions. When progressives in both camps get together after the war we may see something new and startling in production technique.

—p. 82

GRATUITOUS SAVIOR: As we suspected when we commented in the March 13 issue on Philip Murray's proposal to WPB to "save small steel," the 20 small steel companies listed by Mr. Murray were not consulted by the union head in drafting the plan nor are they convinced that his gratuitous proposals would solve their problems.

The suggestion made by Murray that WPB appoint a steel commission consisting of three members each from the government, the industry and the union is viewed suspiciously by small steel companies because it would bring government in competition with industry. The idea of selling pig iron from DPC blast furnaces to small steel at below ceiling prices is frowned upon because it piles subsidy upon subsidy.

Small steel wants freedom of opportunity to solve its problems. It does not want the crutch of subsidy, nor does it want further needless entanglement in red tape.

—p. 84

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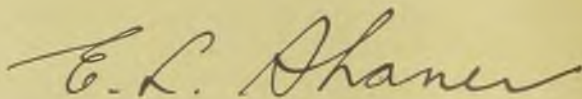
POWER ON THE FARM: A spokesman for the Rural Electrification Administration paints a glowing picture of the postwar market for electrical equipment on American farms. About 40 per cent of the nation's 6,000,000 farms now receive central station power, but of these approximately 800,000 were connected to power lines in the three years preceding Pearl Harbor and—due to wartime restrictions—have not been able to utilize electricity to full advantage.

Agriculturists see ahead a new era in farm operations in which the widespread use of central station power in rural areas may develop a market for equipment and accessories totaling a billion dollars annually.

One can contemplate this bright picture with mixed feelings. On one hand, we must regret that the government is in the power business to the extent it is. This would not have happened if all private power companies had been as farsighted as were a few of the progressive pioneers.

On the other hand, this is no time to weep over spilled milk. Big new markets beckon. By striving to serve these markets intelligently, equipment manufacturers may in time help to free rural areas from excessive domination by government agencies.

—p. 94



EDITOR-IN-CHIEF

Blinding the Enemy with Clouds



This new generator blankets large areas with smoke made from materials ejected from special apparatus mounted on a trailer

—Another War Use of Inland Steel

Unusual clouds shrouded harbors and ports in North Africa and Sicily—man made clouds that reduced enemy artillery fire and bomber effectiveness by 85 per cent. They literally “blinded” the enemy and saved many American lives.

These strange clouds came from smoke generators that were developed by the Chemical Warfare Service of the U. S. Army Service Forces. Many of these generators were built by The Heil Company of Milwaukee. They can be used on landing barges and small craft, but are most often mounted on trailers towed behind fast trucks. Chemical Warfare Service smoke generator

companies equipped with formations of these fog machines are even now blanketing Italian cities against aerial attack. One smoke unit covered the city of Palermo, Sicily, with smoke within 15 minutes after the starting signal was given.

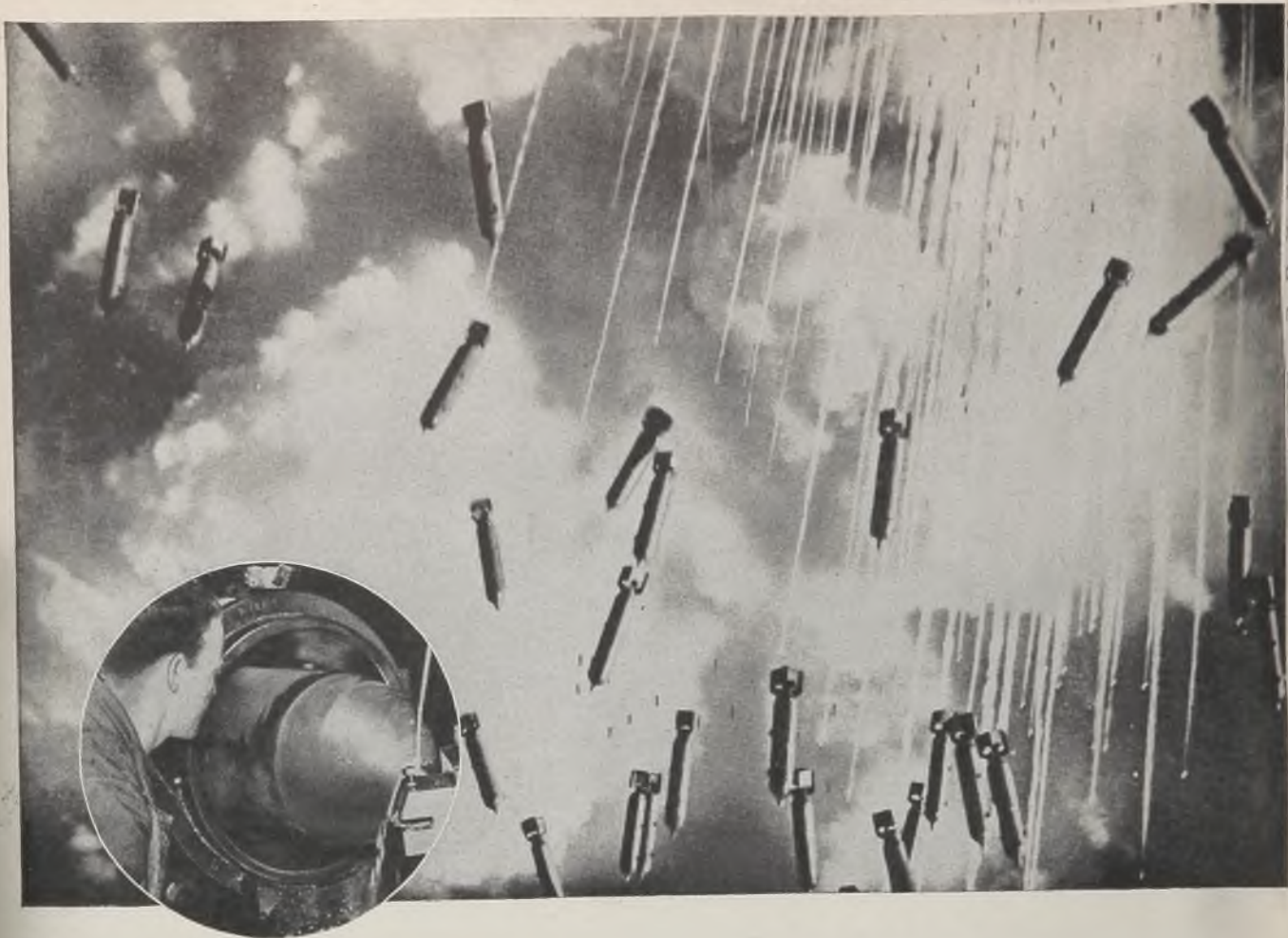
Large shipments of Inland steel—plates, sheets, structurals, and 4-way floor plate—are used in these new mobile units, which generate smoke—obscuring enemy vision and bringing Victory closer at lower cost in lives and material. Devoted now to the production of steel for war, Inland is planning the production of steel for peace.



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STEPPING UP OUTPUT

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from small aluminum stampings—formerly a laborious hand operation. A Texaco Engineer discovered that putting the stampings into tumbling barrels with *Texaco ALMAG Cutting Oil* increased output 20 times.

So effective have Texaco lubricants proved that they are definitely preferred in many fields, a few of which are listed in the panel.

The services of a Texaco Engineer specializing in cutting coolants are available to you through more than 2300 Texaco distributing points in the 48 States. The Texas Company, 135 East 42nd Street, New York 17, N. Y.

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OPA To Raise Some Steel Ceilings

Cost study reveals higher prices necessary on heavy carbon products. To become effective April 15. Specialties may be reduced

INCREASED ceiling prices on a number of carbon steel products will be announced soon by the Office of Price Administration. The decision to permit the higher prices resulted from OPA's recent study of steelmaking costs.

The new prices likely will become effective April 15.

Also under consideration by OPA is a possible reduction in present ceiling prices on certain ordnance items regarded as "highly profitable." Tool steels and high-speed tool steels are mentioned in this connection.

The new ceiling prices to be announced are based on recent steelmaking costs. They do not take into consideration the Supreme Court's decision that Alabama iron ore miners are to receive portal-to-portal pay, which will result in an increase in cost of producing pig iron.

Nor do they take into account an increase in costs that may result from the steel wage increase demands now being heard by a panel of the War Labor Board. If any considerable part of the union's demands are granted, OPA's cost study will be obsolesced and new adjustments required.

PORTAL-TO-PORTAL PAY

United States Supreme Court last week ruled in a 7-to-2 decision that the Fair Labor Standards act requires portal-to-portal pay for iron ore miners. The decision was interpreted as applying also to the demands of coal miners whose contract providing pay for travel time now is before the National War Labor Board for approval.

The iron ore miners' case came before the court on a petition by the Sloss-Sheffield Steel & Iron Co., Tennessee Coal, Iron & Railroad Co. and Republic Steel Corp. which sought declaratory judgments against three locals of the miners' union to determine whether time spent traveling from the entrance to the working face constituted work for which compensation must be paid. The court held that the underground travel involves physical and mental exertion, occurs at all times on the owners' property, and although not productive is part of the workers' actual occupation.

Steel company executives have been unanimous in stating that a reasonable profit cannot be earned at current prices for certain products in view of increased costs. The industry has been held to ceiling quotations since the spring of

United Steelworkers of America deliver argument for wage increase and other concessions before panel of War Labor Board

1941; meanwhile labor and other costs have advanced sharply.

Indicating the position of the industry is the statement by Chairman T. M. Girdler and President R. J. Wysor to stockholders of Republic Steel Corp., which says in part:

"Certain of the corporation's products are now being sold at ceiling prices which do not cover works manufacturing costs. Adjustments in such prices should be permitted and unless the unreasonable demands for higher wages are controlled, additional price increases will be necessary for the steel industry to continue on a sound operating basis during the war and also in the postwar period."

Frank Pumell, president of Youngstown Sheet & Tube Co., in a report to shareholders, says:

"Neither the industry nor the company at present costs and with prices of products as frozen by the government in April, 1941, at the price schedules in effect through 1939, can earn a satisfactory profit on certain steel products. The war demands for high quality materials, which heretofore have commanded higher ceiling prices, have been greatly reduced



Philip Murray, president of the CIO and the United Steelworkers of America, right, argues for the abandonment of the Little Steel wage formula before the steel wage panel of the War Labor Board. Panel members are seated at the table. Left to right, they are: Hugh Morrow, presi-

dent, Sloss-Sheffield Steel & Iron Co., Birmingham, Ala.; Edwin D. Bransome, president, Vanadium Corp., New York; N. P. Feinsinger, vice chairman; David Cole, chairman; John Despol and Stephen Levitsky, labor members. NEA photo

and the demand for some such products has practically disappeared, so that today the company's production is confined largely to lower-priced steel products. During the entire war period the company, in common with the industry as a whole, has absorbed the continuously rising costs and has been able to make profits principally because of the demands for high quality products and high rates of operations. It is probable that the rate of steel operations will recede as the war's end approaches and without the advantage of capacity production the steel industry must obtain higher selling prices for its products, if it is to earn a profit."

Producers have complained especially that they have been losing money on such carbon steel products as rails, plates, shapes, bars and some sheets.

While the OPA was formulating its announcement on price relief last week, the United Steelworkers of America was pushing its demands for a wage increase and other concessions before a panel of the War Labor Board in Washington. Their demands—which include in addition to a 17-cent hourly wage boost, a guaranteed annual wage, severance pay, additional vacation allowances, sick leave with pay, etc.—would, if granted, destroy the Little Steel wage formula, breach the stabilization program, and add an estimated \$350,000,000 annually to steel producers' costs.

Union Seeks Revision of Formula

Obviously, the granting of any considerable part of these demands would invalidate OPA's cost study and necessitate sharp upward revisions in the prices of all steel products.

The union opened its argument for revising the Little Steel formula on March 24 by presenting a 116-page brief summarizing its demands. Coupled with the brief was an oral address by CIO President Philip Murray to the steel industry in which he termed the union's demands for higher wages and a guaranteed annual wage a challenge to their ingenuity. He warned the producers they would "have to do more constructive thinking" about giving people jobs after the war "than you have ever done in your lives."

The union's brief was read to the panel by David J. McDonald, secretary-treasurer, and offered an argument that it no longer was necessary for the steel industry to be in the "prince-or-pauper" class. Pointing out that operations currently are between 95 and 98 per cent of capacity, on a work-week averaging 45.3 hours, the union contended that the operating rate could drop to 75 per cent on a 40-hour week before the industry "would have to lay off any of its present employes and incur an obligation under the guaranteed wage."

An "imperative social need" exists, the union said, to assure the steelworkers that they no longer will face a future in which they may be employed on short time while the industry struggles to operate at 20 to 30 per cent of capacity.

"Economic security through full employment, thereby creating freedom from want and freedom from fear, can and must be accomplished for this basic industry. This objective is not attained through the pitiful unemployment compensations.

STEEL PRICES, WAGES

	Average Hourly Earnings	Average Weekly Earnings	Composite Steel Price
1941			
Jan.	\$0.866	\$33.95	\$56.73
Feb.	0.869	34.24	56.73
March	0.877	33.81	56.73
April	0.971	38.26	56.73
May	0.981	38.95	56.73
June	0.992	37.89	56.73
July	0.991	37.46	56.73
Aug.	0.985	36.64	56.73
Sept.	0.982	37.22	56.73
Oct.	0.983	38.52	56.73
Nov.	0.990	37.22	56.73
Dec.	0.999	38.16	56.73
1942			
Jan.	0.992	38.89	56.73
Feb.	0.995	38.80	56.73
March	1.001	38.14	56.73
April	1.004	39.85	56.73
May	1.011	38.11	56.73
June	1.020	39.47	56.73
July	1.027	39.44	56.73
Aug.	1.041	39.14	56.73
Sept.	1.086	43.31	56.73
Oct.	1.077	42.97	56.73
Nov.	1.093	43.06	56.73
Dec.	1.094	43.97	56.73
1943			
Jan.	1.107	44.06	56.73
Feb.	1.105	45.97	56.73
March	1.103	46.55	56.73
April	1.112	47.26	56.73
May	1.134	47.51	56.73
June	1.127	48.79	56.73
July	1.154	50.24	56.73
Aug.	1.133	48.83	56.73
Sept.	1.160	52.55	56.73
Oct.	1.159	51.65	56.73
Nov.	1.164	52.02	56.73
Dec.	1.161	50.16	56.73
1944			
Jan.	1.165	53.24	56.73

"If the steelworkers as a group are guaranteed an annual wage, thereby assuring the continuity of their full employment, they have the security which permits them to go out and purchase their automobiles, their refrigerators and the thousand and one other articles which require steel.

"This very demand is what creates the demand in the industries that in turn require steel. Nothing could create greater security for the steel industry itself than the security established for the steelworkers themselves."

The guaranteed annual wage was feasible, the union contended, for two reasons; first, seasonal fluctuations no longer are necessary, because of war experience, and, second, postwar demand for steel products should provide a high level of operations.

Money for the guaranteed wage would come, according to the union, partly from refundable federal taxes and from reduced operating costs due to the elimination of overtime.

The union said the revenue act of 1942

provided for a 10 per cent postwar refund of excess profits liabilities of a company for the years ending after Dec. 31, 1941.

In addition, it was said, the revenue acts since 1939 have established a "system of carrybacks and carryovers which result in a guarantee to the companies for two years of net profits in excess of their 1936-39 annual average net profits."

According to the union's figure "Should the entire industry in 1944 drop down in operations to the break-even point, which is less than 50 per cent of ingot capacity, it will receive in refund on federal excess profits and income taxes \$122,153,000, or a sum almost equal to its net earnings in the peacetime period of 1936-39."

Exhibits Offered by Union

"Should the entire steel industry in 1944 drop down in operations to a point below 40 per cent of capacity and lose as much money as it did in 1938, plus losses for those companies that actually made money in 1938, it would receive a check from the federal government for \$167,495,000, or 31.7 per cent more than it was able to earn in net profits after taxes in the four peacetime years, 1936 through 1939."

Among the exhibits offered by the union was a table purporting to show that officers and directors of 19 steel companies representing 86.6 per cent of the industry's capacity received in salaries a yearly average of \$7,760,500 in the 1936-39 period and \$10,571,263 in 1942, an increase of 36.2 per cent.

After hearing the union's presentation, the WLB panel spent March 30 and 31 in Pittsburgh touring steel mills. On April 5 the panel will hold hearings for all companies in the list of 500 who are not on the list of 94 (basic steel producers) so as to make recommendations to the War Labor Board on the groupings and procedures for handling these cases. On April 11, the 94 basic steel producers will present their case.

Ore Shippers Given Some Price Protection

Merchant iron ore shippers have been given some measure of price protection on 1944 ore shipments in the event costs are materially increased and made retroactive as in the case of possible War Labor Board approval of the 17 cents an hour wage increase demand now under consideration.

The new order No. 7 to RMPR-113, effective March 30 last, states that OPA will give consideration to establishment of a fair maximum price on 1944 ore shipments. Now that shippers have been assured that rising costs will be taken into consideration in setting the 1944 season iron ore price, they are committing themselves on shipping ore to their regular customers on the basis of prices to be later established by OPA.

Ex-Quota Steel Shipments Offset Decline in Lend-Lease Movement

Additional tonnage moving to Latin America largely consists of discards, off-heats, war plant surpluses and distress material at seaboard. Plans reported under way to extend to Middle East use of private export trade

WHILE Lend-Lease shipments are being progressively reduced, movement of steel to Latin America (under government license and control) is expanding. Monthly quotas for Latin American countries have changed but little in some time, but more ex-quota tonnage is being shipped and this is offsetting somewhat the decline in lend-lease shipments.

This ex-quota tonnage falls largely in three categories. One covers products made from discard and off heats, the use of which would in no way drain on war requirements. Reinforcing steel appears to be the principal item moving in this group, with other products including plate ends, waste-waste, and so forth.

The second category comprises tonnage originally produced for war needs, but no longer required. Thus the steel represents an excess, which the government is often glad to dispose of abroad, and which includes cold-drawn bars, cold-rolled strip and alloy steel, it is said.

The third category comprises distress material at seaboard, intended originally for Allies who subsequently found they did not require it. This material is sold on an "as is" basis and often is not in prime condition, owing principally to exposure. Incidentally, several months ago as much as 100,000 tons of pipe were shipped to the seaboard for export under lend-lease, only never to be forwarded on to its original destination. Subsequently, practically, if not all, this tonnage has been sold elsewhere, some of it to Latin America, it is understood.

Steel in the latter two categories has been of primary help to export brokers, many of whom for a long time previously had had little tonnage with which to trade, while steel moving in the first category has been of more direct help to the mills.

Although lend-lease tonnage is declining, the Foreign Economic Administration, Washington, recently disclosed plans for extending to the Middle East the use of private export trade in the shipment of iron and steel products. The program calls for the movement of these products to 12 Middle Eastern countries through commercial channels. But, officials said, it will be necessary for the Combined Agency for Middle East Supplies, which is operating the program, first to ascertain what supplies are available.

Exporters and manufacturers interested in regaining some of the trade to this region are therefore asked to communicate with the Combined Agency at 837

Seventeenth street, N. W., Washington 6, D. C.

Countries to which the products will be shipped are Egypt, the Anglo-Egyptian Sudan, Iran, Iraq, Syria, the Lebanon, French Somaliland, Ethiopia, Eritrea, Saudi Arabia, Cyrenaica Tripolitania. Commercial orders for iron and steel

products for these countries, it is said, will be cleared by the usual procedure in effect in the Middle East, through import licenses granted by the countries of destination and reviewed for essentiality by the Middle East Supply Center.

In the meantime, there is considerable speculation as to the scope of export trade after the war, and recently in New York, W. E. Knox, assistant general manager, Westinghouse Electric International Co., sounded a rather pessimistic note. He said that because of the growth of new services provided by the United States to recipients of lend-lease aid and because of the war-spurred development of substitutes which will curtail future availability of dollar exchange in other countries, the outlook for foreign trade certainly "is not good for a long period of time."

Present, Past and Pending

■ LIFTS BAN ON USE OF STEEL FOR SEVERAL PRODUCTS

WASHINGTON—WPB conservation order M-126 has been amended to permit manufacture of: Awning frames and supports at the rate of 75 per cent of 1941 output; window and roller-type shades for street cars and buses; stencils, cigarette lighters; and commercial size mop ringers (but not household size); laundry tags and badges.

■ OSBORN CO. PRESIDENT DIES IN FLORIDA

MIAMI BEACH, FLA.—Anthony W. Howe, president and general manager, J. M. & L. A. Osborn Co., Cleveland, warehouse and sheet metal distributor, died here March 29. Mr. Howe had served as president of the National Sheet Metal Distributors Association and was a director of Sharon Steel Corp.

■ TO CLARIFY EXCESS STEEL DISTRIBUTION

WASHINGTON—Amendment No. 21 to RPS-49 is expected out soon, aimed at clarifying the position of dealers in the redistribution of excess steel stocks.

■ FORGINGS CLASSIFIED "UNDESIGNATED" UNDER M-293

WASHINGTON—Forgings, including propellers, crankcases, large hammer forgings, and small hammer press forgings now are classified as "undesigned" products under general scheduling order M-293. (See page 89)

■ CONTROLS ON USE OF STAINLESS STEEL SCRAP MODIFIED

WASHINGTON—Restrictions have been removed on using stainless steel scrap in melting stainless steel. This action was taken in revocation of direction 3 to War Production Board order M-21-a.

■ AUTHORIZE \$27 MILLION WORTH OF LAUNDRY EQUIPMENT

WASHINGTON—Program for the production of \$27 million worth of commercial laundry equipment has been authorized by the War Production Board for the year beginning April 1.

■ PREDICTS POSTWAR BOOM IN REPAIR BUSINESS

TOLEDO, O.—A tremendous boom in automobile repair business will occur in the postwar period, according to Royce G. Martin, president, Electric Auto-Lite Co. His prediction is based on the expectation that present cars will be well-worn, that new cars will not be available to many for several years, and that speed restrictions will be lifted.

■ HEAVY INDUSTRY PROFIT MARGINS LOWER

PHILADELPHIA—Increased federal income taxes and the effect of war contract renegotiation have lowered the margin of profit in the heavy goods industries occupied mostly with war production, according to the Securities and Exchange Commission.

■ REROLLING OF RAILS INCREASES 80 PER CENT

WASHINGTON—Production of bars and small shapes by rerolling used rails in January amounted to 42,019 tons, an 80 per cent increase over similar production in January, 1943.

Inflation Being Kept In Check

OPA Chief Bowles says living costs have not advanced in past ten months. Thinks controls can be continued if wages are not raised

ALTHOUGH the Office of Price Administration has frequently creaked and groaned, although it has made many mistakes, it has turned in a fine performance in fighting inflationary trends, Chester A. Bowles, its director, told the Senate Committee on Banking and Currency during its hearings on whether the price control act should be continued another year after June 30. Saying that pressures that would hasten inflation are becoming heavier, he warned that discontinuance of price control would bring chaos.

Endowed with an engaging personality and given to candor, Mr. Bowles' reception was much less critical than those given his predecessors when they appeared before congressional committees, and particularly because he had a very effective story to tell. Before he left the stand, in fact, he heard appreciative expressions from some of the senators who have been sharply critical of OPA.

Mr. Bowles told his story through 106 charts which provoked much interest. He started his story with a home run when he produced a chart showing what happened to the buying power of the dollar during three wars. In the Revolution, the value of the dollar dropped from \$1 at the start of the war to 35 cents at the end of the war. In the Civil war the value of the dollar dropped from \$1 to 44 cents. In World War I the dollar wound up at 40 cents.

"A \$2000 salary in 1914 was \$960 in 1920 when the inflationary forces got through," was the way Mr. Bowles put it. He showed how huge war profits of corporations were replaced by huge deficits, how business failures in the post-war period increased 40 per cent over those in the prewar years, how unemployment increased 5,624,000 between 1919 and 1921. The farmer fared worst of all segments of the population. Farm prices collapsed between 32 and 85 per cent and 453,000 farmers lost their farms through mortgage foreclosures.

As a result of these disastrous experiences, said Mr. Bowles, an effort was launched in this war, first through execu-



Chester Bowles, OPA administrator, examines an exhibit pertaining to illegal sales of gasoline in which counterfeit coupons are displayed along with legal coupons. NEA photo

tive order, later endorsed by congressional action, to keep prices under control. Through lack of experience in setting up necessary controls there has been a vast amount of fumbling. Ways of approaching the problem had to be devised, and administrative personnel had to be trained. But the thing has succeeded, said Mr. Bowles. He submitted the following statistics to show that inflation is developing at a much slower pace in this war than during World War I:

	Price Increases, in Percentages, During		
	53 months of World War I	Entire Period of World War I	First 53 months of World War II
Pig iron	154	304	15
Copper	93	165	15
Zinc	73	346	70
Anthracite coal	65	82	32
Bituminous coal	135	675	24
Lumber	67	296	60
Tin	138	224	7
Cement	80	132	3
Coke	171	548	20
Steel plates	187	696	0
Petroleum	200	367	25
Lead	106	195	29
Wool	195	236	63
Cotton	126	211	105

Other comparisons shown in Mr. Bowles' charts were:

	Price Increases, in Percentages, During	
	53 months of World War I	First 53 months of World War II
Cost of living	65	25.9
House furnishings	99	27
Clothing	112	34
Food	83	56

Despite the fact that inflationary pressures are piling higher and higher, said Mr. Bowles, there has been no increase in the cost of living in the past ten months. He thought, therefore, that the situation is under pretty good control and, barring the possibility of such shocks as further drastic increases in wages, it should continue so.

He admitted that his comparisons were not to be considered as entirely accurate.

For example, they do not reflect the deterioration in quality of numerous items.

"There always has been hardship in farming, there always has been hardship in business, there always has been hardship in industry, and there is hardship today," said Mr. Bowles. "But fewer of our people today, in the midst of a hard war, are suffering than ever before in modern history.

"The weekly take-home wages of labor in 1929 averaged \$26.95; in 1939 it was \$23.86; today it is \$43.15. Despite rent control the income of landlords has gone up. In spite of price controls, corporation profits have been increasing to the highest levels, both before and after taxes, ever reached by American business. Small business is doing better than ever before. Business failures are at an all-time low, and small concerns in the field of retailing are steadily improving their positions as compared to the chains. The net income of farmers is at an all-time high.

"We have set 8,000,000 prices. We could not defend them all. Unquestionably we have made and continue to make mistakes. We perhaps have the opportunity to make more mistakes than any other government agency because of the complexity of our activities."

All the time, Mr. Bowles said, the OPA is learning how to be more efficient.

"When Americans really understand that price ceilings and rationing are needed to prosecute the war, and that they are not just subject to control by the whim of a government agency, they co-operate," said Mr. Bowles. "At the outset, OPA was handicapped by having a lot of local boards which, usually because they were not fully informed, were arbitrary or offensive in dealing with the people. Today this situation has been largely corrected and we now are encountering comparatively little opposition or criticism."

Postwar Controls Seen Necessary

Continuation of government regulations and planning thought needed in certain instances to obtain full production, speaker tells meeting of National Industrial Conference Board

CONTINUATION of government controls and planning may be necessary in certain instances in obtaining full production in the postwar era, Mordecai Ezekiel, economic adviser to the Secretary of Agriculture, Washington, declared at a forum session held in connection with the 259th meeting of the National Industrial Conference Board Inc., at the Waldorf Astoria, New York, recently. He believed that where such controls and planning were necessary they should be done by government agencies and not by private groups.

Forum discussion centered around "Planned versus Free Markets After the War", with Hugh B. Cox, assistant solicitor general, Department of Justice, Washington; Fred Lazarus Jr., vice president, F. & R. Lazarus & Co., Columbus, O., and chairman of Retailers' Advisory Committee on National Defense; and Gilbert H. Montague, counsellor-at-law, New York, the other speakers on the panel.

Mr. Ezekiel cited various cases where he believed continued control would be necessary. But it remains to be seen, he said, who is to do the controlling and

planning. "Were private interests to do the planning, they, in his opinion, would be without public accountability for their actions. Were such planning to be set up under public auspices, on the other hand, all action would be subject to governmental authority.

"Publicly-controlled planning is planning by a public responsible bureaucracy," he said. "Privately-controlled planning is planning by an uncontrolled irresponsible bureaucracy."

Economists Do Government's Planning

In response to questions later, he said that the great percentage of planning in Washington is not conceived by politicians, but by economists in government service.

With respect to postwar markets, two extreme sets of ideas prevail, he declared. One set holds that the major thing necessary to create full employment is to enable private businesses to buy and sell in free markets without restraints or guidance, except those necessary to prevent monopoly or restriction of competition. "This philosophy," he said, "is represented in our domestic affairs by the

antitrust acts and the Federal Trade Commission, and in international policy by the Trade Agreement program and Article VII of the Lend-Lease agreements.

The other set of ideas holds that some administered, planned or scheduled production and exchange are necessary if business affairs are to be conducted with any degree of order. This concept, he said, seems to be dominant in England and among continental business men, and is used by the great international cartels and the concerns, French, German, British and American, which make up these cartels and co-operate with them.

With further respect to postwar planning, he said that many communities are considering the development of new industries with the idea of maintaining employment after the war. If the initiative of these enterprises is left solely to the unco-ordinated choice of each community many more new plants may be established in certain lines than the country can use.

The alternative, he said, is "some form of planning, some adding up of what is proposed to be done in each industry, some matching up of proposed capacity with potential demand, and some assigning or prorating of proposed capacity.

"Yet it is also true that when we do face the enormous shift from our expanded war economy to a peace economy there will be need of an exceptionally large volume of new investment. If too much of this new investment is poorly planned, we may have a resulting waste or potential resources of extraordinary magnitude."

Vigorous and impartial enforcement of antitrust laws will go a long way in preserving a free economy, Mr. Cox declared. The laws, he pointed out, possess a number of advantages as a means of preventing private restraint of trade. By enforcing the laws, the government acts as a kind of referee.

In this country's effort to preserve a competitive economy and a free market, it has often had to deviate from its guiding policy. Some of the deviations, he pointed out—the tariff for example—are of long standing, and in the future this country will probably have to make further deviations.

"Our task," Mr. Cox declared "is to apply the general principle to the specific problems that we shall face as we move from war to peace. This may not be easy. It is generally recognized that the pressures of war have led to concentrations of power, both in the hands of government and private interests. The dissolution or diffusion of power once concentrated is never an easy process." He believed that the country will undoubtedly succeed in doing it, but that in the interval, while the power is still concentrated and before its diffusion is wholly achieved, it shall be confronted with opportunities and suggestions for its use that "should be measured strictly against the standard of our basic belief in a free market."



URGES OPA EXTENSION: Marriner S. Eccles, left, chairman of the Federal Reserve Board, urged Congress to extend the price control act for two years after the war to permit industry to reconvert to peacetime lines without fear of inflation. Pending legislation would extend the act only to June 30, 1945. Above photo shows Mr. Eccles discussing the matter with Sen. Robert Wagner (Dem., N. Y.), chairman of the Senate Committee on Banking and Currency. NEA photo

Industries Submitting Lists of "Irreplaceables" for Deferment

Preliminary figures entered so far total more than 100,000, exceeding by 60,000 the number originally agreed upon as essential. Steel industry told none of its workmen under 26 years of age will be deferred. Production decline expected

CRITICAL manpower situation occasioned by the increased pressure of the armed services for able-bodied men appeared no nearer solution last week.

In such basic war industries as steel and metalworking, concern for the future of operations mounted as Selective Service calls for men in the 18-26 year bracket threatened to strip working forces of hundreds of men especially trained in the newer technologies, and whose loss may play havoc with production.

No deferments of men under 26 years of age in the steel industry can be expected, Arthur Bunker, vice chairman, Metals and Minerals Division, WPB, told a meeting of the Steel Industry Advisory Committee last Thursday. He said the only deferments likely in the age group 18-26 would be in a very few industries, such as synthetic rubber and chemicals.

Earlier a special subcommittee of the Industry committee, headed by Walter S. Tower, presented a series of recommendations, urging that an educational campaign be inaugurated to bring about better use of available manpower through the prevention of strikes, absenteeism, labor turnover and other manpower difficulties.

Adversely Affects Steel Output

Mr. Tower said that through draft losses, absenteeism and other interruptions, production of steel already is being affected adversely and that through the expected further inroads of the draft of men under 26, a further drop in production is inevitable.

Steel production has been falling off in some plants because of the shortage of labor. At Youngstown, O., for example, the situation is so critical the mills are seeking to determine whether certain relatively minor departments can be closed down conveniently so as to release workers in them to more important departments.

Manpower shortages are reported particularly acute in aircraft, ball-bearing manufacturing plants, railroading, logging, coal mining and cotton textile industries.

Last week it was learned government agencies have submitted lists asking for deferment of more than 100,000 key men under 26 years of age in critical war industries. This exceeds by 60,000 the 40,000 originally agreed upon as "irreplaceable", and indications were that the list would be still further added to since estimates from all critical industries were

not yet submitted. One of these latter is understood to be the rubber industry.

Preliminary lists of "irreplaceable" workmen in selected industries were submitted to the new master Interagency Deferment Committee which is headed by Manpower Commissioner Paul McNutt. Expectations are that work will start immediately on sifting the lists.

Individual Agencies Submit Figures

The individual agency figures submitted to the McNutt committee were reported as follows: War Production Board, as claimant for most of the must munitions programs, 25,000; Petroleum Administration, including 100 octane gasoline, 2000; Office of Defense Transportation, claimant for the railroads, 20,000; Solid Fuels Administration, including coal mining, 40,000; Selective Service System, claimant for Army and Navy technicians, 2000; and the War Shipping Administration and the War Food Administration, 15,000.

Most of the figures submitted made allowance for the certainty that a considerable number of men will be classi-

fied 4-F and retained in vital industries. At the same time the McNutt committee was warned by military officials that deferment recommendations may be "thrown in the waste basket" by the armed services if the war agencies requested deferments for too many under 26.

Total deferred in the 22-26 age bracket is said to approximate 243,000. It is understood, however, that two out of three of these will be required for combat duty leaving a maximum of 81,000 that could still remain in industry.

The War Production Board last week advised its regional directors that representatives of the War, Navy, Maritime Commission and the WPB are contacting manufacturers engaged in specified critical production to determine if these representatives will endorse manufacturers' requests for draft deferments of individual critical employees, 22 to 25 years of age inclusive, under instructions that such endorsements by these agencies' representatives should be based only on current contact with the manufacturers concerned.

The following is the list of critical urgent war production cited: Army list: Tires, tubes for aircraft, combat and heavy duty, including necessary tire cord, fabric and molds; radar, rockets, critical components for trucks, heavy and light-heavy, including truck trailers and class 1 and 2 tractors; research and development work specifically assigned by technical services. Airplane group 1 through group 4 by plants and by planes as listed in the list to be forwarded. Navy list: Landing craft, rockets, submarines, air-



FAVORS MANPOWER DRAFT: Donald M. Nelson, chairman of the War Production Board, advocated limited service legislation to permit the drafting for vital war work all rejected, discharged or over-age men registered for military service in testifying before a House military affairs subcommittee. Photo shows Mr. Nelson and Rep. John M. Costello (Dem., Calif.), left, chairman of the subcommittee. NEA photo

craft carriers, high capacity ammunition, radar, maintenance and ships and aircraft for the fleet, airplanes as for Army list. Maritime list: All tanker construction, combat loaded cargo and transport ships.

Representatives of the agencies were instructed to limit their endorsements of deferment requests by manufacturers in the age group 22 through 25 to employees in those plants engaged in urgent and critical war programs as listed above, and then only to specific individuals under the limitations in the instructions. Such representatives' contacts with manufacturers are to be completed by April 8.

Late last week Under Secretary of War Robert P. Patterson told the Draft Deferment subcommittee of the Military Affairs Committee of the House that he is firmly convinced the nation is facing a manpower problem of a critical character and that he favors utilization in war industry and other essential activities of men of military age found not physically fit for military service.

The armed forces, he said, are in need of 1,700,000 men this year and these needs must be filled promptly. In view of the present manpower shortages in aircraft, ball bearing, railroad, logging, coal mining and cotton textile industries the problem of mobilizing manpower is paramount, and he recommended immediate passage of a national service act along the lines of the Austin-Wadsworth bill. Such legislation, he estimated, would make about 1,000,000 4-Fs not now in essential war work available for such work.

Earlier in the week Manpower Commissioner McNutt told the Draft Deferment subcommittee, of which Rep. John M. Costello (Dem., Calif.) is chairman, that total labor shortage in the country's 11 ball-bearing plants is around 5000.

Following Mr. McNutt's statement, Rep. William J. Miller (Rep., Conn.) charged he had been unable to get any reliable information from the War Manpower Commission to answer constituents who claim workers at Hartford, Conn., made idle by cutbacks, continue idle for 60 days because the United States Employment Service insists they must work in the Bristol ball-bearing plant 17 miles away and will not let them take jobs in Hartford in the 60-day period despite the fact war plants there need workers.

Representative Miller said he was told in Mr. McNutt's office, in McNutt's presence, two weeks ago the manpower shortage in ball-bearing plants was only 900. He complained that workers are receiving unemployment benefits during the 60 days they ought to be working in essential Hartford jobs and he asked the subcommittee to send an investigator to determine whether there was a labor shortage at the Bristol ball-bearing plant.

Questioned as to whether there was need for national service legislation now that young men under 26 are to be taken out of essential jobs, Commissioner McNutt insisted that there is no need for such legislation, as the manpower situation has been handled effectively by

using persuasion and employing co-operative methods. He thought such methods will continue to bring good results.

Mr. McNutt said the labor turnover has dropped from 6.29 per cent last September to 4.58 in January and is dropping further. He said the Army has the power to induct some million 4-Fs not now in war work and furlough them into war jobs as it did last year in furloughing soldiers to work in the metal mines. However, the Army does not propose to take such action.

Do Not Allow for Replacements

Further, Mr. McNutt said Army and Navy demands do not yet allow for replacements and when these are determined he would not be surprised to see general induction of essential workers up to 28 or 29 years of age.

Despite Commissioner McNutt's view that national service legislation is no longer needed though he "would have welcomed such legislation 18 months ago," indications continue to accumulate that Congress cannot much longer delay enactment of some sort of a compulsory national service law. All key government officials long have been worried over extensive absenteeism in war plants, and even more so over the high rate of

labor turnover. With Selective Service so close to the bottom of the barrel that it now is about to induct men under 26 who hitherto have been deferred because of the essentiality of their occupations—with full knowledge that this policy is going to curtail production in many important industries—the distasteful task of framing a law which would eliminate labor turnover by locking men to their war jobs requires early action.

"The general public," said Austin, "does not know how critical the situation is. They are not informed, and cannot be informed, for reasons of military security."

Questioned by the Costello subcommittee of the House Military Affairs Committee, Donald M. Nelson, chairman, War Production Board, said he was opposed to enacting a national service act at this time.

Mr. Nelson saw merit in a limited service proposal. He thought the Army ought to induct certain 4-Fs and men over 38 who are not already in war work and then put them in war plants; he thought, however, that instead of paying them Army pay they should receive the going rate of wages in industry. He would not induct 4-Fs and those over 38 who are engaged in war jobs.

WPB Salvage Branch Shows Concern As Stocks of Scrap Drop Steadily

CONCERN over supplies of heavy melting and cast scrap grades later this year, and the organizing of ways and means to meet the problem, prompted a national conference of the War Production Board's Industrial Salvage Branch at the Statler hotel, Cleveland, March 29-30.

WPB salvage managers from the 13 regions in the United States, headed by Herbert M. Faust, Salvage Division director, and John J. Sheehan, Industrial Salvage chief, a number of Washington WPB executives and representatives of the armed services and industry attended the conference.

Scrap inventories have declined steadily in recent months and currently are at a point where "we don't dare permit them to recede any further", Mr. Faust said. Stocks of purchased and home scrap totaled 6,214,000 gross tons Jan. 31 last, or about 10 per cent below June 31, 1943. Consumption of scrap in January was moderately above the June, 1943, level, although off from the monthly peak established in October last year.

There is a serious unbalanced situation in the proportion of heavy melting steel and broken cast grades in relation to total inventories. Indicative of this growing problem are numerous reports of foundries forced to operate on a hand-to-mouth basis in respect to cast scrap supplies; and the forced increased use in a number of instances of higher

priced pig iron in their operations to maintain production schedules. Another example of the unbalanced stock situation is the recent WPB allocation of 80,000 tons of heavy melting steel from the West Coast, split between Inland Steel Co.'s plant at Chicago and Republic Steel Corp.'s Canton, O., works.

The nation's open-hearth furnaces absorb about 70 per cent of all the scrap used, yet only half of present scrap inventory is suitable for such use, Herman Moskowitz technical advisor on iron and steel scrap, WPB stated.

Upward trend in monthly excess supply of alloy steel scrap has leveled off recently, but little headway is being made toward reducing the huge accumulation. Increased alloy steel output has helped ease the situation somewhat.

The Bureau of Mines' report for January states scrap consumption of 4,616,000 gross tons was higher than the corresponding 1943 month, when inventories were at near peak levels. Inventories of 6,214,000 gross tons are lowest since September, 1942.

Reflecting the downward trend in purchased scrap collections in recent weeks, at a time when steel production has materially improved, scrap stocks are estimated to have declined further as of April 1. Relationship of heavy melting steel scrap stocks to total scrap inventories is believed to have grown worse since Jan. 31, 1944.

Reconversion To Bring New Era

Engineers view job ahead not as one of "converting back" but rather as the establishment of a new industrial era based on inventions and techniques, materials and tooling inspired or accelerated by the war

By GUY HUBBARD
Machine Tool Editor, STEEL

PHILADELPHIA

AS HAS been the case lately with all major conventions of societies and associations dealing with the shop and engineering phases of the metalworking industries, the annual meeting of the American Society of Tool Engineers strained the convention facilities of its locale.

This meeting, held at Bellevue-Stratford hotel, Philadelphia, March 26, 27 and 28, by running up a registration of 1000, representing chapters from New England to California and including large delegations from Canada, emphasized the fact that the A.S.T.E. with its present membership of 15,777, is one of the largest—and certainly the fastest growing—of all the engineering societies.

Throughout the meeting ran this theme—that while the tool engineering profession has accomplished a tremendous task (still unfinished in certain of its phases) in converting American industry to an all-out war effort, this task is small as compared to the one which lies ahead when the new peacetime industrial era is established in America. Emphasis was on this very point, that that job in no way will be "converting back" but will be the establishment of a new industrial era based on inventions and techniques and materials and tooling whose development has been inspired or accelerated by war.

Tool engineers face this future with a great deal of optimism, but at the same time with the realization that the responsibility of making new jobs for millions of people—and quickly—will rest to a large extent on their shoulders.

One of the most impressive expositions of the engineering, planning, tooling, production and inspection of an intricate product, that this writer has seen and heard in many a long day, was that staged by National Cash Register Co., Dayton, O., as the opener of the technical sessions. Each of the speakers—John Humphrey, Gunnar Nelson, Walter Boswell, Fred Shultz, M. J. Thompson and Edward Herman—not only is heading up some important phase of the work in question, but also is unusually able as a narrator of his experiences.



FOLLOWING THROUGH: More perhaps than in any other branch of engineering, tool engineers must keep in close touch with the practical side of the work in the shop—following through on their designs to see that they function properly and that the shop personnel understands how to use them effectively. OEM defense photo by Palmer, taken in the shop of Frederick Colman & Sons Inc., Detroit

The project with which they dealt in great detail is a computing sight for 50-caliber aircraft turret guns. It is an instrument of relatively small size but of almost unbelievable accuracy and intricacy—a real "thinking machine" and one that thinks fast. Suffice it to say that these men and their associates took this "handmade" instrument and tooled it up for quantity production on practically the same machines and with the same personnel as had been employed on business machines. Instrument makers said it couldn't be done, but they did it. They will do the same with postwar products regardless of their intricacy.

Expand Scope of Old Processes

Many of the so-called new processes really are old processes whose scope has been expanded to meet new demands. One such is honing. At a session devoted to this, A. F. Hasty, Sunnen Products Co., St. Louis, and Kirk W. Connor, Micromatic Hone Corp., Detroit, showed how mechanized honing has been developed as a production sizing, surface finishing and surface trimming technique ranking in importance with boring, grinding, reaming, etc. as a machining method but also capable of dealing with "tenths" and microinches with the greatest of ease. No longer is it confined to small work. Mr. Connor revealed details of huge honing tools used in sizing and surface finishing the

big bore cylinders of catapults for launching bombers from aircraft carriers.

In all this consideration of mechanical processes and equipment, the human element was not overlooked. At a jam-packed session on Monday evening, William S. Jack of Cleveland's famous Jack & Heintz Inc., discoursed on how his company achieves production records by bringing out the best physical and mental abilities of every one of its 7600 associates. The sum and substance of Mr. Jack's philosophy is that the best that is in a working force can be brought out through inspiring their willing co-operation rather than by driving them through any tactics which instill fear rather than friendliness.

As far as the machine shop is concerned, electronics definitely have "arrived." Such was the message brought by G. A. Caldwell, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., to the Tuesday morning session. After stripping the mysteries from electronic tubes with the aid of an interpretive sound movie in which their functions and uses were analyzed graphically, he demonstrated an infinitely variable speed electric drive made possible through their use. Following his demonstration, R. A. Cole, Norton Co., Worcester, Mass., and B. T. Anderson, Sundstrand Machine Tool Co., Rockford, Ill., showed how such controls are being applied to grinding machines and to lathes and

milling machines. Great things lie ahead in this direction as far as the machine tool industry is concerned.

The final technical session, Tuesday afternoon, was devoted to surface machining. Ralph R. Weddell, Weddell Tools Inc., Rochester, N. Y., dealt with a subject intimately related to super-speed milling—the use of modern “fly cutters” for production machining operations. Research in negative rake milling with rugged fly cutters having only one or two tungsten carbide blades, has brought out the fact that on most of the current model milling machines the possibilities of these cutters are cramped by the limited speeds and feeds and inadequate power of these supposedly up-to-the-minute machines. With the help of fly wheels and other expedients remarkable production is being attained, but the maximum will be reached only when machines are designed from the ground up to meet the new conditions. In other words, in the unceasing race between machine tools and cutting tools, machine tools for the time being at least have fallen behind.

At this same session Arthur Burgan, American Broach & Machine Co., Ann Arbor, Mich., discussed the broadening vistas of broaching. It is a far cry from the cutting of a sample keyway to the rifling of a large caliber gun barrel, but within a few short years, broaching has bridged that gap—and more. When the war is over, the technique of broaching small arms and cannon barrels, and many another wartime broaching development, will find its place in the peacetime economy. Broaching and milling will set a fast pace for each other.

John Van Deventer, president and editor of *The Iron Age*, spoke in a parable at the banquet Tuesday evening. A tool engineer dreamed that he was a machine tool. His hunger for chewing metal taxed the ability of his carbon steel teeth, so his dentist fitted him out with a new set made of high speed steel. Then his strength proved inadequate, so a doctor increased his power and strengthened his frame. Thereupon he had tooth trouble again and his dentist fixed him up with tungsten carbide dentures. These were

so good that his frame and power again were overtaxed by his chewing ability. Just as he was about to go to the doctor for another chassis and power overhaul, Mr. Van Deventer woke him up—as of now. The lesson is obvious.

Cleveland was chosen as the place for the next annual meeting, and the probability seems to be that an extensive exhibition of tools and machinery will be held at that time. That exhibition will of course be dependent upon the state of affairs of the war at that time.

Foundrymen Discuss Problems

Regional conferences told industry's marketing, publicity and educational programs have not kept pace with metallurgical developments. Sound cost accounting methods recommended

NUMEROUS problems facing the gray iron foundry industry were discussed at two regional conferences staged recently by the Gray Iron Founders' Society, the first at the Hotel Statler, Boston, March 22, and the second at the Hotel Pennsylvania, New York, March 24. Most speakers appeared on both programs.

Edward C. Hoenicke, assistant to the general manager, Foundry Division, Eaton Mfg. Co., Detroit, and on loan to the government as acting head of the Gray Iron Castings Section of the War Production Board, stated few individuals in government or industry have definite knowledge of gray iron castings as such, and that with the exception of certain interested buyers and engineers in industry who use gray cast iron, most people consider gray iron castings as material confined to use in such things as stoves, radiators, manhole covers and similar products. As a result of this lack of knowledge of the gray iron foundry industry on the part of government, little consideration was given to that industry or its problems when the various departments and agencies were established.

Reports Situation Complicated

This situation is complicated, according to Mr. Hoenicke, through the realization that the average gray iron foundry is a relatively small business, with 50 per cent of the firms doing less than \$100,000 worth of business a year. The average employment in the gray iron foundry industry is approximately 100 employees per plant. These firms usually are operated by a single individual who, of necessity, takes care of all matters pertaining to the business and it is most difficult for these men to find sufficient time to go to Washington to deal directly with the government.

Mr. Hoenicke condemned the reluctance of most gray iron foundrymen to reveal information on operations or to have available complete and accurate records on their business. He further stated marketing, publicity and educational programs have not kept pace with the great strides made in improved proc-

esses and metallurgical developments.

Walter L. Seelbach, president of the Gray Iron Founders' Society, and secretary-treasurer of the Forest City Foundries Co., Cleveland, outlined in some detail his experiences as an industry member of the Fifth Regional War Labor Board. Mr. Seelbach stressed the importance of complete co-operation on the part of foundrymen with the industry members of the various Regional War Labor Boards.

John L. Carter, cost consultant, Gray Iron Founders' Society, presented an interesting paper, “Sound Costing in the Gray Iron Industry”, in which he stated that poor business management is responsible for low profits experienced in average years by the gray iron industry. The industry's profits in 1936 to 1939 were only 4 per cent, and one-fourth of the companies operated at a loss. If the proportion of foundries having sound cost methods had been 75 instead of 25 per cent, Mr. Carter stated the average profit margin in a normal period like 1936-39 would have been doubled or approximately 8 per cent. If the additional 4 per cent had been applied to total sales for 1941, the gain would have mounted to approximately \$30,000,000.

At Boston, following Mr. Welfling's discussion, A. B. Root, vice president, Hunt-Spiller Mfg. Corp., South Boston, Mass., and a member of the Gray Iron Castings Industry Advisory Committee of the Office of Price Administration, emphasized strongly the difficulties that have faced the committee, due to lack of accurate statistics on the gray iron foundry industry.

At New York, A. C. Denison, president, Fulton Foundry & Machine Co., Cleveland, was honored by the society with the presentation of a scroll testifying to his valuable services as the society's president from 1941 through 1943 and for his work as a director.

At the New York luncheon, Brig. Gen. William C. Rose, chief, Executive Services, War Manpower Commission, Washington, spoke on “Re-employment of Veterans”.

OFFICERS ANNOUNCED

Officers of the American Society of Tool Engineers for 1944-45 are:

President: Douglas D. Burnside, superintendent, American Stove Co., St. Louis.

First Vice President: Cletus V. Briner, manager, Small Tool & Gage division, Pipe Machinery Co., Cleveland.

Second Vice President: A. M. Sargent, president, Pioneer Mfg. Co., Detroit.

Third Vice President: W. B. Peirce, works manager, Flannery Bolt Co., Bridgeville, Pa.

Secretary: Earl V. Johnson, carbide tool engineer, Firth-Sterling Steel Co., Dayton, O.

Treasurer: Floyd W. Eaton, personnel manager, Crawford Door Co., Detroit.

Assistant Secretary - Treasurer: L. G. Singer, district manager, Williams & Wilson Ltd., Toronto, Ont., Canada.

Executive Secretary: Adrian L. Potter with headquarters at 2567 West Grand boulevard, Detroit 8.

Small Steelmakers Oppose Union Leader's Proposal "To Save Them"

Survey shows producers view plan as neither practical nor economically sound. Say their troubles stem from advancing costs, chiefly wages. Do not think industry would benefit by having problems solved through government subsidy

SMALL steel companies recently listed by Philip Murray, president, United Steelworkers of America, as prospective beneficiaries of his plan to aid small producers in the steel industry were not consulted by the union head in drafting his plan. These small steelmakers do not regard the plan as either practical or economically sound.

This fact was revealed by a survey of representative companies among those

named by Mr. Murray. Leaders of the small steel companies are agreed their firms have serious problems ahead but they are convinced these problems would not be solved by Mr. Murray's plan.

They describe many statements made by Murray as erroneous and completely at variance with the facts.

According to statements by heads of small producing companies their present and threatening troubles are a re-

sult of the rapid and abnormal advance in costs during a period when prices have been frozen. Chief factor in cost advance has been rise in wages since the start of the war. One typical company reports since 1941 straight hourly time rate has increased 44 per cent while weekly earnings of employees due to the 48-hour week and overtime have increased 64 per cent. Meanwhile prices remain unchanged.

Many of the steel companies named by Murray take exception to his statement that wages are so much lower for their companies than average of the industry. In most instances both base wage rate and weekly earnings are higher than those of other industries in their respective communities.

In his plan Murray lists 20 companies having 23 plants with 5.8 per cent of the annual ingot capacity and 5.3 per cent of the employees in the industry. Murray proposed that the War Production Board appoint a Small Steel Commission to administer his plan, the commission to consist of three persons from government, industry and the United Steelworkers. Small steel producers take strong exception to this proposal on the grounds it would bring the government into active competition with private industry. They want no alliance of government and union even though it is proposed for their supposed benefit. This commission would be empowered to sell pig iron produced in Defense Plant Corp. blast furnaces operated by the government at a price which would enable them to live and compete with large integrated plants. Also the commission would sell battlefield scrap to small semi-integrated steel producers below OPA ceilings.

The small producers claim both these proposals are unsound, insisting pig iron could not be produced as cheaply by DPC as by private industry without government subsidy. Moreover many of these blast furnaces are not well located geographically to furnish iron to these small companies. With respect to battlefield scrap, the small steelmakers maintain this is no solution to the problem because much of it is mixed with alloys and it is useless to them. According to some leaders of this group, they do not believe their interests or the interests of the industry as a whole would be served by having their problems solved by government subsidy at the expense of the taxpayer.

Olds Says Employment Is Joint Responsibility

Referring to the maintenance of the maximum amount of gainful employment as one of the most important tasks of postwar days, Irving S. Olds, chairman, United States Steel Corp., told the Travelers Aid Society at its annual meeting in New York last week that maintenance of such employment is the responsibility of every group, including representatives of government, labor, and management.

POSTWAR PREVIEWS

GOVERNMENT CONTROLS—Continuation of government controls and planning may be necessary in certain instances after the war to obtain full production. See pages 78, 79.

TOOL ENGINEERS—Convention contemplates task of establishing new industrial era in peacetime, based on inventions, techniques, materials and tooling inspired or accelerated by wartime necessities. See page 82.

WHAT'S AHEAD—Second Special Report to Industry, based on survey of metalworking industries by STEEL, indicates physical readjustment to peacetime production will not present undue difficulties. See page 85.

RURAL ELECTRIFICATION—Demand for power tools and appliances on farms expected to supply postwar market amounting to more than billion dollars annually. See page 94.

MANAGEMENT—War is taking toll of top-flight executives. Near confiscatory taxes are weakening incentive, while complicated government regulations, labor disturbances, and scarcity of efficient assistants contribute to exhaustion of industrialists. May slow advancement of industry in postwar period. See page 97.

LABOR RELATIONS—W. H. Davis suggests ways to build sound industrial relations in preparation for peacetime economy. See page 97.

AIRCRAFT—Curtiss-Wright completes new testing facility to aid in developing propellers and engines for "planes of tomorrow." See page 101.

CANADA—Dominion prepares for quick reconversion to peacetime production, while executing larger 1944 war output program. See page 109.

ELECTRONICS—Recent advances in electronics are of special interest to metalworking industries. Knowledge of principles underlying electronic tubes and circuits is one key to understanding of impending developments. See page 112.

RADIOGRAPHIC INSPECTION—Advent of million-volt X-ray unit for examination of welds and castings is likely to be followed by even higher powered instruments for inspection of metals, due to success of the former in rapid location, clear definition of flaws. Depth of sections to be inspected will increase. See page 122.

COLD-ROLLED STRIP—Progressive refinements in process of cold-rolling strip steel being reflected continuously in improved product. Altered surface condition reduces friction in forming, improves adhesion of coatings and affords use of higher annealing temperatures. See page 132.

What's ahead for the METALWORKING INDUSTRY

**SPECIAL
REPORT
TO
INDUSTRY**

as it prepares for peace?

EXCEPT for manufacturers of durable consumer goods, physical readjustment of the metalworking industry to peacetime production should not prove too difficult. Assuredly, the industry's problems will not be as complicated as those faced by industries which experienced total changeover to war both as regards product and plant.

By and large, the products of the metalworking industry are the same whether their ultimate use is civilian or military. This is true even though durable consumer goods, production of which has been prohibited or greatly curtailed throughout the war, constitute a large proportion of the industry's total output in normal times.

Consequently, the metalworking industry's reconversion problem largely will concern adjustment of existing capacity in the transition to the civilian market, comparatively minor changes in physical plant being necessary in most cases.

In their recent report on war and postwar adjustment policies, Bernard Baruch and John Hancock declared that only a relatively small proportion of American industry will have reconversion problems in the true meaning of the word; that

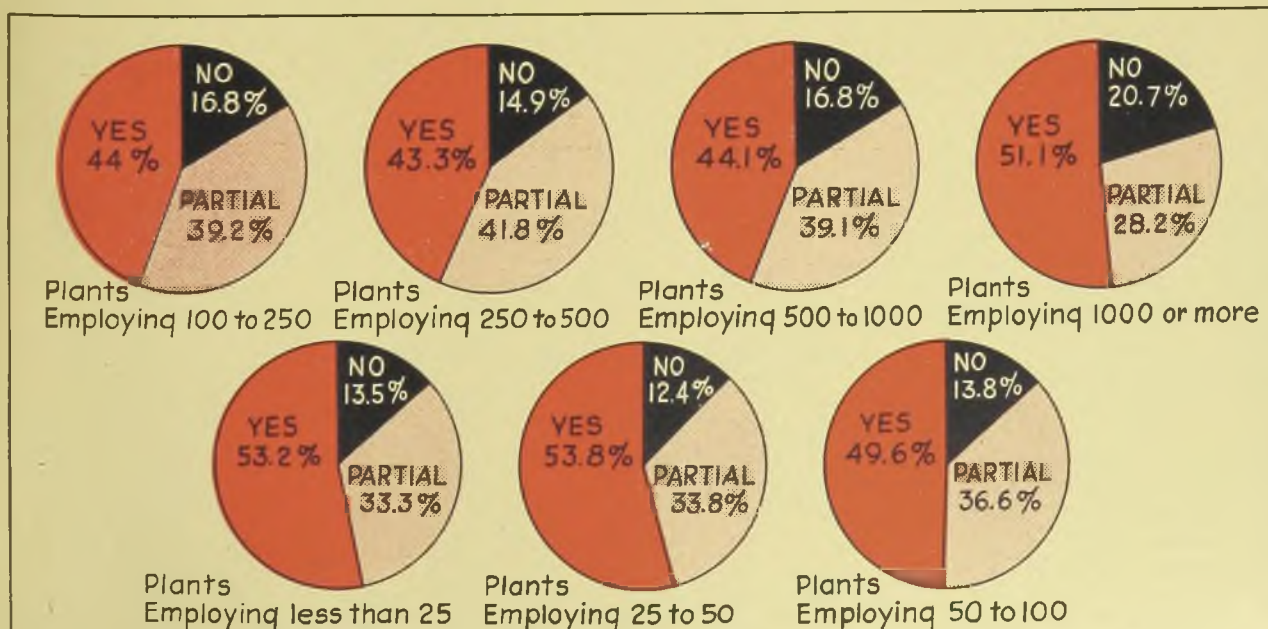
is, will have to change over their plants physically in the shift from war to peace production. According to these government advisers the problem will be confined chiefly to durable consumer goods, where the greatest physical conversion to war has taken place, such as, for instance, the automotive industry. And even here total reconversion will not be necessary since many automotive plants throughout the war continued to produce much the same products they turned out during peacetime.

Baruch and Hancock report preliminary government estimates indicate that at most no more than 20 per cent of the nation's total industrial capacity will confront physical change-over problems, and this view is substantiated by the findings of STEEL's recent survey of the metalworking industry.

Only 15 per cent of the metalworking industry's plants face total reconversion in the matter of product, STEEL's survey shows. Actually 49.4 per cent today are making the same products they made before the war, while 36.6 per cent are partially engaged on prewar products.

Viewed broadly, it can be assumed, based on STEEL's data,

Position of the Industry on Product Manufacture



Approximately 50 per cent of the plants in the metalworking industry did not have to change product production during the war, physical changes of product and plant

largely being confined to durable consumer goods. In the above graph the position of the industry in the matter of products, plotted in size groups, is shown

Industry's Product Position by Class of Prewar Manufacture

(Given in percentages as based on replies in STEEL's Survey)

	Still Making Same Products			To Resume Prewar Products			Have Developed New Products		
	Yes	No	Partially	Yes	No	Partially	Yes	No	Considering Some
Bar Products—Bolts, nuts, rivets, screw machine products	75.0	4.1	20.9	75.0	0	25.0	26.3	48.7	25.0
Wire Products—Wire specialties, cable, wire fabric, welding electrodes	62.6	9.9	27.5	71.9	0	28.1	36.3	35.1	28.6
Sheet and Strip Products—Light gage tubing, stampings	39.1	16.1	44.7	74.7	1.1	24.2	30.4	24.9	44.7
Plate Fabricators — Including welded pipe	41.0	15.0	44.0	74.0	0	26.0	33.8	23.6	42.6
Structural Fabricators	25.8	21.2	53.0	87.2	0	12.8	21.2	53.0	25.8
Ornamental-Wrought Iron Fabricators	16.0	28.0	56.0	90.5	0	9.5	24.0	8.0	68.0
Metallurgical Treatment — Job galvanizing, plating, heat treating, welding	48.0	20.0	32.0	76.9	7.7	15.4	24.0	36.0	40.0
Jobbing Machine Shops	51.9	16.7	31.4	68.2	4.5	27.3	18.5	37.1	44.4
Dies, Molds — For stamping, forging and plastics	52.1	8.3	39.6	70.0	20.0	10.0	33.3	27.1	39.6
Building Hardware, Trim—Prefabricated buildings, sheet-metal working	32.6	20.0	47.4	89.4	0	11.6	38.9	9.6	51.5
Heating, Ventilating, Air Conditioning equipment	40.9	17.2	41.9	85.9	3.1	11.0	38.5	22.2	39.3
Metal Furniture—Cabinets, kitchen equipment	23.8	35.0	41.2	86.4	0	13.6	27.5	27.5	45.0
Containers and Hollow Ware—Light pressure vessels	46.4	17.4	36.2	76.6	10.0	13.4	25.9	27.7	46.4
Light Metal Products—Specialties, light hardware	25.0	32.5	42.5	77.6	0.8	21.6	41.3	11.8	46.9
Plate Products—Boilers, processing equipment, stokers, pressure vessels	64.1	7.5	28.4	77.2	0	22.8	37.3	32.9	29.8
Locomotives, cars, ships	67.7	12.9	19.4	70.0	0	30.0	19.4	61.2	19.4
Aircraft parts, accessories	22.2	44.4	33.4	65.3	7.7	27.0	47.2	19.5	33.3
Parts—Auto and machine	61.4	7.9	30.7	77.7	4.2	18.1	34.4	26.5	34.4
Truck bodies, trailers, airframes	47.8	8.7	43.5	80.9	4.8	14.3	34.7	26.2	39.1
Small tools, cutlery, flatware	62.8	6.0	31.2	72.2	1.9	25.9	37.7	22.5	39.8
Steam specialties, valves, Plumbers supplies	62.6	14.6	22.8	92.0	0	8.0	30.7	25.3	44.0
Agricultural implements	60.0	17.5	32.5	89.6	0	10.4	40.0	21.3	38.7
Contractors' Equipment—Trenchers, scrapers, road building machinery	53.4	6.9	39.7	76.1	0	23.9	34.4	24.3	41.3
Autos, Tractors, Airplanes, Trucks	50.0	22.8	27.2	70.0	0	30.0	22.8	40.9	36.3
Electrical Equipment—Industrial, including motors	59.0	8.0	33.0	90.0	3.3	6.7	47.0	16.3	36.7
Materials Handling Equipment —Power trucks, cranes, hoists, conveyors	58.9	6.8	34.3	83.3	0	16.7	38.3	23.4	38.3
Electrical Appliances, Assemblies	13.5	59.4	27.1	90.3	0	9.7	37.8	10.9	51.3
Engines, Pumps, Compressors, Hydraulic equipment	65.0	10.0	25.0	87.1	0	12.9	42.0	19.0	39.0
Heavy Machinery	61.5	7.7	30.8	83.3	0	16.7	33.3	20.6	46.1
Special machinery	37.9	19.3	42.8	85.0	2.7	12.3	36.8	20.9	42.3
Metalworking machinery	54.2	8.3	37.5	72.7	0	27.3	58.3	8.4	33.3
Machine tools	64.0	2.7	33.3	57.1	9.5	33.4	38.6	13.4	48.0
Machine tool accessories—tools, dies, jigs, fixtures	73.6	10.5	15.9	61.1	16.6	22.3	28.9	36.9	34.2
Instruments—time recording, etc.	50.5	11.0	38.5	87.1	0	12.9	56.0	12.0	32.0
Office machinery — typewriters, calculating machines	27.4	27.4	45.2	100.0	0	0	18.1	27.4	54.5

that about 50 per cent of the industry will have major product reconversion problems, and the severity of these problems will vary considerably as to the separate segments of the industry and the size of the plants involved.

The war has affected product production in varying degree. For example, the larger manufacturers, those employing 1000 or more, percentagewise have experienced greater change than have the smaller interests. Something like 20.7 per cent of the large plants face total product reconversion as against 12.4 per cent for plants employing 25 to 50. On the other hand, the percentage of large plants compelled to change only partially was smaller than that of either the moderate sized plants or the very small companies. (See graph on page 85).

While this implies that the product reconversion problem of the larger firms is greater than that of the smaller, it should not be overlooked that 51.5 per cent of the large companies continued to make the same products during the war as before. This is significant when relating the implications of product change to overall reconversion, since it is these large plants to which the nation is looking to provide large-scale employment in the postwar era.

Why product change was greater in the larger than in the smaller plants is understandable. Normally, in the large plants the bulk of the war-banned consumer goods is produced while the smaller companies, generally speaking, are specialty manufacturers whose products were readily applicative to war use.

On first glance some of the data presented in the table on page 86 would seem illogical. For example, only 22.2 per cent of the airplane parts and accessory manufacturers are shown still making the same products they produced before the war, while 44 per cent had changed entirely and 33.4 per cent partially. In view of the accelerated demand for airplane equipment the figures would appear misleading. Upon close study, however, product changes in the airplane parts category are explained by the fact that many companies entered the field since the outbreak of the war, prior to which time they were engaged in work which placed them in a different industry classification. This reasoning is supported by the fact that of those in the field that have changed prod-

uct during the war 65.3 per cent plan to resume production of their prewar product when the war ends, 27 per cent will resume partially, and only 7.7 per cent will not backtrack to their old work.

As is to be expected most companies will resume production of their old products when the war ends. According to the data collected by STEEL, of all plants that changed 80.4 per cent will turn back to their former products, 17.3 per cent will return partially, and only 2.3 per cent will not take up their old work to any extent.

There is a concordance of opinion on the part of both large and small plants with respect to prewar product resumption. Of the large manufacturers that changed products, 87 per cent will resume their prewar production, and this ranges down through the various size categories to 76.5 per cent of the very smallest concerns, those employing fewer than 25. More of the smaller companies are engaged in the manufacture of products which have both war and civilian applications, which probably accounts for the smaller number not returning to prewar product. (See graph at bottom of page).

On the basis of product classification those lines commonly described as durable consumer goods, banned during the war, rank high in the percentage rating of those manufacturers planning to return to prewar products; for example, 77.6 per cent of the light metal products trade, 70 per cent of the automobile, tractor, and truck builders, and 86.4 per cent of the metal furniture and equipment manufacturers.

Also high on the list are those manufacturing lines usually associated with the building trades, such as building hardware and trim, ornamental and wrought iron, steam valves and fittings, structural fabricators, etc. (See table on page 86). Both the durable consumer goods and the building supply lines were hard hit by the conversion to war production.

Machine tool accessory manufacturers top the list of those not planning to return to prewar product. This, possibly, is explained by the fact postwar prospects for the machine tool industry are clouded in uncertainty and are such as to cause parts suppliers to cast about for new fields in which to serve.

New product development has not been neglected in the metalworking industry throughout the war. Considerable work

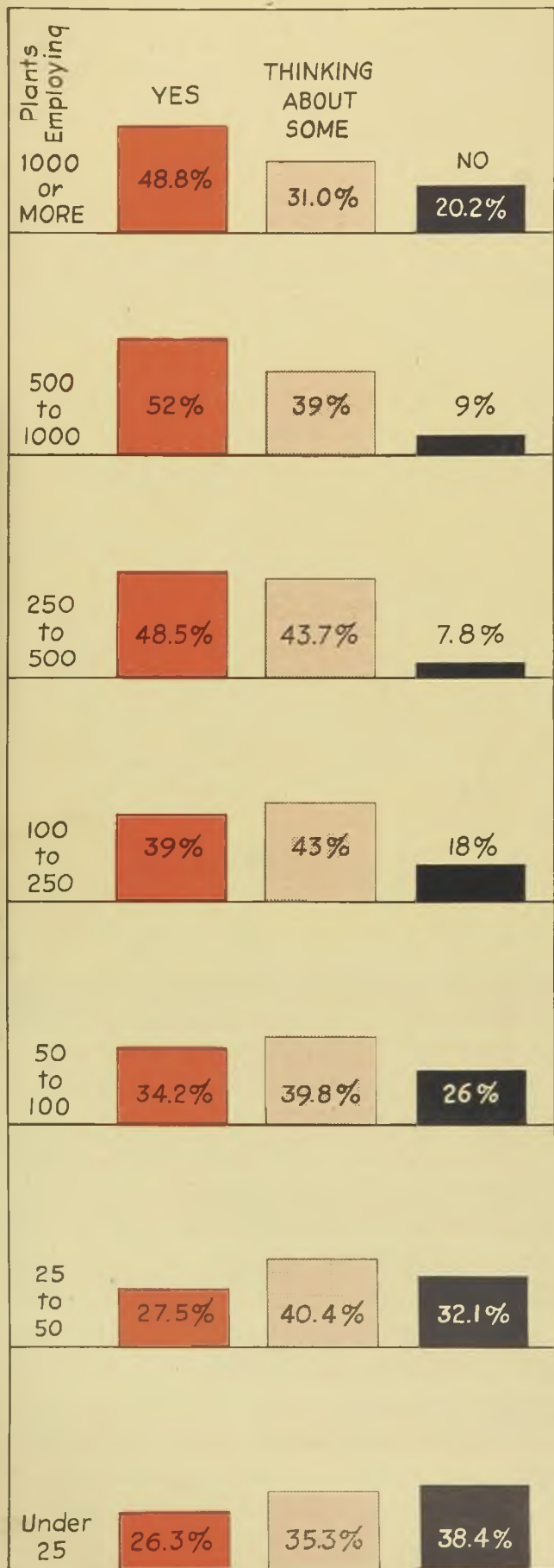
Intend To Resume Prewar Product Manufacture

Plants Employing			
1000 or more	YES 87%	PARTIALLY 11.7% →	NO 1.3% →
1000 to 500	YES 85.6%		PARTIALLY 14.4%
500 to 250	YES 77.9%	PARTIALLY 18.4%	NO 3.7%
250 to 100	YES 82.5%	PARTIALLY 16.2% →	NO 1.3% →
100 to 50	YES 80.9%	PARTIALLY 17.3% →	NO 1.8% →
50 to 25	YES 80%	PARTIALLY 18.3% →	NO 1.7% →
Less than 25	YES 76.5%	PARTIALLY 19.4	NO 4.1%

Most companies in the metalworking industry which had to change their product manufacture during the war plan to resume their prewar product when the war ends. Data

collected by STEEL shows that only 2.3 per cent of all the plants that changed products will not resume their prewar production

New Product Development



already has been done along this line with many companies positioned to introduce innovations once the go-ahead signal is given. Further, there are many more companies which, while not yet ready to announce their plans, are aggressively pushing product research, confident they will be able to come up with something new when the curtain is rung down on the war.

Data developed in STEEL's survey shows that interest in new products is general throughout the industry, both large and small plants reporting progress in this respect. This indicates that the industry is largely conscious of the competitive implications which wartime advances in science and technology hold for the peacetime economy. Management is well aware of the fact there will be new materials and improved metals available in greater quantities and possibly at lower prices in the postwar era. They know that technological and metallurgical advances during the war will of a certainty bring about changes in manufacturing and marketing; that improvements in machine tools and other metalworking machinery undoubtedly will outmode many prewar products. They know that those lines of production which fail to prepare for the postwar world with new products and new methods of manufacture will lag behind the industrial parade.

STEEL's survey shows 35.9 per cent of the industry has developed new products while 39.6 per cent is giving the subject thought, which, broadly interpreted, can mean they are developing some. Only 24.5 per cent of all the plants reported they had done nothing whatsoever with respect to new product development.

So far new product development appears to have been farther advanced in the larger plants than the smaller ones. Something like 50 per cent of the companies employing more than 500 report they have developed new products compared with only 37 per cent for plants employing less than 50.

In the different fields varying progress in new product development is noted. For example, 56 per cent of the instrument manufacturers have new products to offer, but only 18.1 per cent of the office equipment makers, and 33.3 per cent of the heavy machinery builders.

Metalworking machinery classification is highest in new products, 58.3 per cent of the industry reporting it has new developments. This, possibly, is explained by the concern for the future in this field occasioned by over-production of metalworking equipment during the war.

In this important matter 52 per cent of the plants employing 500 to 1000 have new developments to launch in the postwar era. The very largest plants, those employing more than 1000, rate next with 48.8 per cent and this ranges down to 26.3 per cent for the very smallest plants, those employing fewer than 25. Significantly, the very smallest plants with 49.1 per cent are highest in the list of those which have taken no action whatsoever in product development, followed by plants employing 25 to 50 at 46.3 per cent and plants employing 50 to 100 at 42.8 per cent. (See accompanying graph).

Unquestionably, new product development will be stimulated within the metalworking industry as events unfold new possibilities for application in the postwar world. STEEL's survey indicates, as a general thing, new product development within the industry is fairly well advanced, though many companies still have not yet taken any action along this line. The large number of companies considering the development of new products, however, as indicated by STEEL's survey, warrants the conclusion that when wartime restrictions are relaxed and normal competitive conditions once more prevail, new scientific and technological developments will appear in the industry at a faster rate than ever before.

New product development for introduction in the postwar era is fairly well advanced in the metalworking industry, data collected by STEEL show. Indications are product research is being pushed aggressively with many companies expecting to launch innovations once restrictions on production are relaxed

Order M-293 Provides Scheduled Items Are To Be Shipped as Needed

"Freezing" of shipping schedules expected to increase production. System supplements preference ratings. Provisions of order clarified in new pamphlet published by the War Production Board

GENERAL Scheduling order M-293 has been perfected by the War Production Board to assure, as far as possible, that manufacturers ship the scheduled items in the order in which they are needed. The order is also intended to increase production by the "freezing" of shipping schedules.

To help clarify provisions of this order, WPB has issued a 16-page *Scheduling Primer*. It was pointed out that scheduling, under M-293, supplements the preference rating system. Preference ratings control up to the point where the schedule is frozen. However, when a shipping schedule has become frozen, preference ratings have no further effect, and changes in shipping dates can thereafter be made only by WPB directions specifically amending the frozen schedule.

Primary responsibility for scheduling shipments is placed with the manufacturers. Rules governing the sequence in which shipments should be made are contained in priorities regulations, especially regulation No. 1.

Shipping dates for a portion of the order board, once established in accordance with priorities regulations Nos. 1 and 18, cannot be changed except by specific WPB direction. The frozen schedule is a distinguishing characteristic of WPB scheduling orders. Without the "freezing" of schedules frequent rearrangement of orders might occur as new contracts were placed and old contracts up-rated. Where the entire order board is frozen, the "freeze" period, as determined by the industry division, may be anywhere from two months up, dependent on the manufacturing cycle. Once each month, the freeze period is extended for shipments 30 days beyond the portion of the schedule frozen in the preceding month.

Designations of products under M-293 refer to the type of scheduling action and not to the characteristics of the product. The "X" designation is used where it is necessary to freeze order boards of all manufacturers of a given product.

When a product is assigned a "Y" designation, the purchaser must obtain WPB authorization before placing his order, and no manufacturer may accept the order without such authorization. When a manufacturer has accepted an authorized order for a "Y" product, it is frozen in his schedule until shipped.

Sometimes a combination of the "X" and "Y" procedure is used. In such a case, not only is the entire order board frozen, but purchasers must receive prior

approval from War Production Board. "Undesignated" products are those for which scheduling can be limited to a few manufacturers, providing a method under which action may be taken when and where required. WPB may require a manufacturer of an undesignated product to submit its order board for freezing, and in addition, a manufacturer of such a product may voluntarily submit his order board and request that it be frozen.

Tables in M-293 show what type of scheduling is applied to each product; what forms should be used for summary operations reports, for reporting order boards, and for requesting authorizations to purchase; and the number of months for which the schedule is frozen.

When a schedule is amended by WPB directing new shipping dates, the manufacturer may redirect shipments or he may have to rearrange production. While WPB normally consults a manufacturer to determine whether a proposed amendment of his shipping schedule is practicable, the responsibility for seeing that the shipment is made on the specified date is the manufacturer's, and he must make whatever adjustments in his operations are necessary.

The "Z" product designation (which provided, in effect, for tracing component delivery dates down through the subcontracting chain and then freezing schedule on the basis of established related delivery dates) has been discontinued. The amended order provides for a limited "order identification" procedure if required for specified programs by specified claimant agencies, but it is confined largely to the first subcontracting level and has no bearing on the freezing of delivery dates unless the WPB takes specific action.

With the latest changes in provisions applicable to "X" and "undesignated" products, the distinction between the two types of products has been reduced. However, as shown in the accompanying chart, they differ in several respects.

"X" VS. "UNDESIGNATED" PRODUCTS

	"X"	"UNDESIGNATED"
SET UP SHIPPING SCHEDULE	IN ACCORDANCE WITH PRIORITIES REGULATION 1	
FILE SHIPPING SCHEDULE WITH WPB	UNLESS DIRECTED BY WPB NOT TO DO SO	(a) IF DIRECTED BY WPB TO DO SO (b) IF MANUFACTURER WISHES TO REQUEST THAT IT BE FROZEN
SHIPPING SCHEDULE FROZEN	ALL MANUFACTURERS, WHETHER OR NOT SHIPPING SCHEDULED IS FILED WITH WPB	(a) IF FILED AT WPB DIRECTION (b) IF WPB SPECIFICALLY FREEZES A VOLUNTARILY-FILED SCHEDULE
PERIOD FOR WHICH SCHEDULE IS FROZEN	AS STATED ON M-293 TABLE (USUALLY AVERAGE PRODUCTION CYCLE PLUS 30 DAYS)	
CHANGES IN FROZEN SCHEDULE	MAY BE MADE ONLY BY WPB	
CHANGES IN NON-FROZEN PORTION OF SCHEDULE	MADE BY MANUFACTURER IN ACCORDANCE WITH PRIORITIES REGULATION 1	

Touchy Subject

CONSULTATIONS are under way which may result in modification of the 1941 agreement banning Great Britain from exporting British-made counterparts of American lend-lease goods. The British have protested this stipulation no longer is fair; they point out, for example, that British cotton goods exports in 1942 were only 25 per cent of 1937 exports, whereas American exports were 190 per cent. This hits the British in a very touchy place—their foreign trade.

Less Than 2 Per Cent

Exports of farm machinery under lend-lease have been less than 2 per cent of the American production, according to President Roosevelt. He thus indirectly replied to complaints in the House and the Senate that farm machinery is being shipped abroad, in many cases to countries which never before have had such equipment, when American farmers are unable to get machinery they need for food production. The President explained that the exported farm machinery will help provide food for our overseas soldiers, soon to number 5,000,000 men. Sen. Bennett Champ Clark (Dem., Mo.) has asked that the Senate Committee on Agriculture conduct an investigation of these exports.

To Get War Report

Highlight of the coming annual meeting of the Chamber of Commerce of the United States, at the Waldorf-Astoria hotel, New York, will be an up-to-the-minute report on the progress of the war from three top commanders on Wednesday morning, May 3. The speakers will be Gen. George C. Marshall, Army chief of staff, Admiral Ernest J. King, commander-in-chief, United States Navy, and Lieut. Gen. Alexander A. Vandegrift, Marine Corps commandant.

Production Varies

Members of a House subcommittee were surprised when Donald M. Nelson, chairman, War Production Board, told them that daily and weekly working hours at some plants have been reduced. "We are watching hours very carefully," he said. "Where it brings increased production we extend the hours. Some plants are getting greater production by shortening the hours."

For Postwar Planners

Many postwar planners will be interested in reading a discussion by Melvin A. Brenner, War Production Board economic analyst, entitled "The Outlook for Synthetic Rubber". Taking deferred needs and new rubber markets into account, Mr. Brenner concludes that "the annual world demand for rubber for the first few years after the war will exceed 1,500,000 tons by a considerable margin", also saying "it appears probable that the

rubber supply and demand for the first postwar year will be very nearly in balance." As long as this condition continues the synthetic rubber industry will continue to enjoy its present non-competitive position, says Mr. Brenner, adding that survival of that industry in the

JUST WORRIED

Worried by reports of increasing indignation among American troops overseas because strikes, absenteeism and high labor turnover, joint committee of the American Federation of Labor and the Congress of Industrial Organizations has asked the War Department to see to it that servicemen be kept more fully and accurately informed than at present. "We are convinced," they said to Under Secretary Robert P. Patterson, "that they are not getting the full story now; that they are hearing only one side of the case."

They held the War Department "owes a responsibility to give them the full truth," by giving the soldiers the facts on war production, or by permitting "labor organizations to make their own publications more widely accessible to the soldiers, a privilege now severely curtailed by Army regulations." Judge Patterson refused the delegation's request that the Army assume the responsibility to correct "misconceptions the troops might have derived" from reports of labor troubles.

end "may depend in large part on its ability to meet the price and quality competition of natural rubber."

Arabian Pipeline Probe

Sen. Francis Maloney (Dem., Conn.) has been appointed chairman of a committee to investigate the petroleum situation and particularly the projected 1200-mile United States government-owned and built Saudi-Arabian pipeline which has been the subject of hot controversy for several weeks.

Termination Hearing On

House Naval Affairs Committee last Tuesday started hearings on H. R. 4469, a revision of H. R. 4382, the committee's comprehensive bill covering termination of Navy contracts. The important feature of the revised bill is that it has a "reconversion" title giving the Secretary of the Navy considerable latitude in allowing payments in the light of financial needs of terminated war contractors in reconverting from war production. The committee also is thinking about recommending the bill to cover all contract terminations rather than only Navy terminations.

Johnston Going to Russia

Eric Johnston, busy president of the Chamber of Commerce of the United States, has accepted an invitation of Premier Stalin to visit Soviet Russia. He plans to leave the United States about May 12 and return about June 20. Believing that the United States must be prepared to compete in world markets with Russian collectivism, as well as trade with Russia directly, Mr. Johnston is desirous of viewing the operation of the Soviet system from the point of view of the American business man.

For Price Stabilization

Federal Reserve Chairman Marriner S. Eccles told the Senate Banking Committee that Congress should keep the price stabilization program alive two years after the war "to maintain the public faith and the value of the dollar." A sudden release of pent-up spending as soon as hostilities end "might well be fatal to the nation's economy."

Folsom in New Post

Marion B. Folsom, treasurer, Eastman Kodak Co., Rochester, N. Y., has been appointed by the House Special Committee on Postwar Economic Policy and Planning as director of its study and planning staff. Mr. Folsom is board chairman of the Federal Reserve Bank of Buffalo, trustee of the Committee for Economic Development, a member of the Business Advisory Council, Department of Commerce, and of the New York State Advisory Council on Unemployment Insurance.

Brand Names Essential

Rep. Charles A. Halleck (Rep., Ind.), chairman of the National Congressional Republican Committee, who may deliver the platform address at the Republican national convention in June, in a radio broadcast last week declared that preservation of brand names and the trademark is essential. Efforts to force standardized grading through Congress, he said, are the first step in an organized plan to undermine "the social and economic system... under which this nation has grown great. This insidious campaign to destroy the benefits of our system of brand names and trademarks is a threat to the quality of everything we eat, everything we wear and everything going into the home."

George Bill To Be Revised

The Subcommittee on Contract Terminations, Senate Military Affairs Committee, will begin two weeks of hearings, Tuesday, April 4, on S. 1730. This is the Murray-George bill covering termination of contracts. Already enjoying considerable support in the Senate, the bill now is to be revised and polished up in final form.

There are many GOOD THINGS



AHEAD...

Transparent plastic cells will make easier the checking of storage battery solutions.



A new coating for metal is claimed to have five times as much resistance to salt spray as galvanizing.



A chemical substance, added to hard nickel alloys, is claimed to save 75% of machining time.



With the promise of an infinity of electronic tube applications, the effect of their radiation on humans is being carefully studied. There seems to be no evidence of ill effects from even long exposure.



The new thyatron motor control, which makes possible the operation of D. C. motors from A. C. current supply, is said to permit exact variations in speed from 25 to 1,750 r.p.m. by the turning of a graduated knob.



Many new kinds of ink have been developed for war needs, including one that is oil-proof which is used to print instructions on mechanical parts. Another prints the lines on gun sights and surveyors' instruments for which spiders' webs were formerly used.



A new series of plastics containing silicon has very great resistance to heat.



The old "lost wax" process of casting, long a method of jewelry manufacture, has been revived for the making of small, complex mechanical parts.



A small section of Connecticut highway is being paved experimentally with steel mat similar to that used for quick construction of landing fields and on invasion beaches.



A new high-speed X-ray inspection machine is claimed to be capable of photographing as many as 17,000 castings per hour on a continuous film.

A new landing gear, for aircraft, works on the caterpillar principle, and is said to be lighter than the conventional wheels with from four to eight times the supporting surface.



A new cement that may be applied with a brush and set with a flat iron is claimed to bond metals with a strength and permanence equal to spot welding.



In one of the trickiest of new finishing processes, the sprayed paint coats one side of an object and, after passing by it, turns around and returns to paint the other side.



Broken drills and reamers are being removed from holes with dynamite.



A new 120-inch searchlight, with 900-watt mercury light source, develops 7,500,000 candle power.

So many uses are anticipated for glass fibers that they are being produced in seven standard types. Their fibers are now being used in making filters and insulation, for reinforcements in felt, paper, plastics and alone, or in combination, with cotton, rayon or asbestos in textiles.



A new method of checking liquids during processing depends on the observation of color by a photo-electric colorimeter.



Aircraft piston rings finished with oil-retaining, porous chrome plate are reported to increase by five the flying time between overhauls.

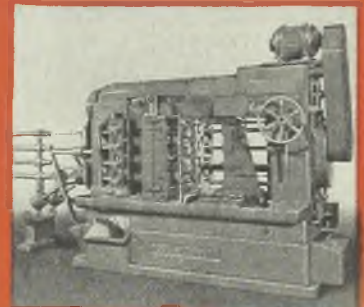


A new "wide-angle photo-electric scanner" is offered as an inspection or safety device. While the work that it does is similar to that done by more familiar applications of the "electric eye", the new device scans the whole of an area, such as a sheet of paper or the space in front of a machine. Any change occurring in the area produces a reaction that may be used to give a warning signal or shut off power.



*When
you think ahead,
think of
production like this*

These four tension bolts are all made at once, automatically, in twelve seconds — three seconds each — on the one-inch 4-spindle Vertical Conomatic. Production like this has helped America to overcome the time advantage of its enemies in war, and will help American manufacturers to overcome competition in time of peace.



CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U. S. A.

PRIORITIES-ALLOCATIONS-PRICES

Weekly summaries of orders and regulations, together with official interpretations and directives issued by War Production Board and Office of Price Administration

INSTRUCTIONS

IRON CASTINGS: Restrictions on use of malleable iron castings and other materials in short supply have been extended by prohibiting operators of transportation systems from using quarterly quota ratings assigned them to purchase certain items of transportation MRO equipment. Malleable iron hand brake wheels cannot be acquired except for repair and maintenance purposes. Operators are specifically prohibited from acquiring such equipment for conversion from nongeared to geared type. Freight car (AB) brakes, other than for use as repair parts, and steel wheels also are covered under terms of amended direction 1 of order P-142.

AUTOMOTIVE PARTS: Suppliers now may obtain allotments of controlled materials forms and shapes of copper, steel, and aluminum for the manufacture of certain automotive replacement parts, when treated as class A products, from the persons who wish to buy them, rather than from the appropriate industry division of the WPB as in the case of class B products.

These parts may be treated as class A products if all of the following conditions are met: Manufacturer of the product must specifically ask his customer to treat it as a class A product, rather than a class B product; the product must be of a type which is not used exclusively or primarily as an automotive part; and the product may not be separately listed as a class B product in the official CMP Products List, but may only be included under the general heading of "automotive replacement parts."

Preference ratings which are available to assist manufacturers in obtaining production materials may be used for the purchase of automotive parts to round out a line if the parts are treated as class A products under the newly amended direction No. 5 to CMP regulation No. 3. These rules do not apply to automotive replacement parts which are sold for use in making new vehicles or new subassemblies of vehicles. Automotive repair parts are specifically excepted from the general rule that all repair parts shall be treated as class B products, regardless of whether they are actually class A products or class B products.

CAPITAL ADDITIONS: Labor costs that may be disregarded in determining the value of the addition made under Controlled Materials Plan regulation No. 5 are funds paid for (1) the services of the purchasers' own regular employees, (2) additional employees that are hired for doing construction or installation work, and (3) fees to independent contractors who install equipment or do construction work where, under normal business practices, the fee is paid primarily for services as distinct from materials.

SPECIAL ITEM: A "special item" of controlled materials, as used in CMP regulation No. 2 with respect to acceptance of deliveries of materials when requirements therefore have been reduced, is one that a producer does not usually make, stock or sell, and one which he cannot readily dispose of in course of his business.

L ORDERS

OFFICE EQUIPMENT: Iron and steel may be used to produce visible reference panels for general office and industrial use to extent of 40 per cent of amount consumed for same purpose in year ended June 30, 1941. This is in addition to any iron or steel that may be used to fill military orders. No new steel other than flat rolled sheets or strips less than 12 inches wide may be used.

Office and industrial users apply for authorization to purchase metal office furniture and fixtures by filing WPB-1319 in field offices.

Except for insulated filing cabinets, safes, and metal visible reference panels, which may be used for military purposes anywhere, metal office and industrial furniture and fixtures may be produced and sold without specific authorization only for use on steel seagoing vessels or at advance military bases outside the continental limits of the United States. (L-13-a)

FURNACES: Unrestricted use of inner liners for furnace casings is permitted. Use of carbon steel or cast iron in feed door smoke curtains, feed door linings, hot blast lift doors and up-right shaker handles also is permitted. (L-22)

COOKING APPLIANCES AND HEATING STOVES: Restrictions limiting the weight of iron and steel permitted in domestic cooking appliances and domestic heating stoves have been removed. Restrictions prohibiting use of alloy steel in these products also have been removed. Production is still regulated by amount of controlled materials made available to manufacturers each quarter as a result of approved requirements. (L-23-c)

INDEX OF ORDER REVISIONS

Subject	Designations
Aluminum	M-1-c, 1-i
Cast-Iron Ware	L-30-c
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Price Regulations

Aluminum Tubes	GMFR
Brass, Bronze Ingot	No. 202
Imports	IPR
Price Protest	Procedural Reg.

CAST-IRON WARE: Restrictions have been removed on specifications for types of cast-iron ware which are permitted to be made. Permitted types are skillets, griddles, household kettles, sugar or wash kettles, butchering kettles, dutch ovens, and sad irons. In addition, each manufacturer may produce either muffin pans or breadstick pans. (L-30-c)

ELEVATORS: Manufacture of escalators is now prohibited. Ratings of AA-5 or better, assigned on form WPB-617 for construction of a new building, now may be used to obtain a new elevator for the building. Applications for authorizations to install a new elevator to replace an existing one, or for installation in an existing shaft, providing such replacement or installation involves construction as defined in order L-41, should be filed on form WPB-1236 with form WPB-617.

Dollar value of inventory spare parts not for immediate use that may be acquired by the owner of an elevator has been increased from \$25 to \$50, and from a total of \$50 to \$100 for any calendar year. Acquisition of both small inventories and capital additions up to

\$500 may be obtained under provision of CMP regulation No. 5. (L-89)

CONTAINER CLOSURES: Packers of food and medical products that were customarily packaged with aluminum closures before wartime restrictions were imposed on that metal will be permitted aluminum, within quota limits, for their glass container closures. About 500,000 pounds of common alloy strip aluminum will be required for this purpose during the remainder of 1944. Use of aluminum closures for blood plasma now is permitted without specific authorization. Blackplate steel for beverage bottle crowns is no longer limited to rejects. (L-103-b)

FLATWARE: Manufacturers may use chrome stainless steel, other than that obtainable from distressed stocks, in making flatware for sale to hospitals, war plant cafeterias, hotels, restaurants and other institutional users. Stainless steel flatware for home use still is prohibited. Minor specifications, as those for the finished weight of flatware, have been removed. Specifications for the minimum thickness of plating on silver-plated carbon steel and minimum gages of metal for flatware to fill non-military orders are still in effect. (L-140-b)

METAL DOORS: Maximum permitted gage of ferrous metal in doors used for fire protection is now No. 16 U. S. standard gage instead of the previous No. 24, but any metal heavier than No. 16 may be used if at least 85 per cent of it by weight (exclusive of hardware) was held by the manufacturer before Sept. 26, 1942, and has been offered for sale through the Steel Recovery Corp. for at least 60 days. (L-142)

SCALES: Following specific changes have been made in simplification schedules of order L-190: Baby-weighing or nursery scales now may be equipped with metal trays, although copper and copper-base alloys are still prohibited for this purpose; prohibition on the installation of pit type motor truck scales with concrete decks has been removed; provision that only wood could be used for pillars, caps and platform centers of 2000-pound capacity portable beam scales has been deleted; and prohibition on production of all built-in floor scales, except those with wood platforms, unless production was specifically authorized by WPB, has been removed. Production of coin-operated person-weighing scales is now prohibited under the order. (L-190)

HAND TOOLS: Except where alloy steel only is specified, manufacturers of permitted types of wrenches or pliers and nippers may make them out of carbon or alloy steel, but must not make the same type in both carbon and alloy steel.

Restrictions have been eliminated on the use of alloy steel in manufacture of shanks for rotary files. While sizes and shapes of rotary files which may be manufactured are still limited, it is no longer necessary to manufacture shanks having cutting diameter of $\frac{1}{4}$ -inch or more from carbon steel exclusively. Restrictions on shank diameters and overall length of rotary files have been revoked. (L-216)

PUMPS: Certain restrictions on use of metals in contractors, dewatering and supply pumps have been removed. Wheel bushings may contain copper or copper-base alloy. Body construction of self-priming centrifugal pumps may be of iron or aluminum, instead of only iron, and restrictions on skids, which formerly could be made only of wood, have been removed. (L-217)

SUN GLASSES: Core wire in plastic temples of sun glasses now may be manufactured from wire obtained from any source. (L-238)

FARM EQUIPMENT: All preference rating requirements have been lifted for the purchase of atomizing hand sprayers, hand dusters, wheel-type hand cultivators and hand plows.

Manufacturers of tractors will be prohibited, beginning July 1, 1944, from completing in any quarter more than the total number of units shown on their approved production schedules for that quarter of the 12-month period starting July 1, plus any approved amounts scheduled but not completed in previous quarters.

Certain restrictions on the use of steel in the

manufacture of farm machinery and equipment have been removed. A carryover provision permits a three-month extension for completion of scheduled, and unfinished, equipment without charge against the new production period quotas. (L-257)

THERMOMETERS: Standardization restrictions on the production of general purpose thermometers have been removed. Composition of copper-base alloy for industrial thermometers is limited to maximums of 74 per cent copper and 1½ per cent tin. (L-272)

LUBRICATION EQUIPMENT: Restrictions have been lifted on sizes and models of lubrication equipment that may be produced. A new schedule of prohibited items has been established while controls over production of lubrication equipment, maintenance and repair parts has been extended. (L-314)

M ORDERS

ALUMINUM: Use of low-grade aluminum ingot now is permitted for topburner heads for stoves and ranges.

Additional uses of aluminum for products essential to the war effort are allowed. Such uses extend to all products and equipment for the military services when government specifications call for aluminum. In addition to military uses, but subject to some restrictions, aluminum may be used in automotive trucks and trailers; commercial communication equipment; fire-fighting equipment; protective signal and alarm equipment; commercial food processing machinery; industrial fans and blowers; industrial machines; industrial safety equipment; industrial spray guns; engineering instruments; safety control and heating control instruments; internal combustion engines; jigs and fixtures for industrial production; industrial type lighting equipment; molds for manufacture and repair of rubber products; medical, dental and ophthalmic instruments; experimental purposes; and closures for certain food and drug products. (M-1-c, 1-1)

CHROMIUM: Amount of chromium metal exempt from restriction has been reduced from 3000 pounds to 250 pounds per month. Any processor or dealer now may deliver and any person may receive, without filing forms, not more than 250 pounds of chromium metal in any calendar month. (M-18-a-1)

IRON CASTINGS: Inventories of malleable iron castings now are limited to a 45-day supply. Acceptance of delivery of such castings by any person is prohibited, if such delivery increases the purchaser's stock to more than a 45-day supply. Delivery by a supplier is prohibited when to his knowledge such delivery would increase the recipient's stock beyond the 45-day supply. Appeals from this order may be filed in cases of undue hardship. (M-21-i)

GENERAL SCHEDULING: Table 2 to the general scheduling order, which listed provisions of various other WPB orders with which producers of products covered by M-293 did not need to comply, has been revoked. (M-293)

PRICE REGULATIONS

IMPORTS: Those importers of industrial materials who are entitled to base their prices on their first purchases after Aug. 20, 1943, may sell these materials at those prices until May 1, 1944. After May 1, the prices must be reduced by the amount that the supplier's price for those first purchases exceeds what the supplier charged or would have charged on Aug. 20, 1943. Using a base date of April 30, 1943, instead of Aug. 20, 1943, the same privilege already had been extended to importers of manufactured goods. (Import Price Regulation)

BRASS AND BRONZE INGOT: Maximum prices for the principal grades of brass and bronze ingot in the 85-5-5-5 group have been raised ¾-cent while those in the 80-10-10 group have been raised 1½-cents. (No. 202)

ALUMINUM TUBES: Manufacturers resuming production of collapsible aluminum tubes must submit proposed prices for these tubes to OPA for approval. (GMPR)

Many Terminations Involve No Claims Against Government

Average value of canceled portions estimated at over \$200,000. Large proportion of "no-claim" cases attributed to ease in disposing of raw materials and common components, and usability of such inventories in other war work

IN ALMOST three-quarters of contract terminations reported by the War Department to the War Production Board, there has been no financial claim against the government. This is revealed in a report just issued by the Bureau of Planning and Statistics, Industry and Facilities Branch, WPB, covering a total of 9502 contract terminations by the end of September, 1943, and having an estimated value of \$6.5 billion.

Some of these "no-claim" cases involved fairly large terminations; the average value of the canceled portions being estimated at more than \$200,000. Comparative ease in disposing of raw materials and common components and the usability of such inventories in other war work are undoubtedly important factors accounting for this large proportion of "no-claim" cases.

It is important to note, the report said, that current terminations are very likely to be quantitatively and qualitatively very different from those which will occur at the cessation of hostilities, especially if overall company settlements should be resorted to. In the latter event, the present distinction between prime and subcontractor will be eliminated; in all likelihood, claims will be much larger; markets for most materials will be very tight; and there will be no replacement awards. Consequently, care should be exercised in attempting to project the findings of this report, especially in forecasting the impact of terminations at the cessation of hostilities.

More than one-half of the number of claims reported were settled by the end of September, 1943, but these cases represented only \$52 million of claims, while the pending cases represented \$179 million. Claims in excess of \$100,000 represented one-seventh of the number but accounted for seven-eighths of the dollar volume of claims. Sixty-four per cent of the former group but only 32 per cent of the latter had been settled.

The larger claims require a much longer time for settlement. More than one-half of the settled claims of the \$1 to \$10,000 group were closed in three months or less and only one-sixth required seven months or more for settlement. In contrast to this, only one-fifth of the claims of over \$100,000 were settled in three months or less, while more than one-half required seven months or more. This pattern was even more clearly marked in the pending cases: Only one-tenth of the cases in the \$1 to \$10,000 group as against nearly one-half of

the claims in excess of \$100,000 had been pending for seven months or more.

On the average, it took four and one-half months from the effective date of the termination to dispose of the 1148 cases settled through the end of September, 1943. However, almost half of this time was required for the filing of claims. This delay in filing was due principally to the failure of subcontractors to submit their settlement proposals promptly, resulting from a lack of knowledge as to the proper procedure to be followed in submitting claims, and to an apparent disinterest of some contractors toward documenting claims.

Time Lag Increases

The report revealed that settlements are not keeping pace with terminations. The proportion of claims in excess of \$50,000 requiring more than six months to settle increased from 38 per cent in July to 50 per cent in September, 1943. Settlements amounted to about three-quarters of the amount of claims.

Partial payments on account of termination claims amounted to less than one-tenth of the total amount of claims. The proportion of partial payments was somewhat higher than for settled claims. At any rate, it appears that this type of payment is not playing a significant role in interim financing of contractors. It is probable that other types of loan-financing have affected the extent to which partial payments were made and that relatively good markets for many types of materials and replacement awards for terminated contracts may have served to alleviate somewhat the financial problems of contractors.

Of the total claims of \$127 million for which the distribution between prime and subcontractors was available, less than one-fifth represented the subcontractors' portion. Since large contracts are generally more susceptible to subcontracting than the small contracts, the subcontractors' percentage of the claims of over \$100,000 was more than twice as large as for claims of \$1 to \$10,000. For pending cases, the subcontractors' share increased with the increase in the size of the claim. Thus, subcontractors' claims amounted to less than 5 per cent of claims in the \$1 to \$10,000 group but more than 22 per cent in the over \$100,000 group.

The subcontractors' portion of total claims was 18 per cent, while their portion of partial payments was only 11 per cent.

Huge Postwar Market Seen for Farm

Forty per cent of farms now receive central station power. Many were connected with lines in three years preceding Pearl Harbor and have not yet been equipped with tools. Market expected to be more than a billion dollars annually

WASHINGTON

AMERICAN farms will constitute a huge and expanding market for electrical equipment and appliances of all kinds in the postwar period, or as soon as existing wartime limitations can be eased, in the opinion of Dixon Merritt, Rural Electrification Administration official.

"About 40 per cent of our 6,000,000 farms now receive central station power," says Mr. Merritt. "Of the approximately 2,400,000 electrified farms about 800,000 were connected to power lines in the three years immediately before Pearl Harbor. Many of these farms never used power to full advantage; they were not sufficiently equipped with power tools by the time production was halted as an emergency war measure.

"Today, although many of them are not yet making great use of electricity, farmers who have electric power have a better knowledge of its potentials. These 2,400,000 electrified farms, therefore, represent an enormous immediate market which eagerly is waiting for electrical equipment to become available.

"In addition there are vast potentials. Applications already approved by REA and which are ready to be carried out call for expenditure of about \$100,000,000 in bringing power to farms not yet so served. In addition, REA has an additional list of projects calling for another \$100,000,000.

"In fact, this thing is spreading like a prairie fire. Electricity has brought to the farmers a new way of life. The missionary work has been done; farmers who do not yet have electricity know how the farmers that do have electricity benefit thereby. They read about it in farm and rural papers, they hear about it in meetings and over the radio, and they are anxious for the 'high line' to reach them. We estimate that of the remaining unelectrified farms at least half can be electrified on a self-supporting, self-liquidating basis, at rates farmers can afford to pay. In addition, a very substantial number of non-farm rural houses, community buildings, churches, schools, stores, etc., as well as rural industrial plants, remain to be electrified.

"We know," Mr. Merritt continued, "based on past experience, that within a short time after receiving power the average farmer's investment in electrical equipment, household appliances, plumbing facilities made possible of use by installation of an electrically-operated water pump, and farmstead wiring comes to about \$450. This investment grows

substantially and continuously as his finances permit.

"Counting the needs on the farms still to be electrified, also the needs awaiting fulfillment on already electrified farms, it is no exaggeration to say that this business should come to well over a million dollars annually in the postwar era."

The prospect is enhanced by the fact that we are just entering an electro-agricultural era, in which hand production of agricultural products is being replaced by machine production methods, says Mr. Merritt.

"Eight cows are about all the average farmer cares to milk by hand, but with an electric milker he can handle twenty. An electric pump solves the problem of watering parched crops that could be hand-watered only with great hand labor in carrying water. An electrically-powered rip saw turns out a cord of wood in no time. The electric chick brooder reduces the chick mortality rate and is not the fire hazard of the old coal-oil type, and it does not demand frequent cleaning and filling.

Eliminate Egg Production Slumps

"Electric hen-house lighting and water pumped to the hen house not only do away with winter egg production slumps but assure healthier stock. Similarly, water pumped to dairy barns can increase milk production 8 to 15 per cent. Farmers are agreed that the electric pig brooder cuts farrowing losses by as much as one pig in each litter; with fewer brood sows they get the same number of pigs. This means a saving in feed.

"Farmers have learned to use electricity to hoist hay, grind feed, separate and cool milk, water gardens, preserve and cook food and other tasks. Today, we know of more than 300 farm uses of electricity.

"Any manufacturer who is skeptical about our expectations of a great growing farm market for all sorts of electrical equipment and appliances has only to make some investigations to share our optimism.

"A Georgia woman was able to increase her annual broiler production from 6000 to 36,000 immediately after installation of an electrical pump. Last year she raised 65,000 broilers. Previously she spent at least 30 hours per month per 1000 chicks pumping and carrying water. At the same rate, she figures she would have to hire over six men full time to do the work of her electric pump.

"If manufacturers will contact us we can tell them plenty case histories—and we can tell them something about the types of equipment and appliances the farmers want. To the farmer, rural electrification is, first, a new tool for greater production, for better use of manpower, for lower costs. Under this heading comes a large assortment of equipment of which water pumps, cream separators, grindstones, hay hoists, hammer mills, sausage grinders, corn shellers are a typical few.

"But the farmer also sees other advan-



Appliances

tages in rural electrification. It means lights in the yard, the house and the farm buildings; running water, a modern bathroom; radios with no battery to run down; refrigerators that keep butter hard in July and freeze ice cubes; a white, sparkling kitchen. Outside it means a new kind of farming in which much of the drudgery is eliminated; it means shorter hours and more time to enjoy life.

"It means fresh meat, fruit and vegetables the year round. It means motion

pictures in rural schools and theatres. It means improved medical care. It means manual training and home economics courses in rural schools. It means radio weather and market news as well as radio entertainment. It means more small industries in rural communities."

In this broad picture, Mr. Merritt feels, manufacturers blessed with energy and foresight will find many opportunities to do business, not only in the production and sale of electrical equipment and appliances, but in the manufacturing and sale of products to which the door is opened as a result of electrification.

In addition, the REA envisions many potentialities which still lie in the future, or which are in the early stages of development at this time.

"We will have high-frequency soil treatment in place of fertilizers," says Mr. Merritt. "We expect to use high-

frequency, perhaps supersonic waves, for the extermination of ants, termites, mice, cockroaches and bollweevils. We hope to apply electricity for exterminating the corn borer and similar pests. We may have electric tractors with storage batteries, letting the farmer charge the batteries for almost nothing at night, with low-cost power.

"We are going to have home dehydration, home freezing, home wheat grinding and home pasteurizing, making it possible for the farmer to sell his milk in his own community. Kitchen and bathroom will have sterilization by means of a sterilite or similar device."

The fact that use of electricity on the farm results in greater food production with less labor led the War Production Board early in 1943 to relax to the extent of permitting line extensions to farms which had or were producing at least "five animal units." Because of this labor-conservation angle, it is entirely probable that further extension of farm electrification may be allowed in the near future.

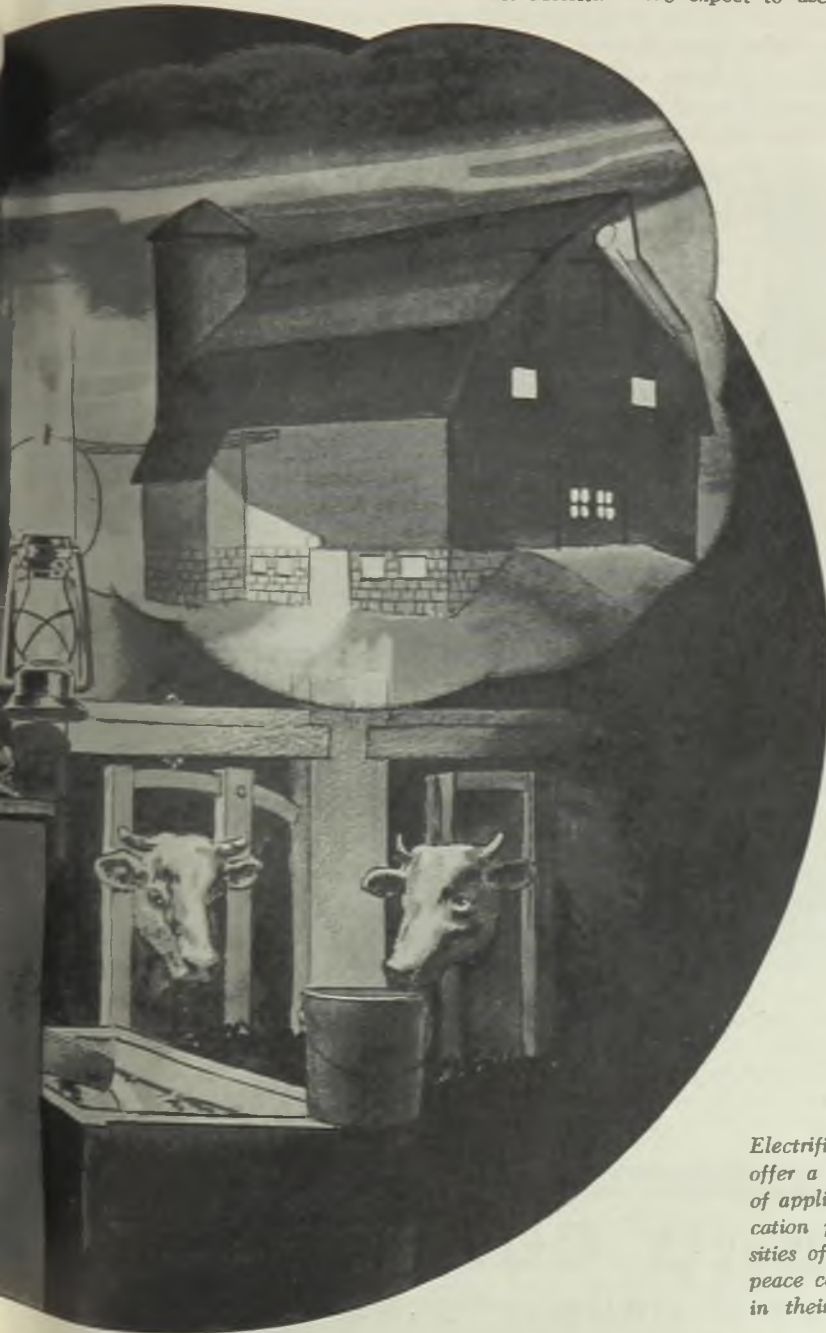
REA Subjected to Criticism

The fact that the Rural Electrification Administration has been the subject of much criticism in Congress in recent months should not be taken as any indication that the life of this agency is threatened. One congressional criticism has been that New Deal has used the REA to control the farmer vote in its favor. Another has resulted from inclusion of the REA in the Department of Agriculture setup where, some of its friends in Congress feel, it cannot function as efficiently as when it was an independent agency. A Senate Agriculture subcommittee inquiry in recent weeks has been aimed at determining whether REA engineers have improperly swung business to the copper industry to the detriment of the aluminum industry.

But the underlying principle of the REA, that of farm electrification, is popular with Congress as a whole and no effort to spike the program is indicated.

Financially, the REA has one of the best records among government agencies. Since it was organized in May of 1935 it has loaned \$368,000,000 to rural electric systems with from 20 to 25 years in which to repay. To date, borrowers have repaid \$48,705,976 in interest and principal, including \$12,663,787 paid back before it was due. Total delinquencies at the end of 1943 amounted to \$18,125, a loss that looks like a big profit when compared with the great benefits of this program to the country's overall economy.

Electrified but inadequately equipped farms offer a vast potential market to manufacturers of appliances and power tools. Rural electrification program, slowed down by the necessities of war, is expected to be resumed when peace comes again. Farmers, with ready cash in their pockets, are eager for labor-saving devices



CRANKCASE PLATES

for one of the **9,000**

October 1943 saw 9,000 planes roll from America's production lines. Proof that in nearly every operation of the thousands involved the airplane engine builders have invariably now settled upon Bullard machines for the job.

Bullard Vertical Turret Lathes with two heads working together provide that extra speed so necessary in today's production. Because of its rigid vertical structure it is trusted with work involving many of today's close tolerances.

After the war planes of the United Nations have done their work, and victory is ours, the adaptability of the V.T.L.s will be a "quick asset" held by their owners, as they face the demands of the world of tomorrow.

Just 15 minutes is the time for rough turning and chamfering outside and inside radii on these counterweight plates for airplane engine crankcase on this Vertical Turret Lathe. This machine is in the plant of a famous California builder of engines.

Spiral Drive Vertical Turret Lathes are built in 24", 36", 42" and 54" table sizes. Also Cut Master Vertical Turret Lathes in 30", 36", 42", 54", 64", and 74" sizes with two or three heads.

BULLARD

THE BULLARD COMPANY
BRIDGEPORT 2, CONNECTICUT

War taking toll of industrial management. Near-confiscatory taxes weakens incentive. Complicated government regulations, labor disturbances, scarcity of efficient employes contribute to exhaustion of executives

DETERIORATION is one of the despicable handmaidens of war, and instances of her insidious infiltration mount as the months go by. Deterioration of moral fiber, both juvenile and adult, is evidenced generally, but particularly in large industrial centers. Deterioration in the productivity of labor, as measured by prewar standards, was mentioned in these pages last week. Deterioration in quantity and quality of merchandise available to the civilian population is an accepted fact, which the OPA has pondered carefully and apparently considered outside the pale of its directive action.

Another casualty, about which little has been heard, is industrial management, in whose ranks deterioration has certainly left its mark, to varying degrees.

The incident is related of an American business man who for the past decade or so had operated a large industrial company in the British Isles. In company with many others, he saw his plant and his home bombed out in the German blitz, and recently returned to this country after a long absence. He fell to considering this matter of changes in caliber of industrial management as it had affected Britain. Assuming British prewar plant managements to be grade 1, he estimated that the incumbents could be considered no better than grade 3. The result has been a serious decline in the drive and initiative of top management there, many executives becoming little more than jobholders who put in eight or ten hours a day at their work and then go home with few thoughts beyond getting to work the next morning.

No Indictment of British

This should not be construed as an indictment of British industry which in sum total has accomplished miracles of production in the face of unbelievable hardships, but it suggests possibly why the Beveridge plan of "security for all from the cradle to the grave" has been so favorably received in many sections of Britain. It relieves the individual from too much concern over self-advancement, discourages the employment of venture or risk capital, and in a way withers the free enterprise system.

Is this trend discernible in the United States? Many believe it is. If so, the resumption of free enterprise and the advancement of great industries like automobile manufacturing may be slowed seriously.

It is not difficult to make a case for the weakening of incentives which hitherto have spurred industrial leaders to greater achievement. First, consider the present near-confiscatory taxes on large incomes. A man earning salary of \$100,-

000 to \$200,000 a year must fork over two-thirds to three-fourths of his earnings to the revenue collector, so he may be pardoned if he should ask himself: "What am I burning myself out at this pace for, when I am actually working for the government eight or nine months out of the year?"

In the automotive industry, top executives work at a furious pace, but simply because the rewards have been worth the candle. This is no longer true, and without a fairly complete upheaval in governmental philosophy it will not be

SAVE SHIPPING SPACE

Highlighted by the current rush to get supplies across the Atlantic for the coming invasion is the work of automotive engineers in the past few months to conserve every available square inch of shipping space, reports the Automotive Council for War Production. One automotive company recently revealed a reduction of 55 per cent in the measurements of its disassembled truck crates. Previously, each knocked-down chassis and cab occupied 878 cubic feet in a transport's hold. Today, the same unit has been compressed into 389 cubic feet.

Chief revisions involved detachment of axles from frames and a twin-unit pack. These smaller crates were designed to replace the two larger ones previously used. Upon arrival overseas the vehicles are quickly assembled.

true for many years to come. Nevertheless, most executives have tried to continue their normal pace since the start of war, some are succumbing to actual physical weariness and ill health. One large motor corporation insists that all its top executives take vacations to restore depleted strength. The Florida sands this winter have not been given over entirely to recuperating soldiers, wealthy New Yorkers and European refugees of means.

Contributing to the exhaustion of executive management has been the maze of governmental regulations which must be assimilated these days if a company is to remain in business. Price controls, material controls, production allocations, contract termination and renegotiation, all make their demands on executives' time to the disadvantage of normal business management routine.

Lack of co-operation from labor unions and steady deterioration in relations be-

tween employer and employe have not made the road any easier, and on top of this the inroads of enlistments and selective service have depleted the ranks of younger sub-executives who could absorb some of the extra burdens if they were around to do so.

Meanwhile it has become necessary for industry—and government bureaus, too, if you please—to employ an increasing number of what may be described as "fringe-type personnel", men who ordinarily might have been retired to their farms or holding at best jobs entailing no great responsibility. This type of executive is long on words but short on competence, experience, drive and enthusiasm.

As if this were not enough, industry throughout the country under the spur of wartime expansion has been compelled to push what junior and second or third-tier supervisory personnel it has managed to save from selective service into responsible posts in advance of their time, often with explicit instructions that when the emergency has passed they will be moved back to their former level and allowed to progress normally. This expediency has occasionally been the cause of production and labor relation difficulties which more experienced heads could have avoided.

Heartening To Look Ahead

If this picture appears unduly gloomy, consider it in the light of the production achievement which has been accomplished and there is satisfaction to be obtained. Looking ahead to the postwar economy is not so heartening. If industrial management is going to be contented with mere clock-punching and is going to give up its ingenuity and "imagineering"—as Alcoa calls it—then, like England, we may be forced to turn to a benevolent government which will guarantee security for everyone—schooling, training, a job of sorts, a home, unemployment benefits, old-age pension and a free burial—at a minimum expenditure of initiative and self-government.

Peering ahead into the postwar labor relations problems of the auto industry, William H. Davis, chairman of the National War Labor Board, propounded the question before the Economic Club, which many are now asking: "If we cannot achieve a high degree of harmony in labor relations during a world war, with all the patriotic pressures and the no-strike policy, how can we expect to keep peace in the industrial family after those pressures are removed."

Admitting the difficulty of the problem, Mr. Davis continued: "Great social forces are involved and the economic conditions in which they will exist cannot be foreseen. I make bold to assume that the fundamental economic purpose will be to keep production up and prices down, and that this will be a common purpose of both labor and management. But, having been bold to that extent, my

boldness in the field of economics is exhausted.

"What we are really interested in for the postwar period is a wage policy developed and agreed to by management and labor. This is a field in which Detroit industrialists and labor leaders have expert knowledge, and I can only add that the work of the WLB, and particularly the establishment of brackets of sound and tested rates, has built up a great body of special knowledge about wages in America far exceeding anything we have ever had before.

"... One of the greatest impediments to collective bargaining between manage-

ment and workers is fear in the minds and hearts of both sides.

"It is my firm opinion that the present moment is a favorable one for the study of collective bargaining in its nonwage aspects . . . In this field the WLB has already established certain principles, most of which, I believe, will carry over into the postwar period and help to maintain stability of industrial relations.

"I should like to suggest a few ways in which leaders of labor and management can help speed victory in the war and at the same time build up sound industrial relations for the postwar period.

"1. Live up to your contracts and

make certain that the contracts work.

"2. Install arbitration as the final stage in your contract's grievance procedure.

"3. If you already have grievance arbitration machinery, be sure you utilize it on all disputes.

"4. If your contract is about to terminate, extend it by agreement of union and management until you have negotiated a new one or until the regional board has rendered its decision.

"5. Employers should not cause dissension in their plants by challenging the right of a duly certified union to represent their employes in collective bargaining.

"6. The same holds for unions and their raiding tactics, of course.

"7. When negotiating new contracts, or revising old ones, make a sincere effort to negotiate a settlement.

"8. Above all, employers should impress upon their foremen, superintendents and other supervisors that you don't build tanks or guns or anything else by fomenting quarrels with employes, that the way to get better labor relations is to treat employes like human beings."

Significantly, Mr. Davis concluded his remarks by asking, "Are we going back to jungle warfare in industry. Are we going to win peace abroad only to re-open the war in our own streets, on the picket lines."

Despite a 53 per cent increase in net sales, Packard earnings for 1943 were up only a fraction of 1 per cent over 1942, amounting to 31.7 cents a share on 15,000,000 common shares, against 31.5 cents in 1942. The company billed 70 per cent more engines in 1943 (total was around 28,000) and an even greater expansion is called for during the current year. Only 1.4 per cent of 1943 sales represented commercial business.

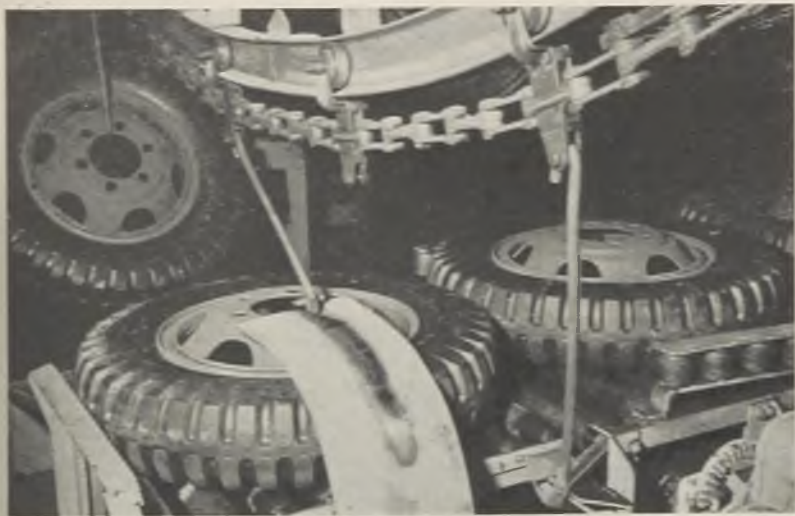
Days lost because of accidents in Chrysler Corp. plants during 1943 were reduced 52 per cent from the 1942 level, despite a 68 per cent increase in man-hours worked. Accident rate in 19 plants figured to 0.39-day per 1000 hours worked, compared to 0.81-day in 1942.

GM Employment, Payrolls At All-Time Record

Employment and payrolls in General Motors Corp.'s plants rose to a new all-time high in 1943, Alfred P. Sloan Jr., chairman, states.

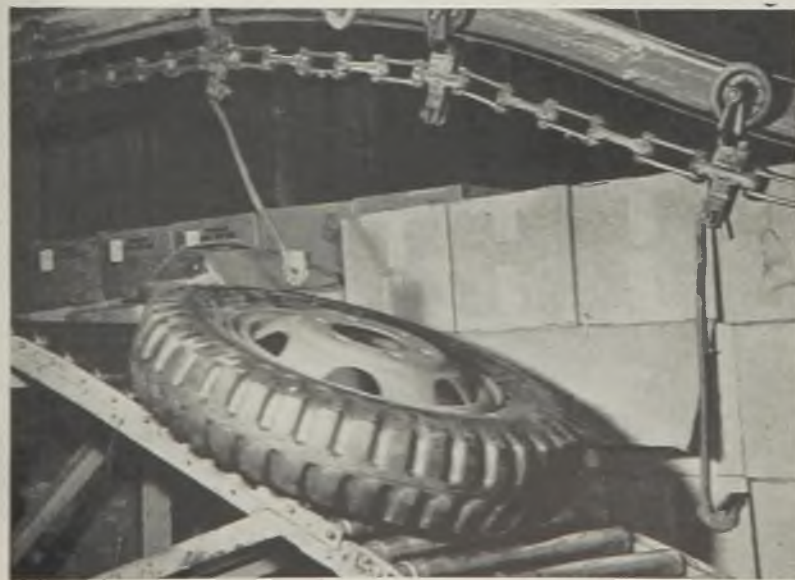
Total payrolls last year were \$1,321,999,829, an increase of 54 per cent over 1942, while average monthly employment was 448,848, up 43 per cent. At the close of the year employment approximated 500,000, of which 115,000 were women or 31 per cent of the total hourly-rate force, against 10 per cent at the end of 1941.

During the past year the corporation increased its training activities 25 per cent. Enrollment in management courses for supervisors totaled 21,500, while during the year 200,000 new employes were trained for war work.



NEAT TRICK: Truck wheels are loaded and unloaded automatically through two ingenious fixtures developed by engineers in Chevrolet's St. Louis assembly plant. After tires are mounted on rims and progress on the conveyor line, rods drop into the wheel and pick it up, above. Unloading of the

line reverses the process, with wheels falling flat on a second floor-parallel roller line which slopes away from the conveyor line in the direction the line is traveling. Hooks slide easily out of the wheels, below, releasing them to roll down to the wheel and axle assembly station



What will Users Want from POSTWAR Machine Tools



Among competing products, the one having the best machined finish almost always has the advantage—other things being nearly equal. It is a natural human trait to associate good finish with good quality.

And, experience with airplane engines has shown that finish is frequently important even when not visible. Airplane engine builders do much careful finishing on parts that are rarely seen . . . because it has been found that finish is a powerful factor in eliminating fatigue cracks, hence fatigue failure.

By equipping machines with Vickers Hydromotive Controls, better finish can frequently be obtained without added cost and without extra operations. For example, smooth and uniform feeds can be secured regardless of variation in work resistance or hydraulic pressure. Vibration, backlash and override are usually easily eliminated . . . smooth reversals and constant cutting speeds on varying contours are also readily obtainable.

Better finish is only one of many advantages obtainable with Vickers Hydromotive Controls. Let Vickers Application Engineers discuss them with you.

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FLUID MOTORS



VOLUME CONTROLS



DIRECTIONAL CONTROLS



PRESSURE CONTROLS



YOUR PRODUCT'S saleability margin MAY BE GAINED WITH **CMP** VERSATILE **THINSTEEL**



DESIGN ADVANTAGES light yet strong . . .

Available in gauges thin as .001 and in a wide range of physical properties to meet unusual service requirements, Thinsteel provides versatility of application. Radio tube parts, liquid filters, springs, razor blades and eyelets are just a few of many successful uses.

CMP Thinsteel is successfully serving in many war products—even in cases where steel was formerly thought not practical. May we give you more information for your product plans? Write today.

THE COLD METAL PRODUCTS CO.

Subsidiary of the Cold Metal Process Co.
YOUNGSTOWN 1, OHIO



PRODUCTION ECONOMIES more parts per pound

Precision cold rolled Thinsteel assures you closest tolerances and thus more feet per pound, and maximum finished parts per ton. With coils available in width up to 24 inches and weights up to 300 lbs. per inch of width, Thinsteel is ideally suited for automatic production equipment.



Curtiss-Wright completes new test cells to aid in developing propellers and engines for "planes of tomorrow." Will accommodate warplane propellers up to 30 feet in diameter and engines of more than 5000 horsepower

LARGEST privately-owned propeller test facility in the United States, a proving ground designed for the advancement of tomorrow's aircraft propellers and engines, has been completed by the Propeller division of Curtiss-Wright Corp. at its Caldwell, N. J., plant.

Duplicating airflow and vibration conditions similar to those encountered in flight, the new propeller testing facility can accommodate the testing of warplane propellers up to 30 feet in diameter and air-cooled and liquid-cooled engines of more than 5000 horsepower.

"In opening these new test cells, we are stepping far ahead of current engine and aircraft requirements," Robert L. Earle, vice president of Curtiss-Wright Corp. and general manager of its Propeller Division, said. "They have been built for the purpose of developing the huge propeller of the future."

In the constant struggle of propeller engineers for the best combination of weight and efficiency, the new cells will play a leading role.

There are three characteristics of the propeller, in addition to efficiency and weight, which must be determined before it is acceptable—safety, durability and serviceability. The first is determined, in part, by Army tests on an electric whirling. All three must be determined under a combination of high vibratory and centrifugal stress conditions in the test cells.

From drawing board into flight, Curtiss-Wright is now equipped with modern and complete proving equipment for development of bigger, better and lighter propellers.

This testing starts in the experimental engineering laboratory, equipped with the most advanced type of electronic vibration apparatus. Here the component parts are examined minutely for structural qualities while the propeller models still are in the design stage. Once the components have passed the exacting requirements of this laboratory, they are ready for assembly and further tests in the new cells.

In the final stages, the propeller tests, including those for aero-dynamic qualities are then carried forward in the Propeller division's flight test unit, located on Caldwell-Wright Airport near the new test cells.

The new cells are 38 feet square with 31-foot orifices. The horizontal-flow type cells are equipped with precision instrumentation to accurately measure all characteristics of the propeller-engine combinations.

Every effort was exerted to insure one of the most important features in propeller testing—uniformity of air flow through the propeller disk. In stands de-

signed previously primarily for engine operation, disturbances and backdrafts—the latter sometimes reaching the velocity of 100-miles-an-hour or more—have set up vibration disturbances and prevented evaluation of the true vibration characteristics of the propeller-engine combination.

Air Velocity May Vary

Velocity of the entering air may vary across the propeller disk, as often happens in some type of cells, or the air after passing through the propeller may recirculate upstream along the walls in some places and combine with the incoming air, again causing nonuniform velocity.

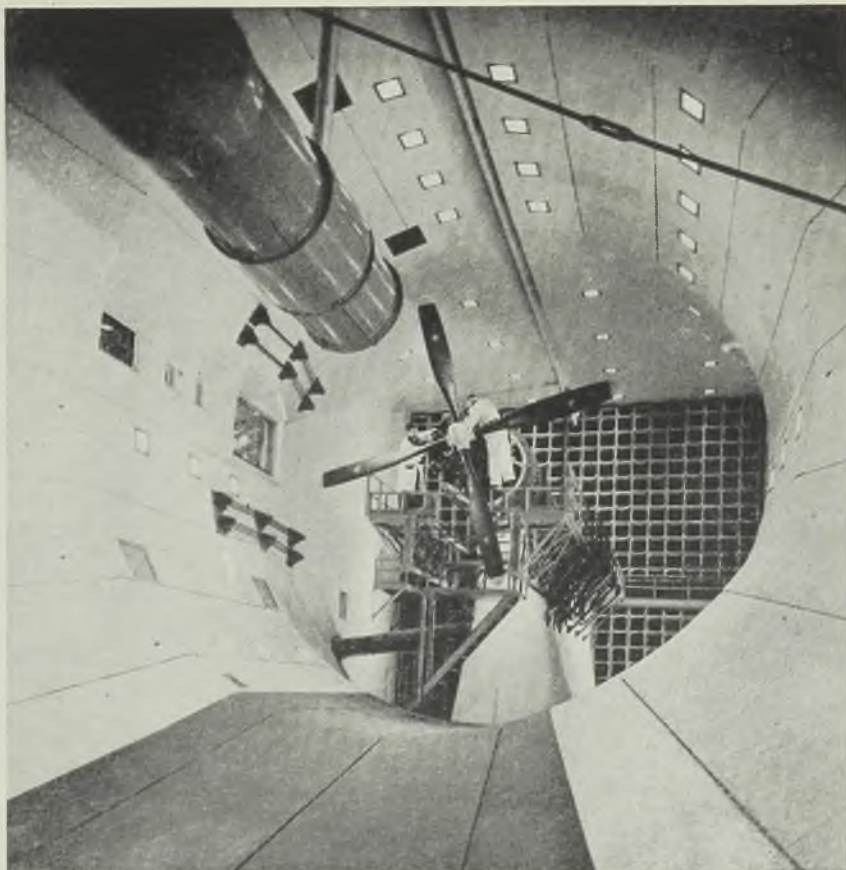
To overcome the former difficulty, the Curtiss-Wright cells have a horizontal intake and the ground is excavated a foot or so deep in front of the inlets to insure that as much air enters at the

bottom as at the top of the cell.

To combat recirculation, the outlets also are horizontal, and the least possible area of the openings are obstructed with soundproofing. The practices found necessary in the largest wind tunnels were used to obtain the best possible airflow. It has been found in the latter that the airflow at the working section, where the model is mounted in the wind tunnel and the propeller is mounted in the test cell structure, is determined not only by the shape of the cell immediately ahead of the propeller but a considerable distance behind it.

Since control of the engine is an essential part of the propeller tests, the testing of the engine-propeller combination can be carried on simultaneously. On the conveniently-arranged instrument panels, the test engineers can follow and chart the engine-propeller reactions while under the test.

At a nearby bench, vibration test engineers, using special equipment, run stress checks for structural and vibration qualities of the blades, hub and power unit, and chart the rate of pitch change and control response on oscillographs and other recorders. These charts are analyzed and checked against previous



One of the two test cells recently completed by Curtiss-Wright Corp. at its Caldwell, N. J., plant shows how the venturi constricts from a front section 38 feet square in the foreground to a circular section 31 feet in diameter. In the background several mechanics are preparing a four-bladed Curtiss electric propeller installed in a Wright Cyclone engine for a test run. The 48-inch jet tube, shown in the upper foreground, slides forward to cool air-cooled engines in operation



EXPEDITIOUS HANDLING: Aluminum alloy turnings from a milling machine are automatically deposited in wooden bins for transportation to the conservation department and then back to the foundry to be remelted at the Glenn L. Martin aircraft plant in Baltimore. Coolant is drained into a reservoir for reuse while the elevator deposits the chips in the scrap bin

tests and the propeller design requirements.

With facilities for quick and easy interchangeability of engine, a propeller model can be mounted and run at the highest stress conditions possible for any desired length of time. For endurance tests, covering several hundred hours, four or more engines of the same model are assembled. After a given period during the test run, a new engine is installed, since the engine's performance occasionally varies, causing changes in the propeller test conditions.

A structural endurance testing program is set up on three bases. First, the propeller is run at the highest revolutions per minute at which it is expected to operate, and second, at that point in power and speed at which the highest vibratory stress would be encountered.

The third basis is the check of the pitch change mechanism, in which 1500 or more consecutive cycles of pitch change are run while the engine is operating at varying speeds.

Facilities are available for operation with either air or liquid-cooled engine in either of the cells. Two auxiliary blowers totaling 100 horsepower for adequate cooling of air-cooled engines can be used simultaneously on one of the cells.

One of these blowers is mounted in a cubicle about 40 feet in front of the building to prevent possible aerodynamic interference with the air entering the cells. It projects a 600-horsepower blast of air, approximately 80,000 cubic feet

per minute, at the front of the engine through a duct leading into the cell and terminating in a ring-shape nozzle just in front of the propeller. In operation, this 48-inch air jet tube slides toward the propeller until it covers the spinner and is within a few inches of the blades. A central cone inside the tube spreads the air into annular ring form to deliver it around the hub and directly into the cowl opening.

Connected to Rear of Engine

The other blower, which by operating suitable dampers can be used as either a suction or pressure blower and connected with either cell, is connected to the rear of the engine through a duct passing under the floor and through the pedestal. Suction or pressure air-cooling of conventional type can thus be obtained on either pusher or tractor type propeller installations.

All other blowers, pumps, heat exchangers and tanks, excepting of course the 42,000-gallon storage tanks, are in one of two rooms adjacent to the control room. All equipment in them is remotely controlled, either electrically or by pneumatically operated valves and dampers. The larger of these rooms, extending the full height of the building, contains two separate Prestone systems with their 400-gallon storage and dump tanks, heat exchangers, filters and auxiliary pumps.

Also in this room are the CO₂ fire fighting system, the two air compressors and the carburetor air supply systems. The carburetor air intakes are through filters in a cubicle on the roof. The air

passes down vertical ducts, past adjustable calibrated metering orifices to the heat exchangers and 60-horsepower blowers, and thence into the cells to the engines. The blowers supply air to the carburetors at pressures corresponding to the pressure on the scoop of a high speed plane.

The smaller room contains the oil and gasoline metering systems and the oil pumps and heat exchangers.

The centrally-located control room which serves both cells is approximately 40 feet wide and soundproofed.

All piping and wiring are concealed behind the control panels and easily accessible through access doors.

Retractable platforms of unique design may be extended past the front of the propeller or withdrawn almost to the front of the concrete pedestal.

Under these ideal and controllable conditions, the study development of tomorrow's propellers goes on. High precision mechanisms of comparatively light weight, they are called upon to do the work of huge locomotives in converting the ever-higher engine power into forward motion through the air.

Wilson Urges Action on Aircraft Material Surplus

First step in obtaining a true picture of inventories of surplus materials in aircraft manufacturers' plants, in line with suggestions advanced by Lieut. Col. A. E. R. Peterka, chief, material distribution branch, Wright Field, has been transmittal of a letter to presidents of all aircraft companies from C. E. Wilson, vice chairman of WPB and chairman of the Aircraft Production Board, requesting them to give "earnest consideration" to the "actual physical segregation and inventory" of idle surplus materials if this has not already been done.

In his letter, Mr. Wilson adds the problem is "a very vital one at this time, not only because of an available production market but also because a shift in inventory values might cause a difficulty in the future financial operations of the aircraft industry."

Purchasers of surplus materials at going prices can be seriously embarrassed in a declining market. For example, Supply Division Inc., Robertson, Mo., points out that since December the prices of hex head bolts have dropped 35-40 per cent, prices of clevis bolts have dropped even more, and clevis pins likewise are selling at reduced prices. The company has an inventory of these items purchased from surplus stocks amounting to about \$125,000 and has outstanding commitments at high prices of another \$40,000. If this stock is to be sold at current market prices, a substantial loss would be involved.

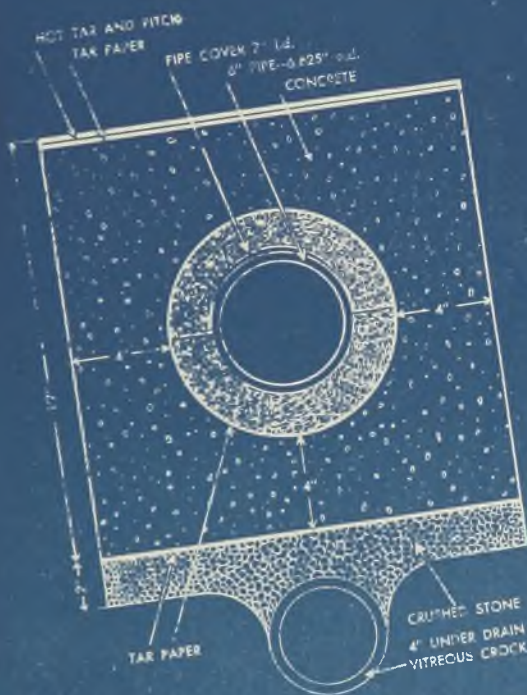
In the past three or four months, there appear to have been more changes and drastic reductions in prices of aircraft hardware than have occurred in the past decade.

This is the **5TH** in a series of messages

DEALING WITH THE PROBLEMS
IN HEAT INSULATION FACED BY
ENGINEERS AND SOLVED BY
USING  unbestos

5a THE PROBLEM: Permanent insulation of underground steam line.

5b THE SOLUTION:



Dig underground trench to proper grade and lay sewer tile over which two inches of crushed stone is placed. Cover crushed stone with tar paper. Install pipe on wooden blocks arranged to support pipe for welding. After welding apply Unibestos sectional pipe covering to allow free movement of the pipe within the insulation, insulation should have an I. D. approximately $\frac{3}{8}$ " greater than the O. D. of the pipe. Pipes should next be brought to proper grade adjustment after waterproofing the insulation. The trench should be filled with concrete. Tar paper and tar can then be applied on top of the concrete to make the structure waterproof. The great structural strength of Unibestos permits this unique installation. Unibestos is sufficiently strong to withstand the movement and weight of the pipe.

UNION ASBESTOS & RUBBER CO.

GENERAL OFFICES: 1821 SOUTH 54TH AVENUE, CICERO, ILLINOIS • NEW YORK • SAN FRANCISCO • PATTERSON, N. J.

Ampco Metal Inc. Plans To Build Two New Plants

Acquire site at Burbank, Calif., which will replace smaller facilities. . . Forge plant to be built at Milwaukee

AMPCO Metal Inc., Milwaukee, plans to build a new plant in California and a forge shop in Milwaukee.

The company has acquired through lease a 3.5 acre site in Burbank, Calif., on which a plant will be constructed to replace smaller facilities in Hollywood, Calif.

It will be equipped with electric melting furnaces, centrifugal casting machines and molding facilities for mass production as well as specialized castings.

The new 6000-foot forge plant, which will be constructed adjacent to its present extrusion mill in Milwaukee, will be equipped with presses and hammers. In addition to producing bronze and copper base alloy forgings, the new plant will be used to turn out resistance welding alloy parts. Welding rods, tips, wheels and jaws, also will be produced at the Milwaukee plant.

BRIEFS . . .

Eaton Mfg. Co., Reliance division, Massillon, O., has released a folder covering engineering data on rings for S. A. E. standard bearings, housing and shaft applications.

Magnesium Association, Chicago, has been organized by industry members to assure the future of magnesium alloys and to foster the development of fabrication techniques.

United States Rubber Co., New York, announces the occupancy of plant No. 1 of the original Lowell Ordnance Works, Lowell, Mass., by its wire and cable department.

Brown Instrument Co., Philadelphia, has adopted a plan to provide war veterans with employment opportunities after they have been discharged from service.

Crosley Corp., Cincinnati, reports its employees invested approximately \$1,600,000 in War Bonds during 1943.

Dayton Rogers Mfg. Co., Minneapolis, has available for free distribution a framed decimal equivalent chart with glass protected table.

General Electric Co., Schenectady, N. Y., recently completed a 6000-kilo-

watt frequency changer set for the Panama Canal.

Woods-Evertz Stove Co., Springfield, Mo., has been sold to L. R. Reynolds, president, General Steel Products Co. It will be known as the General Wesco Stove Co.

Pullman-Standard Car Mfg. Co., Chicago, has introduced a new type of welding mask in its shops, developed by its own medical and safety department, which eliminates sicknesses caused by welding fumes.

E. F. Houghton & Co., Philadelphia, has issued a new booklet describing gear lubrication problems and their correct handling.

National Tunnel & Mines Co., Bingham, Utah, announces the proposed merger of its company with Utah Metal & Tunnel Co., Bingham. It calls for exchange of four shares of Utah Metal for one share of National Tunnel and change of shares of National Metal from no-par value to a par value of \$1 per share.

Bendix Aviation Corp., South Bend, Ind., announces that its new vacuum power braking system now equips more than 500,000 military vehicles.

Sun Oil Co., Philadelphia, has prepared a complete lubrication plan for industry.

Continental Can Co., is planning to resume operations at its plant in Oil City, Pa., which has been inactive since late 1942.

NEW REINFORCING BAR

A revolutionary type of concrete reinforcing bar, which represents the first real improvement in the bonding value of concrete reinforcing bars in more than 30 years and called "Inland Hi-Bond," has been announced by the Inland Steel Co., Chicago.

It is expected to have far-reaching effects in the design of reinforced concrete structures. This development may lead to revisions of existing building codes to take advantage of the greater bond strength, thereby resulting in more efficient structures through conservation of materials and labor.

The bar increases effectiveness of reinforcing steel in concrete through greatly improved load transfer. This is accomplished by means of reversed double helical ribs of proper height which extend between diametrically opposed longitudinal ribs. The bearing area is more than double that of usual commercial types of reinforcing bars.



National Tube Co., Pittsburgh, for the second year in a row achieved in 1943 the lowest lost-time accident frequency rate among the nation's 12 leading steel producers. The figure was 2.33 accidents for every million man-hours of work.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., reduced its accident rate 5 per cent in 1943 from 5.2 per million hours of work in 1942 to 5 per million hours of work last year.

Designers For Industry Inc., Cleveland, has published a "New Products Check Chart", which will aid manufacturers engaged in postwar planning.

Allis-Chalmers Mfg. Co., Milwaukee, announces release of a new movie, "The Surface Condenser."

Cross Gear & Machine Co., Detroit, recently changed its name to Cross Co.

Broderick & Bascom Rope Co., St. Louis, Mo., recently issued a new edition of its "Riggers' Handbook."

Franklin Institute, Philadelphia, selected William D. Coolidge, vice president and director of research, General Electric Co., Schenectady, N. Y., and Peter Kapitza, director, Institute for Physical Problems, Academy of Sciences, Russia, as winners of the Franklin Medals in 1944.

Permanente Metals Corp., San Jose, Calif., has produced 19,000,000 pounds

of magnesium and output still is on the increase.

Modern Collet & Machine Co., Ecorse, Mich., reports that its new factory will be completed late in April. In the reorganization of the company, Browney Mascoe, now heads the company as general manager.

Chicago Alloy Products Co., Chicago, has moved its offices to Nineteenth street and Washtenaw avenue, Chicago.

Willis-Overland Motors Inc., Toledo, O., now is manufacturing in volume smoke shells for the armed forces.

Department of Interior, Washington, has available for distribution a preliminary report on the Iron King No. 1 copper prospect, Kasaan Peninsula, Prince of Wales Island, southeastern Alaska.

Inland Steel Co., Chicago, last week dispatched the vessel P. D. Block from Indiana Harbor to Port Inland, Mich.,

where it will take on the company's first load of limestone of the season.

Tivit Products Co., Los Angeles, displayed a number of new units of specialized equipment for metal processing and cleaning at the Los Angeles truck maintenance show last month.

All-Steel-Equip Co. Inc., Aurora, Ill., has published a folder on the facilities of its three plants.

Continental Roll & Steel Foundry Co. Changes Name

Continental Roll & Steel Foundry Co., East Chicago, Ind., announces its corporate name has been changed to Continental Foundry & Machine Co.

The change was made for the purpose of describing more clearly the company's productive facilities. It in no way affects the corporate structure, management, personnel, policies or products of the company.

Reports Electric Steel Production Increased 866%

Republic Steel Corp.'s publication also reveals plate output 785 per cent greater in 1943 than it was in 1939

IN 1943 REPUBLIC Steel Corp., Cleveland, produced 866 per cent more electric furnace steel and 785 per cent more steel plates than in 1939, according to a recent issue of *Republic Reports*, issued to the company's 65,000 employees.

This and other information pertaining to the company's war effort is contained in the publication's feature article, "From Blast Furnaces to Bomber Parts". Described in the article are events starting with the early preparation for war which enabled the company to supply critically needed armor plate for tanks which stood between England and invasion and which routed Rommel.

In addition to supplying steel and many finished products, including airplane parts, shells, and hull sections for ocean-going vessels, the article stresses that Republic carried on a large construction program in this period.

It spent more than \$62,000,000 of its own money for new facilities and designed and built for Defense Plant Corp. plants and equipment.

AWARDS

Additional war plants honored with Army-Navy-Maritime emblems for outstanding achievement in the production of war materials

American Bridge Co., Ambridge, Pa.
Bell Armature Works, Knoxville, Tenn.
Bliss & Langhlin Inc., Harvey, Ill.
Bradford Motor Works, Bradford, Pa.
Cincinnati Industries Inc., Cincinnati.
Collegiate Mfg. Co., Ames, Iowa.
General Controls Co., Glendale, Calif.
Gray Mfg. Co., Hartford, Conn.
Green Ball Bearing Co., Cleveland.
Hercules Powder Co., Bessemer, Ala.
Illinois Watch Case Co., Elgin, Ill.
Erie Basin Metal Products Co., Elgin, Ill.
Miami Industries Inc., Toledo, O.
Monarch Rubber Co., Hartsville, O.
Silver Creek Precision Corp., Silver Creek,

United States Rubber Co., Naugatuck, Conn.
Wilcox-Gay Corp., Charlotte, Mich.
Yoder Co., Cleveland.
Maico Co. Inc., Minneapolis.
Metals Inc., Berkeley, Calif.
North Carolina Finishing Co., Salisbury, N. C.

N. Y.
Union Hardware Co., Torrington, Conn.
Walker Mfg. Co., Racine, Wis.
Yuba Mfg. Co., Benicia, Calif.
Bristol Co., Waterbury, Conn., adds first star.
Edward G. Budd Mfg. Co., Philadelphia, wins third star.
Bryant Electric Co., Bridgeport, Conn.
Great Lakes Steel Corp., Stran-Steel division, Mansfield, O.
Cooper-Bessemer Corp., Mt. Vernon, O.
N. A. Woodworth Co., Ferndale, Mich., adds second star.
Silent Hoist & Crane Co., Brooklyn, N. Y., wins second star.
Versco Allsteel Co., Chicago.
Bound Brook Oil-Less Bearing Co., Bound Brook, N. J.
Emco Derrick & Equipment Co., Dallas, Tex.
Goodyear Tire & Rubber Co., Cumberland, Md.
Kelly Springfield Tire Co., Cumberland, Md.
Langley Corp., San Diego, Calif.
Reliance Mfg. Co., Columbia, Miss.
Shellmar Products Co., Mt. Vernon, O.
Simplex Products Corp., Cleveland.
Standard Screw Co., Elyria, O.
Western Automatic Machine Screw Co., Elyria, O.
United States Motors Corp., Oshkosh, Wis.
Roanoke Welding & Equipment Co. Inc., Roanoke, Va.
Weirton Steel Co., Weirton, W. Va.
Cochrane Corp., Philadelphia.
Oil Well Supply Co., Oswego Boiler Works, Oswego, N. Y., "M" pennant.



TENNESSEE RIVER'S FIRST: This vessel is the first seagoing ship ever built on the Tennessee river. Built by the Ingalls Shipbuilding Corp., Decatur, Ala., 556 feet above sea level, the ship will sail down the Tennessee river, Ohio and Mississippi rivers to New Orleans—1350 miles before reaching salt water—and then on to take service in European waters under Polish command



E. J. MASLINE



G. E. HUNT



ALEXANDER M. HAMILTON



RALPH S. HOWE

E. J. Masline, general superintendent of Union Metal Mfg. Co., Canton, O., for the past 19 years, has been appointed general manager and a director of Pacific Union Marbelite Co., Los Angeles, a subsidiary of Union Metal Mfg. Co. A. R. Miller succeeds Mr. Masline as general superintendent of the parent company.

Henry D. Stecher has been elected president of Romec Pump Co., Elyria, O., H. H. Newell has been elected vice president and treasurer, and K. E. Fauver has been elected secretary. These men succeed Ralph H. McQuat, former president, and Carl F. Shuler, former secretary-treasurer. The new president previously was chief engineer, Weatherhead Co., Cleveland. Members of the board, in addition to the officers, are: H. L. Gassman, Cleveland broker; H. B. Harsch, treasurer, John Harsch Bronze & Foundry Co., Cleveland; A. B. Taylor, president, Lorain County Savings & Trust Co., and John A. Zimmer, vice president, Packer Corp.

G. F. Hessler, a vice president of Graybar Electric Co. Inc., New York, has been made a member of the executive committee and a voting trustee of the company.

Newly-elected officers of South Chester Tube Co., Chester, Pa., and its wholly-owned subsidiary, Chester Tidewater Terminal Inc., include: J. W. Lawton, vice president and secretary; R. F. Bradshaw, treasurer and assistant secretary, and N. G. Kriebel, assistant treasurer.

E. F. Patterson, former manager of the Mansfield, O., plant of Great Lakes Steel Corp., Detroit, has been named manager of plants, Stran-Steel division, with headquarters in Detroit. R. L. Kretschmar, previously co-ordinator of production for the company, will succeed Mr. Patterson as manager of the Mansfield plant.

William A. Roberts, James M. White and William C. Johnson have been elected vice presidents of Allis-Chalmers Mfg.

Co., Milwaukee. Mr. Roberts is manager of the company's Tractor division, Mr. White is general works manager in Milwaukee, and Mr. Johnson is general sales manager of the company.

G. E. Hunt, formerly manager of the Indianapolis office of Cutler-Hammer Inc., Milwaukee, has been appointed acting manager of the company's Atlanta territory with offices and warehouse in Atlanta, Ga.

Alexander M. Hamilton, previously executive vice president, Montreal Locomotive Works Ltd., Montreal, Canada, has been appointed vice president, foreign sales, American Locomotive Co., New York. Mr. Hamilton has held various foreign sales positions with the company and is a past president of the Export Managers Club.

R. K. Clifford has been elected vice president and general manager, Continental Steel Corp., Kokomo, Ind. Prior to joining Continental Steel Corp. in 1937 as works manager at Kokomo, Mr. Clifford had been associated with Kokomo Steel & Wire Co. as chief chemist and later as general superintendent. He was elected vice president in charge of operations for Continental Steel Corp. in 1940; was elected a director of the corporation in 1941, and became a member of the executive committee in 1943.

Samuel J. Walker, assistant to the president, Chicago Railway Equipment Co., Chicago, has been elected vice president.

Soren H. Mortensen, chief electrical engineer, Allis-Chalmers Mfg. Co., Milwaukee, was recently awarded an honorary Doctor of Engineering degree by Illinois Institute of Technology, Chicago, for "leadership in the development of alternating current machinery."

C. F. Nagel Jr., formerly chief metallurgist, Fabricating division, Aluminum Co. of America, Pittsburgh, has become chief metallurgist for the company and will head the newly-created Metallurgical

division. T. W. Bossert succeeds Mr. Nagel as chief metallurgist of the Fabricating division, C. L. Dunham has been made chief metallurgist of the Reduction division, and H. J. Rowe has been named chief metallurgist of the Castings division.

Ralph S. Howe has been elected vice president and manager, New Britain-Gridley Machine division, New Britain Machine Co., New Britain, Conn. Mr. Howe, who will be in charge of sales, has been associated with the company since 1920 and recently held the offices of treasurer and factory manager. Julian C. Pease was elected assistant secretary and factory manager of the machine tool division, and William J. Lofgren has been elected treasurer of the company.

Henry W. Jackson has been elected president of Bearings Co. of America, Lancaster, Pa., to succeed Jack L. Straub, who has been elected board chairman. Previously, Mr. Jackson had been vice president of the company. Charles D. Addams, vice president, E. E. Marshall, secretary-treasurer, and Oliver J. Swartz, assistant secretary-treasurer, were re-elected, and John I. Hartman was elected a vice president.

J. L. Hensch, president, Mid-West Forging & Mfg. Co., Chicago, has been elected president and treasurer, Knapp Bros. Mfg. Co., Joliet, Ill., succeeding Mrs. Henrietta F. Knapp, who has been president since the death of her husband, George A. Knapp, ten years ago. Mrs. Knapp becomes chairman of the board and assistant treasurer. C. E. Robinson, manager of sales, Mid-West Forging & Mfg. Co., has been elected assistant to the president.

Thomas A. Hughes, former assistant advertising manager of Underwood Elliott Fisher Co., New York, has been appointed manager of air conditioning advertising, Westinghouse Electric Elevator Co., Jersey City, N. J.

Robert E. Crockett, well known authority on ore beneficiation, has become



JULIAN C. PEASE



CORLISS A. BERCAW



DR. SAMUEL L. HOYT

associated with H. A. Brassert & Co., Pittsburgh, consulting engineers to the iron and steel and affiliated industries. For the past six years Mr. Crockett has been chairman of the eastern magnetite mining and milling committee, American Institute of Mining and Metallurgical Engineers.

Stanley L. Burgess has been appointed sales representative in the Detroit territory for Stearns Magnetic Mfg. Co., Milwaukee. Mr. Burgess held this position before joining the Army Air Forces in 1941, and has been re-appointed since receiving his honorable discharge.

Frederick E. Moskovics, formerly president of Stutz Motor Car Co. of America, and at one time chairman, Marmon-Harrington Co., Indianapolis, has been appointed industrial consultant to the A. O. Smith Corp., Milwaukee. Recently Mr. Moskovics has served as technical adviser of the Mid-Central Procurement district of the Army Air Corps at Chicago.

Arthur M. Price, Price-Watson Co., Chicago, has been re-appointed chairman of the finance committee of the Institute of Scrap Iron and Steel Inc., and Marvin S. Plant, H. Klaff & Co. Inc., Baltimore,



NICOLAS W. BAKLANOFF

Who has joined the staff of Battelle Memorial Institute, Columbus, O., as announced in STEEL, March 27, p. 74.

has been made vice chairman of the committee. Charles R. Ritter, Luria Bros. & Co. Inc., Philadelphia, has been re-appointed chairman of the transportation committee, and Harry Burkhardt, Hyman-Michaels Co., Chicago, has been made vice chairman.

Corliss A. Bercaw, formerly production manager, Diesel Engine division, Baldwin Locomotive Works, Eddystone, Pa., has been appointed assistant general manager of the Springfield, O., division of Elliott Co.

Charles S. Mattoon, manager of industrial relations, Curtiss-Wright Airplane division, Curtiss-Wright Corp., New York, has been appointed permanent chairman of the industrial relations committee of the Aircraft War Production Council, East Coast, Inc.

Grant S. Wilcox Jr., assistant master mechanic for Plymouth division, Chrysler Corp., Detroit, has been elected chairman of Detroit chapter No. 1, American Society of Tool Engineers.

Quincy M. Crater, former manager of the petroleum and chemical section, industrial department, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has been appointed assistant manager of the Westinghouse Detroit office territory, with offices at 5757 Trumbull avenue, Detroit.

Henry H. Ritchotte, in recent years a member of the contractors' tool service staff in the Philadelphia branch office, Independent Pneumatic Tool Co., Aurora, Ill., has been appointed manager of the company's contractors' tool department.

P. J. Potter has been appointed production metals engineer, Federal-Mogul Corp., Detroit. Associated with the company's research and production departments for 21 years, Mr. Potter had been superintendent of the company's Detroit foundries for the past five years.

Dr. V. N. Krivobok, until recently chief metallurgist, Lockheed Aircraft Corp.,

Burbank, Calif., and formerly professor of metallurgy at Carnegie Institute of Technology, Pittsburgh, for many years, has become associated with the Development and Research division, International Nickel Co. Inc., New York. From 1924 until 1941 Dr. Krivobok also had served as associate director of research, Allegheny Ludlum Steel Corp., Brackenridge, Pa.

Dr. Samuel L. Hoyt, technical advisor, Battelle Institute, Columbus, O., has been selected by the Golden Gate Chapter of the American Society for Metals to present its 1944 educational lectures. The lectures, on the subject, "Properties, Selection, and Specification of Alloys", will be delivered at the University of California, Berkeley, April 19, 20, 21, 24 and 25.

James D. Ford has been appointed credit manager, Weirton Steel Co., Weirton, W. Va., to fill the vacancy created by the death of W. L. Horner.

Joseph T. Meade, formerly personnel and industrial relations manager, Sheffield Farms Co. Inc., New York, has been appointed personnel director, Mack Mfg. Corp., Long Island City, N. Y.

Honorary membership in the Electrochemical Society Inc. will be bestowed on Paul J. Kruesi, president, Southern Ferro Alloys Co., Chattanooga, Tenn., and Willis R. Whitney, General Electric Co., Schenectady, N. Y., at the annual convention of the society to be held in Milwaukee April 13-15.

Henry J. McAdams has been appointed manager of the New York district office of Jones & Laughlin Supply Co., Tulsa, Okla. T. L. Lewis, who recently joined the company, has been named district manager of tube sales in Houston, Texas.

E. Holley Poe has resigned as executive vice president and general manager of the Petroleum Reserves Corp. Mr. Poe plans to return to private business.

Col. Barrett Rogers, United States

Army, has returned to inactive status after three and one-half years of active duty and will open offices in Chicago and Milwaukee as a consultant on industrial management. At the time of his release from active duty Colonel Rogers was director of technical training and regimental commander, Aberdeen proving grounds, Maryland.

H. H. Smith has been appointed assistant manager, metallurgical department, American Steel & Wire Co., Cleveland, succeeding the late Lawrence H. Dunham, who died in January. R. A. Woodside succeeds Mr. Smith as works metallurgist at the company's Donora Steel & Wire Works, Donora, Pa.

Joseph R. Kraus has been elected president, National Bronze & Aluminum Foundry Co., Cleveland, Herbert Pfahler has been elected vice president and treasurer, and Don W. Hornbeck was

named board chairman. Mr. Kraus is a director of Valley Mould & Iron Corp., Hubbard, O., General Tire & Rubber Co., Akron, O., Addressograph-Multi-graph Corp., Cleveland, Cleveland Hobbing Machine Co., and Fremont Foundry Co., Fremont, O.

D. J. Stewart, previously assistant general manager, Barber-Colman Co., Rockford, Ill., has been named vice president and general manager, to succeed Earle D. Parker. H. F. Collins, former assistant general superintendent of Barber-Colman Co., has been appointed works manager.

Lewis Walker III, now a lieutenant in the United States Naval Reserve, has been elected president of Talon Inc., Meadville, Pa., a company which his grandfather founded 50 years ago. He succeeds W. C. Arthur, Pittsburgh attorney, who resigned after heading the com-

pany five years. J. Malcolm Johnston has been elected a director, to fill Mr. Arthur's place on the board, and J. F. H. Turton has been elected a director to succeed the late Herbert R. Walrath.

Ben Van Horn has retired as manager of the Crane Sales division, Harnischfeger Corp., Milwaukee, after a continuous association of 47 years with the company. Mr. Van Horn joined the company in 1896 as a stenographer, advanced into crane sales work by 1913, and rapidly rose to the position of sales manager of cranes.

J. D. Zaiser has been named executive vice president, Ampco Metal Inc., Milwaukee, and George Dreher has been appointed vice president in charge of manufacturing. Both positions are newly-created. Mr. Zaiser formerly was assistant general manager, and Mr. Dreher was superintendent of manufacturing.

OBITUARIES . . .

Fred S. Doran, 56, vice president, Joseph T. Ryerson & Son Inc., Chicago, died March 24 in that city. Mr. Doran had been associated with Ryerson 39 years. In 1927 he was made manager of the Ryerson plant in Cleveland, and in 1941 he returned to company headquarters in Chicago, a year later becoming vice president in charge of purchasing for all ten of the company's plants. A member of the American Steel Warehouse Association and the American Iron and Steel Institute, Mr. Doran was one of the most experienced and well known men in the steel industry.

Capt. W. P. McElroy, 68, retired fleet captain for the Pittsburgh Steamship Co., ore-carrying subsidiary of United States Steel Corp., died March 22 in Cleveland. Captain McElroy leaves one world record of his sailing days which still stands. On Sept. 7, 1921, the D. G. KERR, of which he was master, loaded 12,886 gross tons of iron ore at Two Harbors, Minn., in 16½ minutes.

Frank B. Wilkinson, 87, founder of Logansport Machine Inc., Logansport, Ind., died there recently.

Levi M. Sawyer, 55, since 1919 president of Chicago Steel Tape Co., died March 21 in Chicago.

Mont Levine, who for the past 18 years conducted a scrap yard business in Fairmont, W. Va., and who recently held a warehouse license for dealing in new steel, died in Fairmont recently. Mr. Levine was a member of the Pittsburgh chapter, Institute of Scrap Iron and Steel Inc.

Frank F. Slick, 68, former general superintendent, Edgar Thomson works, Carnegie-Illinois Steel Corp., Braddock, Pa., died in Pittsburgh March 22. Mr.



FRED S. DORAN

Slick had retired after illness forced him to take a leave of absence from his work in 1937. Up to the time of his retirement he had served 42 years with the corporation.

Humphrey J. Kiely, 78, retired executive vice president, Link-Belt Co., New York, died March 26 in that city. Mr. Kiely was associated with Link-Belt Co. for 50 years, rising from office boy to vice president in charge of foreign trade. He was the inventor of a machine for refining sugar which is widely used in the sugar industry.

Francis K. Kernan, president of the Bossert Co. Inc., Utica, N. Y., since 1910, died March 11. Mr. Kernan was a prominent lawyer and was a director and member of the executive committee of the Equitable Life Assurance Society of the United States.

Eugene E. Schmitt, 67, owner of the Schmitt Iron & Wire Works, St. Louis, died March 15 in that city. Mr. Schmitt was one of the founders of the Rogers-Schmitt Iron & Wire Works in St. Louis

40 years ago. Twenty-five years ago he sold his interest in that company and founded his own business.

William D. Plumb, 55, president, Fayette R. Plumb Inc., Berwyn, Pa., died March 23 in Bryn Mawr, Pa.

J. Frank Bruckman, 53, supervisor of sales in metropolitan New York for American Safety Razor Corp., Brooklyn, N. Y., died in New York March 20. Mr. Bruckman had been associated with the corporation for 31 years.

George W. MacLaughan, 59, general purchasing agent, Thomas A. Edison Inc., West Orange, N. J., died March 20 in Orange, N. J. Mr. MacLaughan had been associated with the company since 1917.

Harry A. Campbell, 55, assistant secretary, National Supply Co., Pittsburgh, died March 22 in that city.

R. Max Eaton, founder and retired president of Niagara Searchlight Co., Niagara Falls, N. Y., died March 26.

M. Beach Helme, 59, assistant manager, procurement department, Joseph T. Ryerson & Son Inc., Chicago, died there March 7. He had been affiliated with the company 34 years.

Charles W. Landis, 67, since 1906 contracting engineer with United States Steel Export Co., New York, died March 20 in Robeson, Pa.

Roscoe C. Pattison, 63, who retired six months ago as head of the pattern making department, Pratt & Letchworth Co., Buffalo, and a former plant superintendent, T. H. Symington Co., Rochester, predecessor of Symington Gould Corp., died March 19. Mr. Pattison had been a member of the American Foundrymen's Association.

Quick Reconversion of Dominion's War Industries Being Planned Now

War production in Canada during current year to total \$2,850,000,000, an increase of about \$83,250,000. . . More than 1,000,000 Canadians employed directly or indirectly in war production. . . Of these, 120,000 are women

TORONTO, ONT.

C. D. HOWE, Minister of Munitions and Supply, announced in the House of Commons that the reconversion of Canada's war industry to peacetime purposes is not yet opportune but preparations are being made for quick conversion at the proper time.

In his review of war production for the past year, he outlined a number of changes in the production program scheduled for 1944.

Production for the fiscal year ended March 31, 1944, totaled \$3,435,000,000 compared with \$2,900,000,000 in the previous year. Contracts awarded by the Department of Munitions and Supply since the outbreak of war now total \$9,450,000,000 while capital expenditures amount to \$850,000,000. The supply situation has improved to a point where some relaxation is possible in control of lumber, a number of metals, steel and some chemicals, Mr. Howe stated.

Industrial war production in Canada during the current year will total \$2,850,000,000, an increase of about \$83,250,000 over last year's war output. By the end of this year, Mr. Howe stated, Canada will have produced in its factories and shipyards \$8,750,000,000 of war supplies for the Dominion and its Allies. This includes miscellaneous military stores, mechanical transport, cargo and naval vessels, aircraft, armored vehicles, guns and small arms, gun ammunition, instruments and signals, chemicals and explosives and small arms ammunition.

The minister estimates that more than 1,000,000 Canadians are now employed directly or indirectly on industrial war production of whom about 800,000 are directly engaged in war manufacture. Of these, 122,000 are women. About 39,000 women are engaged in aircraft manufacture and more than 50,000 in Canadian shipyards. As long as war demand for motor vehicles continues at its present level, there is no prospect of resuming manufacture of passenger autos.

Steel Situation Improves Materially

The steel situation, the minister said, has improved materially in recent months. Seven steel control orders have been lifted and more steel is being made available to civilian industry. But sheet steel, used in manufacture of many household and other equipment, is still in short supply.

Canada's war production record as reported by Mr. Howe is as follows:

Aircraft: 4133 were produced in 1943; 3811 in 1942, a total production at March 1 of 11,390. Value of planes produced in 1943 was 50 per cent higher than in 1942.

Armored fighting vehicles: 15,500 produced in 1943, 12,500 in 1942, a total at March 1 of 34,000 units. Production of self-propelled mounts and other armored fighting vehicles will continue at a high rate in 1944.

Mechanical transport: Production dropped from 192,000 units in 1942 to 175,000 in 1943 because heavier and

more costly equipment was made in 1943. March 1 total is 593,000 units. Fewer units will be produced in 1944, but they will be of a heavier type.

Locomotives: 24 are being produced monthly for shipment overseas.

Artillery gun barrels, carriages: 1943 total was 45,000; 1942 total was 31,000; total production to date is 84,000 units. There will be a cut in army gun production, a slight increase in production of naval guns.

Machine guns, rifles, other small arms: 325,000 in 1942, 580,000 in 1943, total production 1,000,000 units; 1944 production will be slightly greater than in 1943.

Gun ammunition: 30,000,000 rounds produced in 1943, and 28,000,000 in 1942. Total production since beginning of this war, 62,000,000 rounds. Production rate in 1944 will be about the same as in 1943.

Small arms ammunition: 1,250,000,000 rounds in 1942, 1,500,000,000 rounds in 1943, total production to date is 3,500,000,000 rounds. Program will be reduced in 1944.

Cargo vessels: 150 vessels, or 1,476,000 deadweight tons, in 1943; 81 vessels, or 838,000 deadweight tons, in 1942. Total production at March 1, 249 vessels. Slight reduction of program in 1944.

Naval vessels: 100 produced in 1943; 117 in 1942. Since war began, 336 escort vessels produced. Actual deliveries of escort vessels and other new types will be higher in 1944.

Small craft: 3600 delivered out of total of 4300 orders placed. Rate of deliveries in 1944 will be about the same as in 1943.

Instruments and communications equipment: \$180,000,000 worth produced in 1943; \$84,000,000 worth in 1942; total value since the war began \$320,000,000. Program will continue to expand.

Defense, other construction projects: \$194,000,000 spent in 1943; \$219,000,000 in 1942. Since the war began, \$675,000,000 spent in construction, including housing.

They Say:

"We have had rationing on a lot of things, but none so far on thinking. This is the time to think about the post-war problems and to prepare for them. Intelligent planning and thinking now will save us trouble in the future."—Charles C. Carr, director of public relations, Aluminum Co. of America, Pittsburgh.

"An undue accumulation of dead savings funds may prove to be a millstone around the neck of our private economy. It is the use to which savings are put that we should now give our most careful consideration and begin to make plans at once for the postwar period."—A. L. M. Wiggins, president, American Bankers' Association.

"The business world is, of course, looking forward hopefully to relief from the restraints of wartime controls just

as soon as the emergency conditions warrant. Most of these limitations have no doubt been thoroughly justified as part of the war effort, but there have also been some flagrant abuses by overzealous, inexperienced enforcement agents."—Dr. Julius Klein, business consultant and former Assistant Secretary of Commerce.

"The railroads have performed a miracle in their war effort. And they will lead the way to peacetime economy. They have money now that they can't spend, money that needs to be spent for maintenance and repair. That money is piling up as a tremendous backlog for peacetime planning. . . Railroads have at least two billion dollars to put into new equipment and replacements when the war ends."—Dr. Julius H. Parmalee, director, Bureau of Railway Economics, Association of American Railroads.

Munitions Output Again Falls Behind Schedule

FEBRUARY munitions output recorded the second consecutive monthly decline from the December peak, despite a reversal of the downward trend in ammunition production and the steadily expanding output of planes in the latest period. Production remains behind 1944 scheduled requirements.

Manpower is seen becoming a more critical problem in munitions production during the months ahead, for the nation faces the problem of maintaining an overall output slightly higher than at present, in the face of intensified manpower drains in the lower age brackets. Programs most likely to be affected by the manpower shortage are radar, aircraft, high-octane gasoline and synthetic rubber, which are forced to rely on young engineers, technicians, and skilled workers with special training.

AIRCRAFT—All-time record output of 81,400,000 pounds of airframe weight, excluding spare parts, was established in February. Production totaled 8760 planes, running practically even with projected schedule and accounted for 30 per cent of munitions production for the month. Again heavy bombers pushed airframe weight into new high ground.

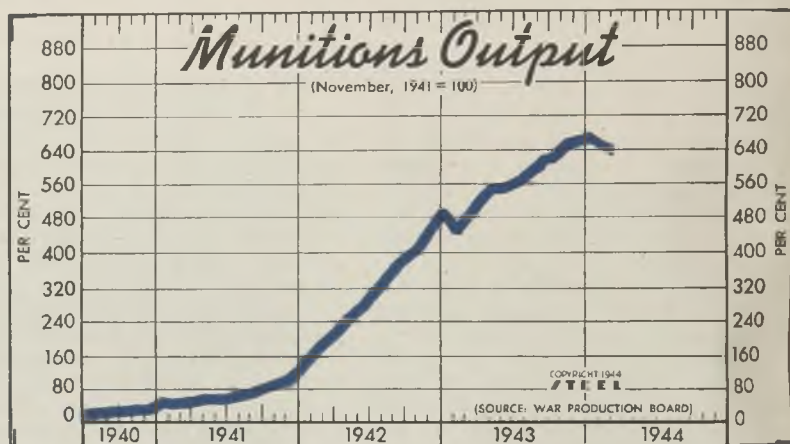
SHIP CONSTRUCTION—Maritime Commission delivered 134 vessels, totaling 1,373,000 deadweight tons in February. This was an increase of 14 per cent in tonnage over the preceding month's deliveries, but still considerably below December's all-time peak. The first of the Victory ships was delivered. February output of landing craft, the most pressing program, was up 10 per cent.

AMMUNITION—Some phases of the ammunition program reflect the difficulty in slowing down assembly lines to the right pace in meeting reduced schedules. General purpose and aerial bombs, antiaircraft shells, and ammunition loading all went way over their generally declining schedules while small arms ammunition dropped 3 per cent more than scheduled. Small

arms declined 5 per cent as planned, guns and fire control equipment ran somewhat behind a declining schedule.

COMBAT VEHICLES—Output reached a 13-month low, as design change in one armored vehicle primarily accounted for the poor showing in this group. Motor carriages for self-propelled guns fell 15 per cent behind January output, although a drop of only 10 per cent was planned.

WPB's MUNITIONS INDEX—February production declined to a preliminary figure of 641 from the revised January figure of 647, and compares with December peak of 662. By major categories, February output recorded the following percentage changes in comparison with January: Aircraft, up 4 per cent; ships (value of work done on Army, Navy, and Maritime ships including maintenance and repair) down 4; guns and fire-control equipment, down 1; ammunition, up 9; combat and motor vehicles, down 10; communication and electronic equipment, down 5; other equipment and supplies down 3.



WPB's Munitions Index
(November, 1941 = 100)

Month	1944	1943	1942	1941	1940
January	647	453	166	41	..
February	*641	476	182	45	..
March	..	518	213	52	..
April	..	547	247	60	..
May	..	548	276	57	..
June	..	560	309	59	..
July	..	587	339	64	23
August	..	609	372	72	22
September	..	611	387	83	22
October	..	644	403	91	27
November	..	661	448	100	34
December	..	662	497	133	50

*Preliminary.

FIGURES THIS WEEK

INDUSTRY

	Latest Period*	Prior Week	Month Ago	Year Ago
Steel Ingot Output (per cent of capacity)	98.5	98.0	98.5	99.0
Electric Power Distributed (million kilowatt hours)	4,409	4,400	4,512	3,928
Bituminous Coal Production (daily av.—1000 tons)	1,987	2,038	2,158	2,046
Petroleum Production (daily av.—1000 bbls.)	4,384	4,385	4,384	3,896
Construction Volume (ENR—unit \$1,000,000)	\$39.9	\$29.4	\$37.0	\$74.1
Automobile and Truck Output (Ward's—number units)	17,725	17,810	18,110	18,210

*Dates on request.

TRADE

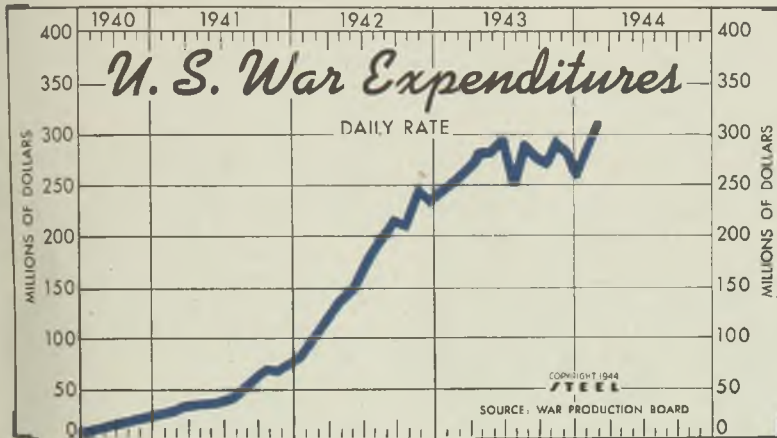
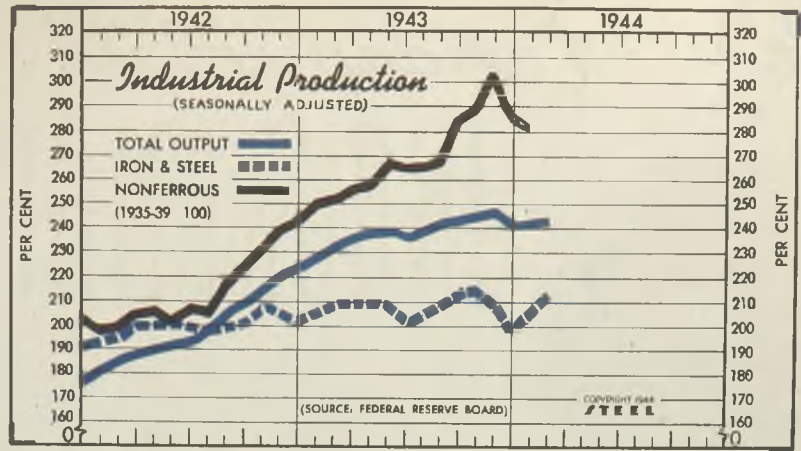
Freight Carloadings (unit—1000 cars)	785†	786	776	787
Business Failures (Dun & Bradstreet, number)	30	29	25	94
Money in Circulation (in millions of dollars)†	\$20,934	\$21,006	\$20,610	\$16,065
Department Store Sales (change from like week a year ago)†	+11%	+2%	-21%	+3%

†Preliminary. †Federal Reserve Board.

Federal Reserve Board's Production Indices

(1935-1939 = 100)

	Total Production		Iron, Steel		Nonferrous	
	1944	1943	1944	1943	1944	1943
Jan.	242	227	208	204	281	250
Feb.	243	232	211	208	...	252
Mar.	...	235	...	210	...	256
Apr.	...	237	...	209	...	257
May	...	238	...	208	...	266
June	...	236	...	201	...	264
July	...	239	...	203	...	264
Aug.	...	242	...	209	...	267
Sept.	...	243	...	213	...	284
Oct.	...	247	...	214	...	289
Nov.	...	247	...	209	...	304
Dec.	...	241	...	200	...	286
Avg.	...	239	...	207	...	270

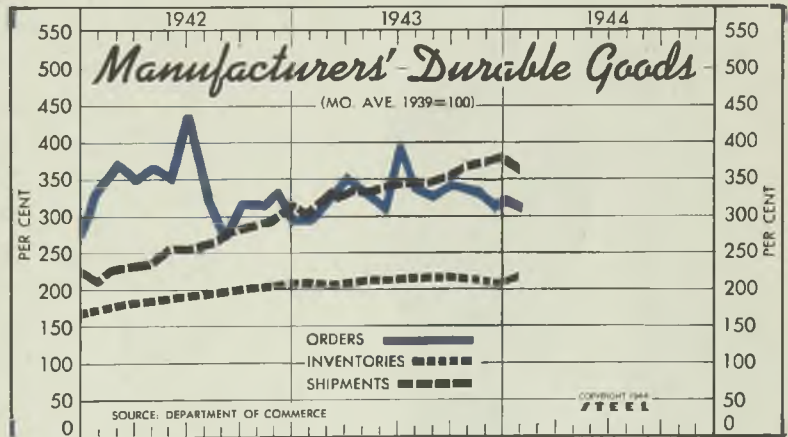


War Expenditures (millions)

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

Index of Manufacturers Durable Goods

	Orders		Shipments		Inventories	
	1944	1943	1944	1943	1944	1943
Jan.	316.9	293.5	364	208	215.7	211.3
Feb.	...	326.6	...	337	...	209.6
Mar.	...	349.2	...	330	...	210.7
Apr.	...	329.8	...	338	...	213.5
May	...	313.0	...	338	...	213.5
June	...	392.7	...	343	...	212.5
July	...	338.7	...	346	...	211.4
Aug.	...	325.0	...	354	...	213.4
Sept.	...	339.5	...	356	...	214.9
Oct.	...	339.5	...	371	...	214.0
Nov.	...	316.1	...	373	...	213.3
Dec.	...	324.2	...	380	...	212.8
Ave.	...	332.3	...	339	...	212.7



FINANCE

	Latest Period*	Prior Week	Month Ago	Year Ago
Bank Clearings (Dun & Bradstreet—millions)	\$10,880	\$9,028	\$8,927	\$8,940
Federal Gross Debt (billions)	\$187.9	\$187.4	\$185.5	\$119.7
Bond Volume, NYSE (millions)	\$64.5	\$56.9	\$107.1	\$108.3
Stocks Sales, NYSE (thousands)	6,696	7,484	4,365	8,267
Loans and Investments (millions)†	\$52,885	\$52,903	\$53,256	\$42,198
United States Government Obligations Held (millions)†	\$38,601	\$38,522	\$38,902	\$29,343

†Member banks, Federal Reserve System.

PRICES

	\$56.73	\$56.73	\$56.73	\$56.73
STEEL's composite finished steel price average	251.3	251.5	249.3	249.2
Spot Commodity Index (Moody's, 15 items)†	113.9	113.3	112.4	111.5
Industrial Raw Materials (Bureau of Labor index)†	100.6	100.6	100.6	100.6
Manufactured Products (Bureau of Labor index)†

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

Fundamentals of INDUSTRIAL ELECTRONIC

INDUSTRIAL electronics equipments are playing a mighty role today in America's record-breaking war production. A comparative newcomer to industrial plants, since the major developments in industrial electronics have taken place since World War I, this industrial tool has been directly responsible for saving millions of man and machine hours, and millions of pounds of critical materials since Pearl Harbor.

Hundreds of electronics equipments are now available to the metal producing and metalworking fields to help do jobs better or more economically, or to take over jobs that could not be done otherwise. Included are equipments for welding, heat treating, positioning, speed matching, current and voltage control, temperature control, color matching, motor control, counting, process control, inspection, measurements and testing, power rectification and frequency changing, industrial X-rays and precipitation.

The application, use, and proper maintenance of the many electronic equipments now in industrial use demand a

certain familiarity with the fundamentals of circuits used in various standard electronic equipments. These articles have been prepared with this need in mind.

We already know how electric current flows in motors, incandescent lamps, electric furnaces, transformers, and in magnetic control devices; the electricity always flows in the copper wire or other metal parts. But consider a stroke of lightning, where electricity jumps through space. The great electric pressure of lightning forces the electric current to pass through the air. In the same way, inside any radio tube, tiny electric currents are made to pass through the space separating certain parts in the tube. We say that such action—where electricity flows through space instead of being confined to metal conductors or circuits—is electronic.

Why is it called electronic? Years ago, scientists who were trying to explain how electricity passed through space, thought that such an electric current was a steady stream of tiny electrical particles. They called these particles elec-

Fig. 1—A contactor operated on a sinewave alternating current

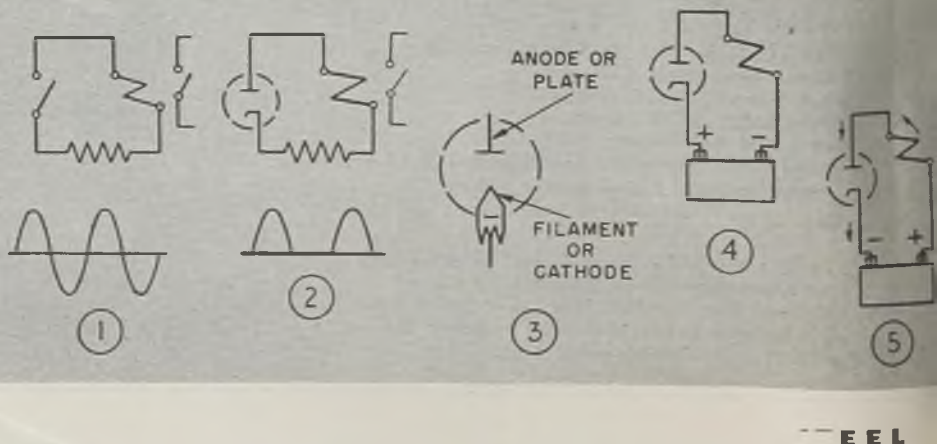
Fig. 2—A contactor operated in series with a rectifier tube on A.C. The half-wave intermittent current will cause the contactor to chatter

Fig. 3—The diode rectifier or kenotron

Fig. 4—The rectifier tube connected in series with a load and a battery. Cathode positive, no current flows

Fig. 5—Same as Fig. 4, except battery reversed. The cathode is negative and current will flow

(Left)—Indicative of the wide range of electronic tubes available for industrial equipment are these comparatively simple phanotron rectifier tubes which, top to bottom, have ratings of $12\frac{1}{2}$, 5, $\frac{1}{2}$ and $\frac{1}{8}$ amperes



Many recent developments in electronics of specific interest to the metal producing and metalworking industries make this series, the first part of which is presented here, especially significant. Those who regard it highly desirable to have a working knowledge of the basic principles involved and their commercial applications will find the author has covered his subject in a clearly understandable manner and has put electronic tubes to work in practical circuits

By G. M. CHUTE

Application Engineer
General Electric Co.
Detroit

trons. Today, we believe that any electric current is made of countless numbers of electrons. Only when electricity passes through space, when the stream of electrons comes out of the metal into the open, is such action called electronic. Whenever electricity flows across the space inside a device which controls its stream of electrons, that device is called electronic.

In ordinary air, electrons seem bashful, and can be made to jump through space only by the pressure of high voltage. But if they are enclosed in a tube from which the air has been removed, the electrons flow across the space more easily. All tubes are carefully sealed to maintain the desired conditions inside the tube. While most of the small tubes are vacuum tubes, the larger ones usually contain mercury or other vapor with a slight reduction

of the vacuum which permits them to handle much larger electric currents. They are called vapor-filled tubes.

Some electric lights are electronic. The common incandescent light bulb is not considered electronic even though it is enclosed like a radio tube, for the electric current flows entirely within the metal filament. In contrast, the fluorescent lamp is electronic, for its light is produced by the action of electric current which flows through the space between the two ends of the lamp.

Electronics as a science is not new, for radios, sound pictures, fluorescent lights, and public address systems depend upon electronics. However, the recent developments based on electronics now challenge us to gain a better basic understanding of the subject in general.

Let us list five important ways in which electron tubes give operation unequaled

by other kinds of electric equipment:

1. Electron tubes can respond to very small control signals, and produce a corresponding but larger signal. In this way, tubes increase or amplify the input signal;
2. Electron tubes can respond at speeds far beyond those attained by the most sensitive moving devices;
3. Acting at high speeds or high voltages, electron tubes can produce special radiations (such as radio or X-rays);
4. Some kinds of electron tubes respond to light, serving as "electric eyes";
5. With alternating voltage applied, electron tubes can carry current in one direction, while refusing to carry it in the opposite direction. In this way, tubes change or rectify alternating current into direct current.

This last type of action is characteristic of the phanotron rectifier. But before we attempt to study the complete circuit, let's make some fundamental observations.

Condition and Rectification in a Rectifier Tube

In Fig. 1 we see an ordinary transformer winding which can force current (Please turn to Page 148)

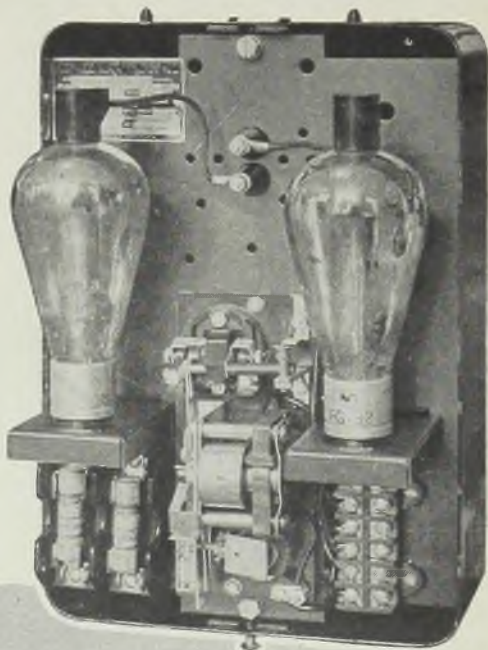


Fig. 6—The variation of anode current with change in anode voltage while the cathode (or filament) temperature is held constant

Fig. 7—The variation of anode current with change in cathode (or filament) temperature while the anode voltage is held constant

Fig. 8—The wave shape of the output of a full wave rectifier (unfiltered)

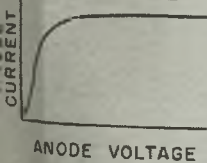
Fig. 9—Circuit of the two-tube rectifier

Fig. 10—The same circuit as Fig. 9, but the two rectifiers have been included in the same tube

Fig. 11—The output wave form from a multiphase rectifier. Compare this with the much greater voltage variation of Fig. 8

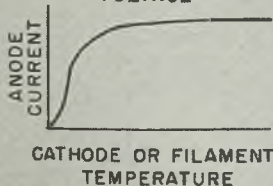
(Right)—This simple single-phase phanotron rectifier provides maximum direct current output 5 amperes, 450 volts. The time delay relay prevents application of anode voltage until cathode reaches working temperature

CONSTANT FILAMENT TEMPERATURE

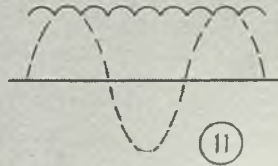
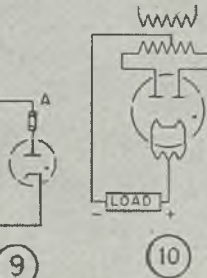
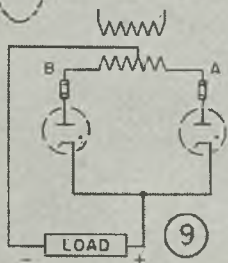
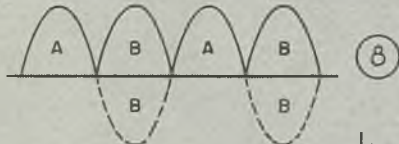


6

CONSTANT ANODE VOLTAGE



7





AN EXCELLENT example of the increase in production capacity possible with a well-planned handling system is presented by a new plant set up in the Chicago district to produce demolition bombs. Although this plant is of relatively small size, it has an enormous capacity obtained through the proper plant layout and use of conveyors and produces bombs at a low cost per unit.

While a description of bomb manufacture itself is of only passing interest at this stage of the "battle" on the production front, there are many ideas to be gleaned which may prove useful to those planning more efficient handling systems as a means of lowering production costs.

The plant was engineered and is being operated by Mechanical Handling Systems Inc., Detroit. It has two railroad sidings, one to handle incoming raw material which is largely in the form of seamless steel pipe in standard lengths. The other siding is inside the plant for handling outgoing shipments of finished bombs.

Pipe is handled in and out of the storage yard (Fig. 1) in units of three by a 5-ton overhead crane equipped with

a special sling. Pipe ready for processing is transferred to a skid rack equipped with an automatic discharger for loading each tube onto a friction saw carriage housed in the small building in the background of Fig. 1.

This carriage advances the pipe to a fixed stop and the saw cuts it to the proper length. After the sawing operation, the pipe travels forward through a pair of deburring rolls to clean up the edges and from there the delivery conveyor shown in Fig. 2 carries the pipe into the plant for further processing. This conveyor is of double strand pusher type equipped with cross arms with rollers and runs between two duplicate lines of heating furnaces and forging presses. There are three pairs of furnaces and presses in each line.

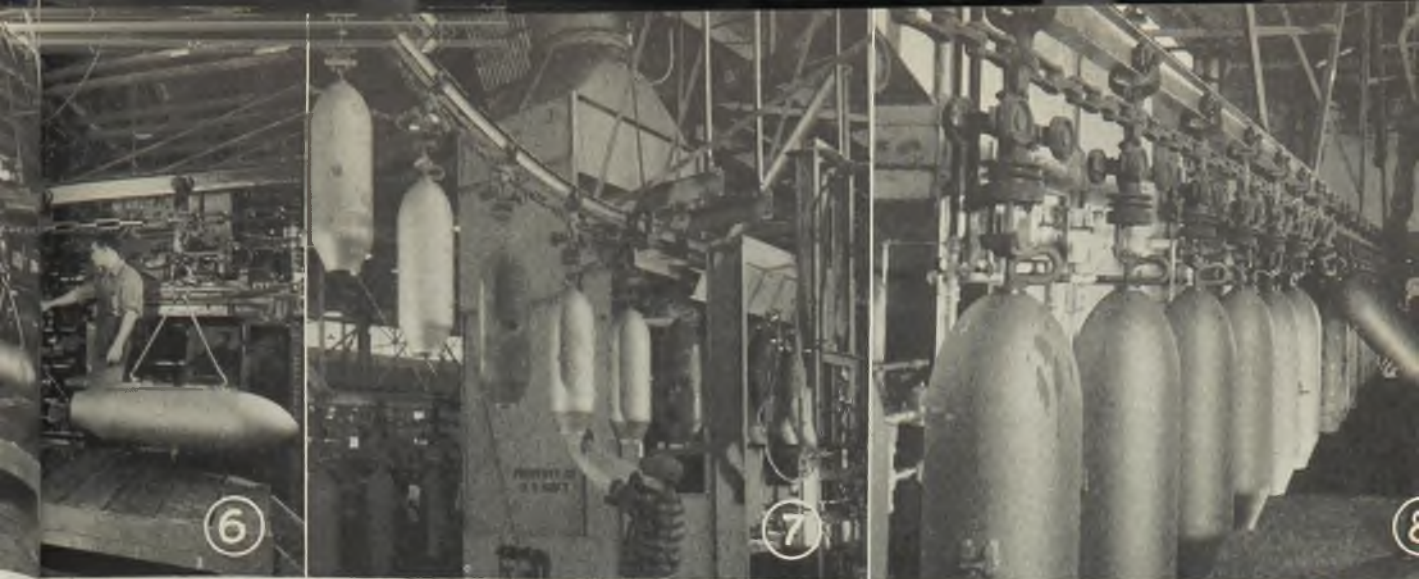
The delivery conveyor automatically discharges the pipe at the loading end of each furnace (Fig. 3) where an operator transfers it to the furnace heating ports by means of a semi-automatic carriage, one of which is shown in the same illustration. The same carriage is used to remove the pipe from the furnace and bring it rapidly into position on the forging press.

After each forging operation, the bomb is either discharged directly to the next furnace for reheating or automatically to a cooling conveyor located underneath the pipe delivery conveyor. After the forging operations are completed, the bomb bodies are delivered to a final cooling conveyor which is enclosed and provided with forced draft for rapid cooling.

The bomb bodies then are delivered from the end of the cooling conveyor to a station for tack welding of suspension lugs. After tack-welding, two other welding operations are performed which require distribution to a number of operators. This is accomplished by means of the monorail conveyor shown in Fig. 4 equipped with double deck roller-type carriers, the lower deck being used for delivering the bomb bodies to the welders and the upper deck for conveying the finished work to the hardening furnaces which are next in line.

There are two duplicate hardening





Efficient Handling

. . . in relatively small new plant provides enormous capacity, cuts production costs

and draw furnaces of the continuous pusher type, both of which are served by the double deck conveyor. An automatic quench is located between each pair of hardening and drawing furnaces which is controlled by cams, limit switches and automatic door opening devices. The bomb bodies are carried through the furnaces by means of shoes which ride on rails and at the discharge end of the draw furnace these hot shoes are picked up by the operator and placed on a separate conveyor for return to the loading end of the hardening furnace.

The bodies, after heat treatment, are placed on a gravity rail conveyor which carries them to two duplicate automatic shot blasting machines. The bodies are handled to and from the shot blasting machines by means of an overhead transfer crane. After shot blasting, they are placed on a monorail conveyor equipped with slings which engage the bomb lugs so they are held in a horizontal position. This conveyor, shown in Fig. 5, circulates and delivers the bomb bodies to the final machining operations which consist of facing, boring and threading the ends and tails.

The machines are specially designed to time in to best advantage with the handling system. As will be noted by referring to Fig. 6, these machines have a loading fixture which permits loading and unloading while the machine is in operation. A half ton hoist is used for handling the bomb bodies to and from the monorail conveyor.

At the next station, the bombs are removed from the monorail conveyor for inspection and fitting with a special handling fixture which screws into the nose of the bomb permitting subsequent handling in a vertical position, as shown by Fig. 7. The bombs are carried in the vertical position through a large degreaser for removal of grease and dirt and which also heats them to a desirable painting temperature. Painting inside and out is done simultaneously in an enclosed booth (Fig. 7), this being facilitated by the rotating fixture from which the bombs are suspended.

The paint dries rapidly and after a 10-minute hardening period the bombs are removed from the line by means of an overhead hoist, as shown in Fig. 8, and placed in a horizontal position on the

(Please turn to Page 164)

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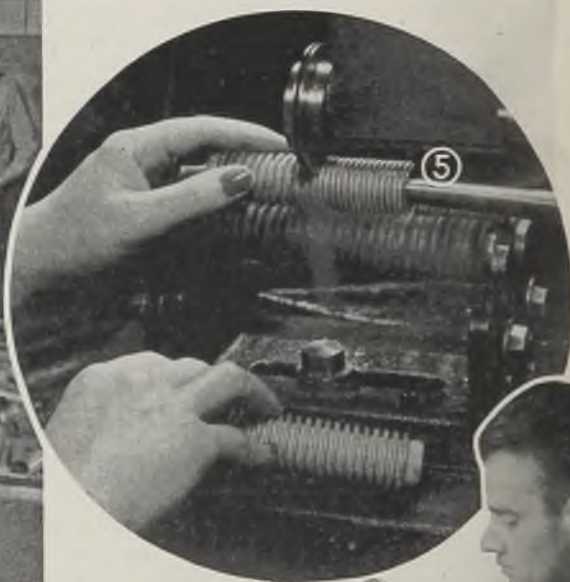
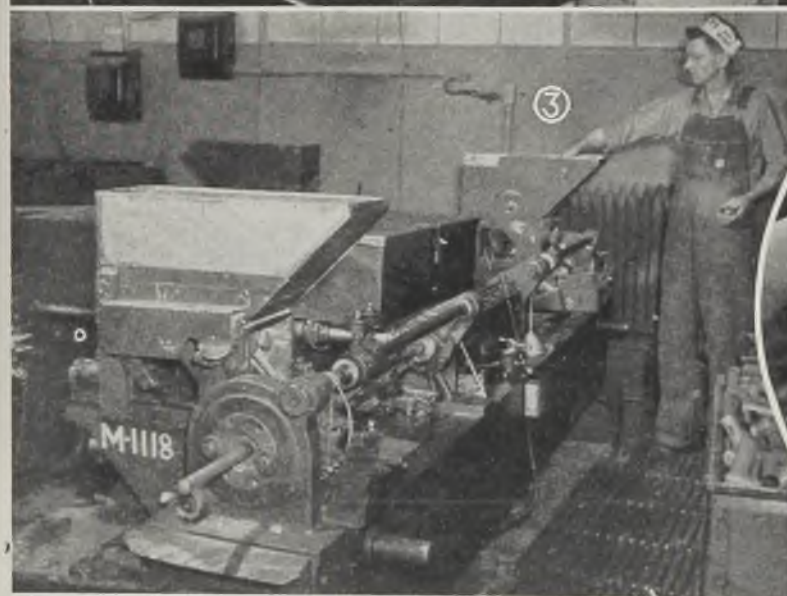




Metal

FORTY DIFFERENT minerals are found within a 100-mile radius of Knoxville, key city of East Tennessee. Most important of these are zinc, copper, aluminum, iron, dolomite, limestone, manganese, bauxite, silica, barite, pyrites, kaolin, feldspar, mica, corundum and emery. This area produces 45 million tons of low-sulphur high B.t.u. soft coal to sell at the lowest price of any American industrial city. Power is cheap and abundant in this administrative center of the TVA hydro-electric development.

Among Knoxville's 160 manufacturing plants, largest metalworking enterprise is the Fulton Sylphon Co., originator of the Sylphon Bellows (1904), now flaunting three stars from its Army-Navy "E" pennant. Air conditioning, automotive, aviation, medical, petroleum, railway, refrigeration, scientific and miscellaneous



Bellows ... involve unusual metalworking operations in their manufacture

applications of the bellows as the expansion member or packless feature among thousands of products.

These employ the bellows as a diaphragm for converting pressure effects into controlled movement or for making flexible sealed connections to moving parts. Its wide industrial utility includes adaptations in shutter thermostats; vent valves; gasoline pumps; water valves for gas-fired humidifiers; packless construction for atomizers; electron diffraction camera seal adjustments; cable joint oil reserves; tie rod seals; liquid compass construction; octane control valves; manometers for measurement of blood flow; process control regulators; shaft seal for fluid drives; radiator and expansion valves; pressure and float switches; oil, gas, hazardous liquid, temperature controls of many types.

Fundamental application of the bellows principle in controlling the expansion and contraction of movement is as a thermostatic motor, pressure motor, expansion chamber, motion transmission, shaft seal, expansion joint, flexible joint or in packless construction.

This bellows is essentially a one-piece member capable of dependable expansion and contraction to convert pressure effects into accurately controlled motion. The forming of the deeply folded or corrugated sidewalls required involve some unique and unusual metalworking operations about which little has previously been written.

There is a very extensive variety of such bellows, some as small as 1/4-inch outside diameter, while the largest produced is 68-inches outside diameter. These bellows vary in type, sizes and characteristics as well as number of active corrugations. They are produced in

varied plies in brass, phosphor bronze, Everdur, monel and steel. In bellows assembly, many combinations of end trimmings and head types are possible.

The Fulton Sylphon bellows is a one-piece flexible metal container used to confine liquid or gas, utilizing the forces created when heated, cooled or under pressure to produce useful work. The outer wall of the bellows is formed into deep corrugations, having the general appearance of accordion fold. The thickness of the tube wall is on the order of 0.005-inch but the range of available thicknesses can be extended by use of multi-ply formations.

Some bellows are roll-formed and others are formed hydraulically. Certain special fabrications are a combination of these two. Up to actual forming of corrugations from drawn tubes, operations in either method are the same. Originators of the forming process and with 40 years of development behind it, the Fulton Sylphon Co. has designed practically all the forming machinery. Special units include horizontal hydraulically operated presses for tube drawing; hydraulic forming machines; special trimming devices; vertical stamping machines with expanding dies used as a first step in roll-forming; electric welding machines to join sheets to form large size tubes; many special jigs, fixtures and attachments to produce, test, assemble—such as charging equipment racks to test regulators as near to operating conditions as possible, scale fixtures to determine bellows stroke and pressure.

The company maintains an engineer-

ing staff of 40 technicians with fully equipped physical, chemical and metallurgical laboratories. It has an unusually large machine shop. Engineers, tool designers, master mechanics are constantly improving processing methods and many notable developments have resulted.

Bellows material is received in strips or coils of specified physical characteristics. No attempt will be made to present a technical treatise on bellows characteristics, metal stress analysis or other detailed engineering information bearing on fabrication, because such data would be confusing—there being such a variety of applications.

Because of this great variety, bellows are not stocked but are manufactured as ordered and to customer specifications, the choice of the forming process being determined by the requirements of purpose and usage. Items to be considered are outside diameter and inside diameter, maximum number active corrugations, approximate length per active corrugation, effective area or linear volume, spring rate per active corrugation (in pounds per inch of length), stroke per active corrugation (in inches per pound per square inch pressure change), maximum pressure (in pounds per square inch).

The general process flow follows: Strips or coils of material are placed on an automatic attachment which feeds it into the stamping presses, eliminating all hand feeding. Here circular disks of the metal are blanked out and a further movement of the dies forms the piece

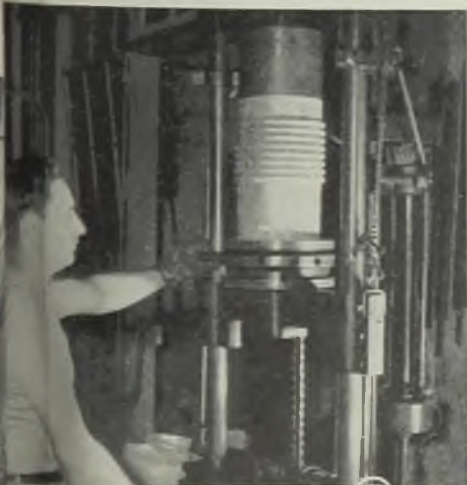


Fig. 1—Stages in production of a metal bellows, starting from flat blank, extreme left, to drawn tube, then corrugated as at extreme right

Fig. 2—Disk is blanked and cup formed in one set of dies at one stroke of press. Most presses are equipped with automatic feed mechanisms. Cup now goes to another press which draws cup deeper and walls thinner

Fig. 3—Special double-ended deep-drawing machine is hydraulically powered, produces drawn tube upon each reversal of ram movement. Tubes fed automatically at both ends from hoppers. Unit operates continuously

Fig. 4—Bellows corrugations started Fig. 7 and finished here by rolling between interleaving roller disks which "float" on drive shaft to allow endwise movement as bellows is closed by forming action

Fig. 5—Roll-forming machine works corrugations to contour and spacing wanted. Bellows here is having corrugations narrowed and spaced closer together

Fig. 6—Unique unit combines hydraulic pressure inside blank to force walls out against "floating" corrugating dies, at same time hydraulic pistons at each end operate to close up corrugations so formed

Fig. 7—This unusual machine has expanding dies in the upper portion over which the large tube is placed. Upon operation, dies travel outwardly to form corrugations as required

into a deep cup, both operations being done on the same machine in rapid succession. Fig. 2 shows one of these first blanking and forming setups making small "cups".

The cup then goes into other draw presses where it is successively drawn deeper and deeper, decreasing the diameter and establishing the wall thickness required.

The unusual advantages of hydraulic forming in the elimination of many operations in the drawing sequence along with the high precision in cold-forming have caused Fulton Sylphon to adapt the method to drawing tubes as well as forming bellows. Special horizontal hydraulic machines perform drawing operations with an economy of stroke motion, the double-ended unit in Fig. 3 producing a drawn part at each movement of the ram, in either direction. An automatic hopper feed device at each end facilitates continuous operation since attendant need only keep hoppers full, entire operation being automatic under sequence control.

Inserted in this series of drawing operations are a number of annealing operations done in a battery of pit-type electric annealing furnaces. Some of

Fig. 10—One of most important checking operations is "weighing". The bellows must compress a specified distance with a given applied force and must spring back to normal length upon release

this treatment is accomplished in continuous electric furnace equipped with a protective atmosphere to produce a particularly good bright anneal. Partially combusted city gas is processed in a condensation chamber and charcoal strainer to remove sulphur and the dry gas. Introduced into the wash chamber of the electric furnace, this atmosphere prevents oxidation of the metal at high temperatures.

Properly trimmed to correct length, the drawn tube is ready for forming into a bellows by either the hydraulic or the roll method. Most bellows under 4½ inches outside diameter are hydraulically formed, larger units are roll formed from tubular stock. Above 8 inches outside diameter, bellows are formed from tubes made by electrically welding strips. The two methods will be described separately.

The hydraulic forming method employs unique forming machines of Fulton design. One is shown in Fig. 6. Two half-dies, carrying the full corrugated pattern, clamp around the tube in a horizontal position, the work being fed in laterally to rest on indexed position. These are not solid dies but consist of a multiplicity of die sections, one per corrugation, strung on rods and mounted with backing plates to take the pressure. The mounting is such that these die sections can move lengthwise the tube as the corrugations are closed together by the action of the machine. Hydraulic pressure is applied within the tube, forcing the tube wall outwardly into the die



pattern. Simultaneously, the machine applies mechanical pressure longitudinally to each end of the bellows being formed, so that there is an inward folding and an outward forming operation accomplished in one stroke and in one operation by the combination of hydraulic and mechanical pressures. Close examination of Fig. 6 will show the sectionalized dies and the method of "floating" the sections so they can move endwise as the bellows is formed.

The inside diameter of the hydraulically formed bellows is substantially the same as that of the tube from which it is made. Consequently the cold-work is imparted chiefly to the outer bends of the corrugations. Where closer spaced corrugations are desired, Fig. 5 shows one method of working the corrugations down to a smaller outer radius and increasing the number per inch of bellows length.

Hydraulic forming permits a wide range of header design, if it is desirable that the head be formed integral with the bellows proper. Usually tubes closed at one end by an integral head are used in hydraulic forming. Otherwise a tight strong head must first be welded, brazed or soldered to close one end. The integral head, of course, eliminates the soldering operation required when bellows are built up from sheets or tubes.

In roll-forming (above 4½ inches outside diameter and below 8 inches) the tube is blanked and drawn from flat stock both ends of the tube are left open. Process steps consist in forming a number of broad corrugations in the tube wall and successively deepening and narrowing these in a suitable series of operations. The diameter of the tube used in making rolled bellows is less than the outside and greater than the inside diameter of the finished bellows. Cold-work is thereby imparted to both inner and outer bends with the result that this type of bellows has good elastic characteristics. Bellows from 11/16-inch outside diameter and larger are possible by roll-forming.

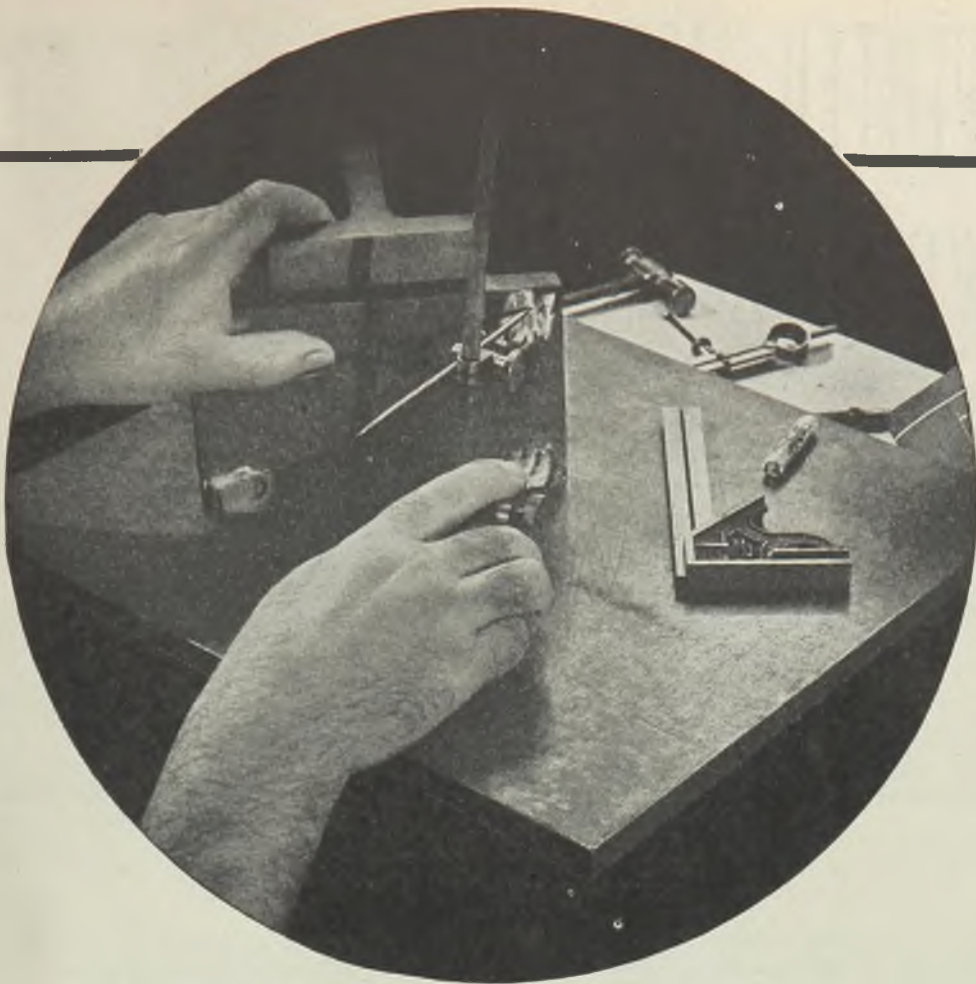
The initial broad corrugation in the
(Please turn to Page 160)



Fig. 8—Part of production testing. Valve assemblies are being checked to be sure they operate properly within the temperature ranges specified

Fig. 9—Rotating table with multiple fixtures greatly increases output of torch soldering bellows assemblies. Girl loads, unloads fixtures while man solders





RE-EXAMINE your tooling now for cost reduction

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The urgent need for speed in wartime tooling has compelled many toolrooms to accept compromises in materials and methods. As a result, short tool life, hardening difficulties, and too frequent regrinds have affected costs and tool performance.

With the initial tooling-up job well in hand in many plants, now is a good time to smooth out some of these wartime tooling problems and look for ways of reducing costs and improving performance.

Check over the specific requirements of each job. See which of the following properties are needed to provide longer tool life — higher output with fewer regrinds — lower tool cost:

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- More toughness
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- Greater hardening safety
- Greater red-hardness
- Greater accuracy and hardening

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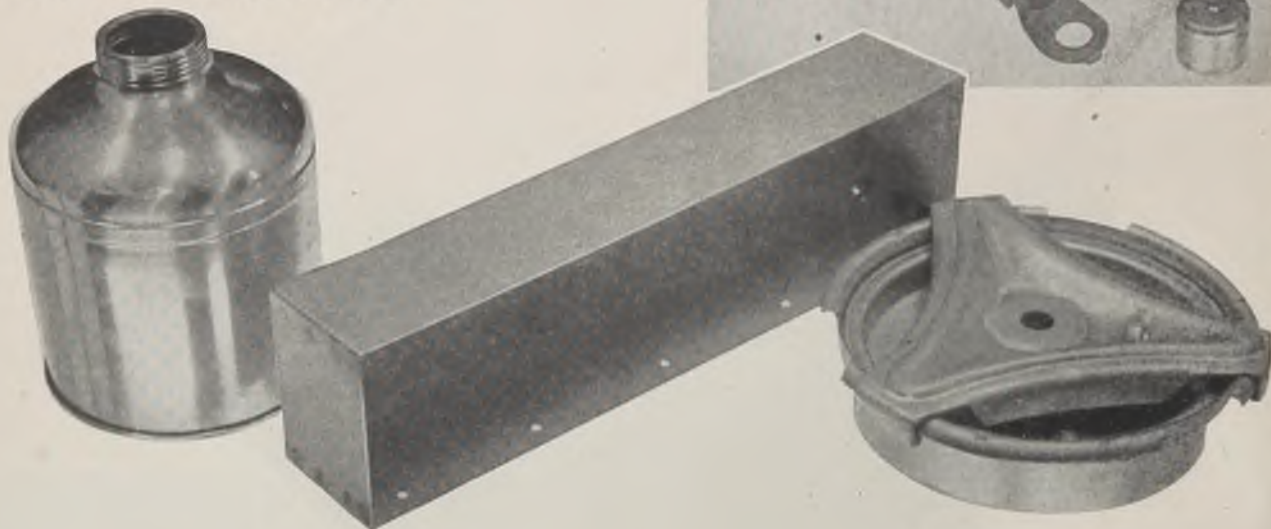
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TOOL STEELS



PRE-PLATED METALS IN WARTIME



DURING the past 40 years pre-plated metal has enabled one industry after another to reduce its finishing costs as sheet steel, zinc, or brass, electro-coated with nickel, and then with chromium, have been used to take the place of piece plating for decorative or utilitarian applications. The progress shown in electro-deposition of metal on metal, particularly since 1930, and the refinements in tool making and welding practice since that time have been responsible for the spectacular use of these materials, up to the outbreak of World War II.

Today, in a war economy, the term "pre-plated metal" denotes sheet or strip steel plated with either brass, zinc, copper or nickel—zinc predominating. The purpose of zinc plating is to conserve the supply of scarce metals by applying a relatively thin, but effectual coating of critical metal on steel, which is thus enabled to serve a variety of new purposes by virtue of the enhanced value resulting from the carefully regulated plating.

One outstanding purpose of pre-plated metal is to save numerous handlings of separate parts in finishing procedures after the item has been stamped or formed. Pre-plated metal according to H. O. Schuessler, vice president and general manager, Apollo Metal Works, Chicago, can be stamped, reasonably drawn or formed without reducing the efficiency of the plate which is applied to the flat sheet or strip. Hence, manufacturers faced with a shortage of workers have interested themselves in the qualities of pre-plated metal, by means of which time and personnel used in finishing operations

(Top right)—Typical wartime uses of pre-plated metals are these various items for electronic devices, including condenser cans, tube shields, terminals, tubing caps and the like

(Above)—Left, two-piece oil can drawn from copper-coated strip in rolls. Rectangular radio crystal box was made from copper-coated sheet, blanked, formed and spot welded. Three-piece powder can top was drawn from zinc-coated steel

have been diverted to other work. There are instances where entire departments engaged in piece finishing have been released for other work when pre-plated metal is used.

In the process of finding substitutes for critical materials, piece plating of stamped parts was early investigated with excellent results. Certain limitations to the use of piece plating, such as the difficulties of depositing a uniform plate in the recessed areas of involved stampings, or of maintaining a specified thickness plate over all areas of a given part on millions of separately piece plated units, have been surmounted largely by the use of precision electro-zinc-plated steel. Now it is possible to accurately control the thickness of the zinc plate on sheet and strip steel so parts will pass all plating thickness tests.

Shortly after the outbreak of the war, pre-plated metal suddenly found itself a major war industry, WPB sought to develop substitutes for stainless steel, aluminum, brass, copper, and tin through the facilities and services offered by manufacturers of electro-coated metal in sheet and strip, according to L. B. Doll,

superintendent, Superior Metal Co., Bethlehem, Pa.

A new and effective use for electro-zinc-plated sheet metal was developed by the aircraft manufacturing industry working with precision electro-coated sheet steel within a few weeks following Pearl Harbor. The shortage of aluminum and stainless were responsible for the discovery that electro zinc steel, when converted into military plane engine cowling, firewalls, nacelle housings, shell extraction chutes, ammunition boxes, hose clamps, and flexible conduits, performed the same functions as offered by the metals originally used.

Precision electro-zinc-plated steel can be produced not only to withstand any required amount of salt spray resistance testing, but the degree of rust resistance found on the plated surfaces is also carried over to the cut, unplated edges. Evidences of the control exercised in the mass production of these sheets is found in the close tolerances of zinc thicknesses needed for satisfactory welding as well as for rust resistance. Thus, as compared with hot dipped sheets, manufacturers in the De-

(Please turn to Page 162)

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Radiographic Inspection of Metals

Ability to define swiftly and accurately the outline of casting cavities or inhomogeneous structure in rolled steel is invaluable aid to producers and fabricators. Selection of right film is extremely important

By ROBERT TAYLOR*

IN the two decades following World War I, X-ray inspection was used to detect defects and prevent failures. At Boulder Dam, and later at Grand Coulee Dam, the welds in penstocks were X-ray inspected. These penstocks welded at each section were 30 feet in diameter and in each case as much as 270,000 feet of film were utilized.

At the present time, X-ray inspection is being carried out on all vertical and circumferential welds in the 10-story stacks at the numerous synthetic rubber plants being constructed in various localities. These stacks are 10 stories high and 41 feet in diameter. Placement of the X-ray machine controls to cover such a large area of inspection requires considerable

engineering knowledge. In one instance, the machine is mounted one-half the height of the stack and 60-foot cables enable placing of the X-ray tube at the desired location for all welds. The work has to be done with accuracy and speed, as inspection is carried out right behind the welders.

X-ray inspection of welds and castings used in the construction of ships, tanks and pressure vessels today is being carried on extensively in conformance with

*This is the first of two articles by Robert Taylor, consultant in industrial radiology, Spokane, Wash., on radiographic inspection techniques. This account of high-powered X-ray developments will be followed by a discussion of inspection methods employing radium.

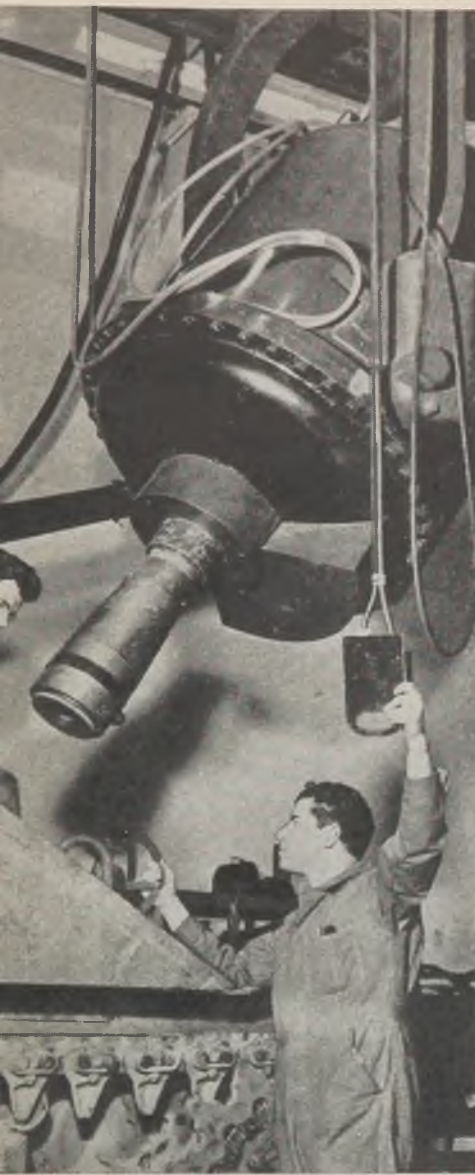
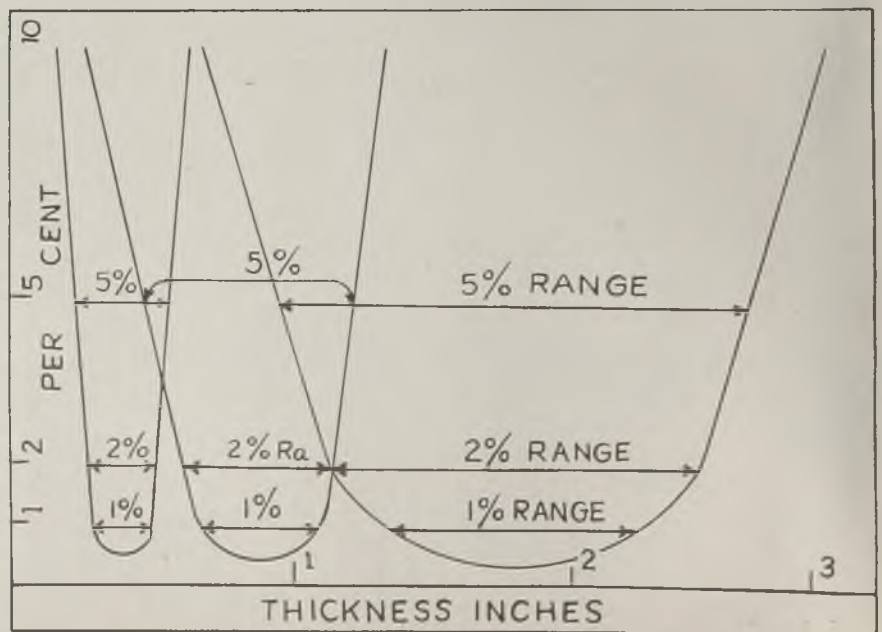
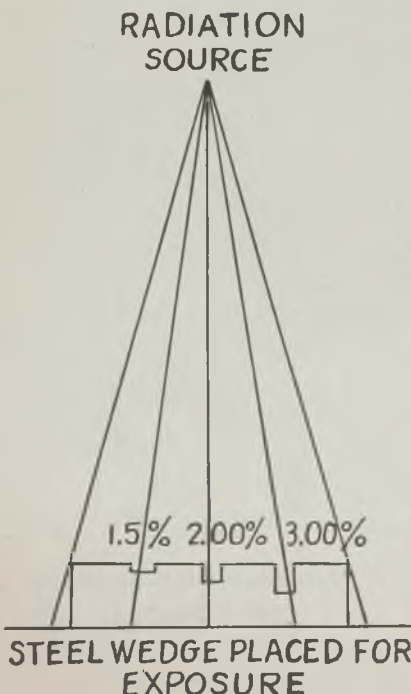
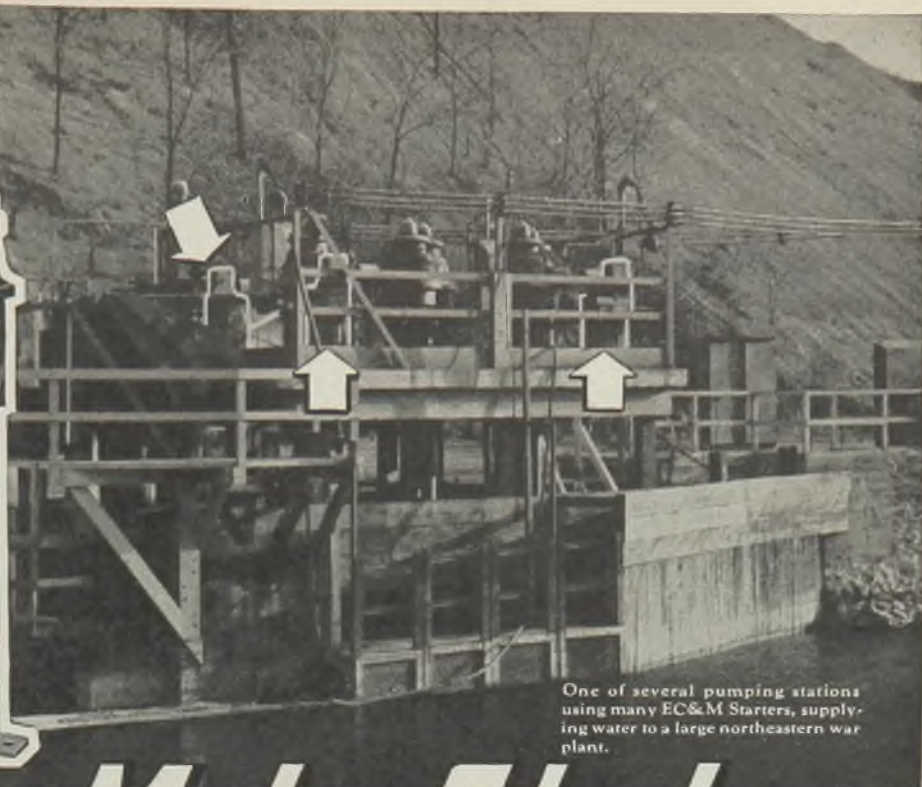


Fig. 1 (Top left)—Million-volt industrial X-ray unit ready to inspect sections of an M-4 tank manufactured by Ford Motor Co. This instrument can "see" through 8-inch steel plate and inspect in 16 minutes pieces of metal that previously required 60 hours

Fig. 2 (Bottom left)—Exposing slotted wedge for determination of density. Schematic diagram of method to find ratio, in per cent, of thickness of thinnest cavity to thickness of metal penetrated. Exposures for each thickness may be used as basis for charting standard set of densities

Fig. 3 (Below)—Chart illustrates range of sensitivities and efficiency of various degrees in achieving thoroughness and economy





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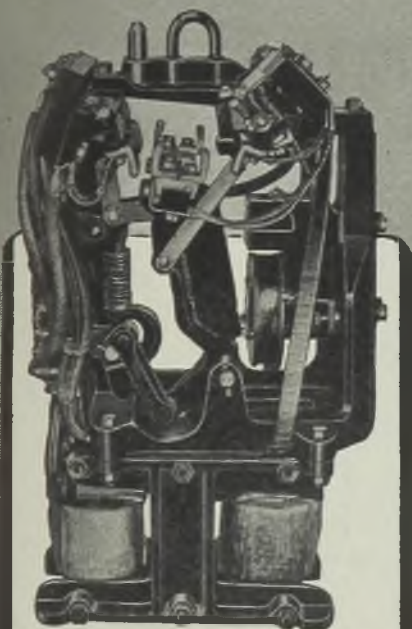


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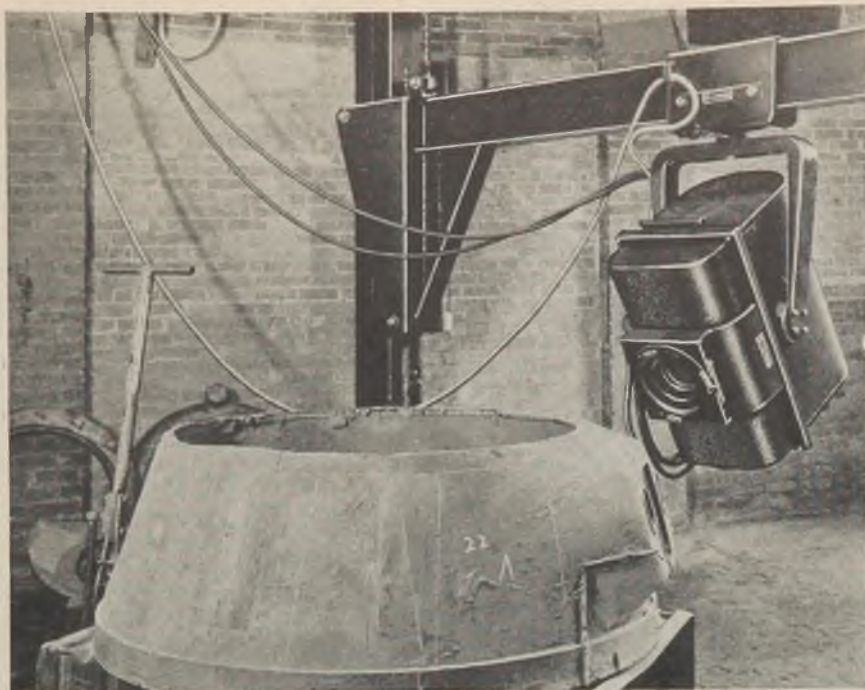


Fig. 4—A 250-kilovolt machine positioned for X-ray inspection of tank turret. Tube is angulated to cover the area of inspection and moves on a jib-crane. Photo courtesy of Picker X-Ray Corp.

existing specifications of the various government agencies. Radiographic inspection varies from the checking of initial products in perfecting production techniques to the routine inspection of each finished part. Frequently it enables the designer to specify one method of production instead of another, or to modify the design, making the product simpler, lighter or easier to produce, depending in this way on the positive inspection of radiography instead of upon a high arbitrary factor of safety.

In foundry practice, for example, the designer and foundryman utilize X-ray inspection together in determining both the best design for the casting and the best way of producing it. Pilot castings are radiographed, melting temperature of the pour, location of gates and risers, ramming, shrinkage and many other factors affecting quality are studied. The design itself or the casting procedure may be changed as a result of this nondestructive test, wherein a better casting is produced with a saving of time, critical material and expense.

Checking Occasional Castings

Routine inspection of the finished product, especially where service failures would seriously involve property damage or loss of life, is common practice. Radiographic inspection of occasional castings also helps the foundry to maintain quality by detecting discontinuities. When their nature and location have been established, these defects may be chipped out and the casting repaired by welding, once again saving time, material and expense. Castings not authorized for repair can be scrapped prior to expensive machining.

Increasing use of castings is accounted for in part by the availability of this non-destructive test. Steel castings are radiographed to determine their soundness and are, in many instances, replacing other forms of steel.

An extremely important part has been played by X-ray inspection in the increasing fabrication of metals by welding. By establishing proof of the soundness of welds, it has made possible the use of welded parts and assemblies unheard of 10 years ago. Another important feature of radiography is its adaptability as an educational tool to check new welders, especially at this time when so many new persons must be trained rapidly for this work. Frequent radiographs of a new welder's work will give indication of his progress, whereas frequent X-ray inspection of the work of production welders provides added incentive to the more experienced.

Reduces Number of Rejections

Inspection of steel tubing by the X-ray method has resulted in noteworthy improvement in quality. In all rolling processes, defects are likely to occur well below the surface. A particular manufacturer found that hidden defects in tubing showed up only after expensive machining had been accomplished. The adoption of radiographic inspection made possible frequent checks until a sample free of voids has been processed. The result is a saving in machining cost and a considerable reduction in percentage of material rejected by purchasers.

In the establishment of an X-ray inspection department there are two factors for prime consideration—first, selection of equipment suitable to the type of inspection intended and that most convenient to use; second, selection of the kind of radiographic film which meets the demand for the type of material being inspected. In the latter, the atomic number and thickness of specimens to be encountered in the examination must be given serious consideration.

In steelmaking, when thickness to be inspected does not exceed $3\frac{1}{2}$ inches, a machine of 250 kilovolts capacity, like

that shown in Fig. 4, is suitable. Excellent radiographic results may be obtained, provided attention is given to the type of film exposed and to accessory apparatus for the elimination of scattered radiation. These factors must be considered seriously in order to provide satisfactory contrast and definition.

Scattering of X-rays has a detrimental effect on film quality, which may go to such an extreme that even a large cavity will remain undetected on the film. The ability to visualize an inhomogeneous area within a specimen is measured by the most minute difference in thickness that can be recognized radiographically and the effect of scattering of rays is to appreciably dull the instrument's sensitivity. Cases have been reported where the intensity of scattered rays was five times that of the direct primary beam after passing through a specimen. It is at times difficult to recognize this condition as its presence is not always obvious from inspection of the radiograph.

Various differences in densities from one area to another are marked by contrast in the radiograph. Within reasonable limits, the greater the contrast the more definitely the various details stand out. Definition is defined radiographically as the degree of sharpness with which radiographic detail is recorded.

Both contrast and definition determine the sensitivity of the radiograph. A radiographic technique is considered to be adequate if the penetrometer is sharply defined, in which case a 2 per cent sensitivity or difference in specimen thickness has been recorded. Two per cent seems

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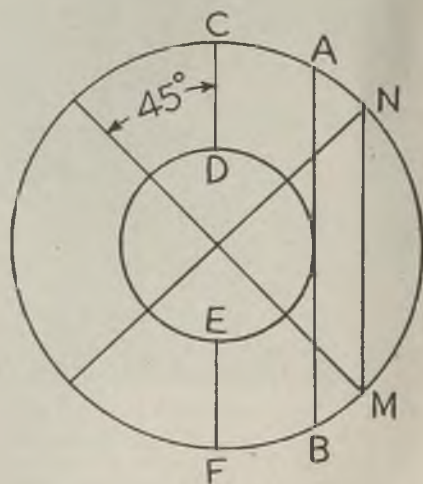


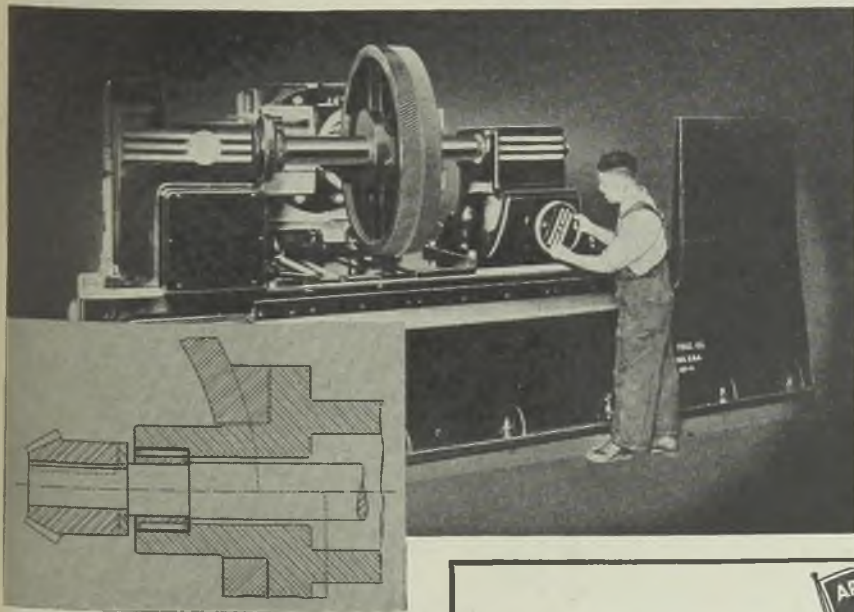
Fig. 5—Diagram shows procedure for making two exposures of a tube. Required thickness range extends through AB, NM to the smaller of the two thicknesses CD and EF

IN THE NEWS

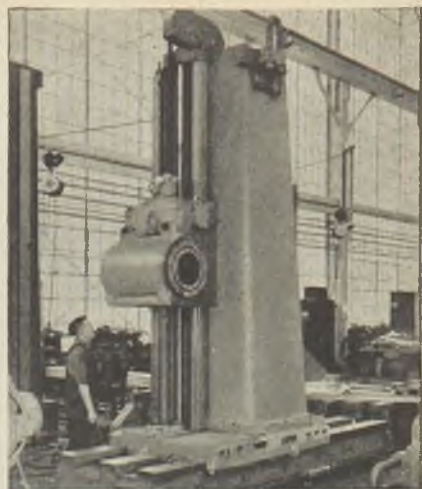
WITH TORRINGTON BEARINGS



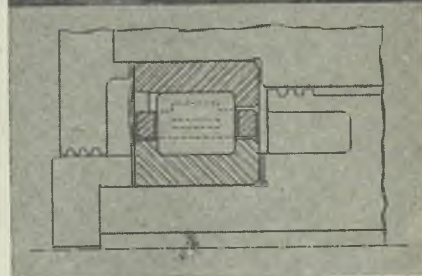
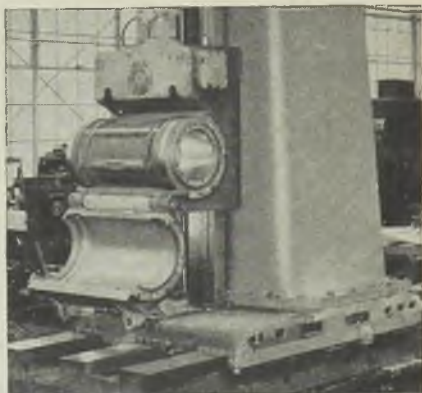
TANK BUSTERS must pack the power not only in armament but for locomotion as well. The M-12 shown here which mounts a 155 MM. field gun and designed to have all the speed and mobility of a tank, was among the first of our Army's fleet of tank destroyers. In the compact, efficient power plants of these modern weapons are small, heavy duty Torrington Needle Bearings—used to carry and transmit the heavy loads under the toughest imaginable service conditions. For applications such as automotive transmissions, universals and differentials, the high unit capacity, small size and efficient lubrication of Needle Bearings make them ideal for all radial load applications.



GEARS FOR TURBINES up to 4 feet in diameter and 20-inch face width are processed on this Michigan Tool Company's gear finishing machine. Several key points in the infed mechanism are mounted on Torrington Needle Bearings to insure smooth, frictionless operation. Typical is the application of a Torrington Type DC Needle Bearing (with hardened inner race) on the hand operated infed shaft shown in the cross-section.



SUPPORT FOR A 24-FOOT BORING BAR is the job of this large end support bearing for a floor type horizontal boring, drilling and milling machine photographed in the shops of Giddings & Lewis Machine Tool Company. Supporting this huge shaft in the housing shown open in the close-up photo (below) are two special 18-inch O. D. radial roller bearings supplied by Torrington's Bantam Bearings Division. These bearings illustrated in the cross-section illustrate the type of service Torrington is equipped to render in the design and manufacture of special bearings to meet the unusual and out-of-the-ordinary bearing requirements. Why not **TURN TO TORRINGTON** for specialized assistance on your next bearing problem?



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388-PUNCH

PIERCING

DIE

... pierces 976 holes in ten different parts with an accuracy of 5/10,000ths of an inch at speed 30 times that of former methods

BELIEVED to contain a greater number of closely co-ordinated punches than any other piercing die ever constructed for aircraft work, the recently developed catwalk piercing die at the Boeing Aircraft Co. incorporates 388 punches with a hole location accuracy of 5/10,000ths of an inch. This unique die pierces a total of 976 riveting holes in the ten separate parts which, when assembled, comprise the walkway through the bomb bay of the Boeing Flying Fortress. Production time insofar as the making of riveting holes is concerned, is improved 34.01 times over the old method by the utilizing of the press piercing methods. Because of the extremely close co-ordination of riveting holes, more rapid assembly is made possible, further increasing the overall usefulness of the die.

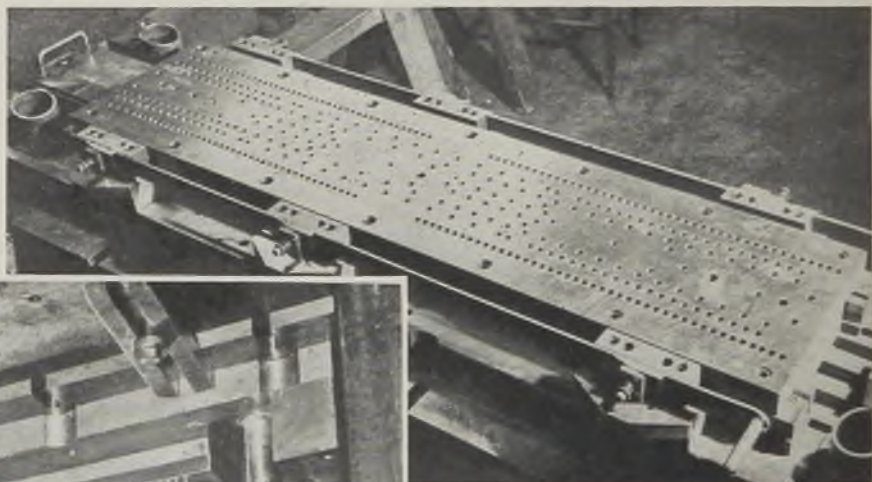
More important than the number of punches, however, is the diversity of this die, on which two differently shaped and sized sheet stock parts are punched, two each of two different angle sections, and four extruded T-sections. Thicknesses vary from 0.064 to 0.150-inch, all materials being 24S-T.

Flexibility in the use of the tool was made possible by a plan whereby stripper plates can be changed with comparative ease and little time. Aside from this, the only changes made in the die during the five different press operations required to turn out the ten parts are found in adjustments to the stock pushers, and in the indexing points for the various types of material.

A redesign of the catwalk through the bomb bay of the Boeing Flying Fortress made possible the design of the porcupine, and the use of high production methods. The new design includes a primary web, or flooring, a secondary web, 0.064 dural and 0.125 alclad respectively. The primary web receives the maximum 388 holes, while the secondary web gets 218. The two reinforcement angles, both on upper and lower sides of the walkway are pierced with 51 holes each on the same stripper plate. The thickness of these parts is 0.150.

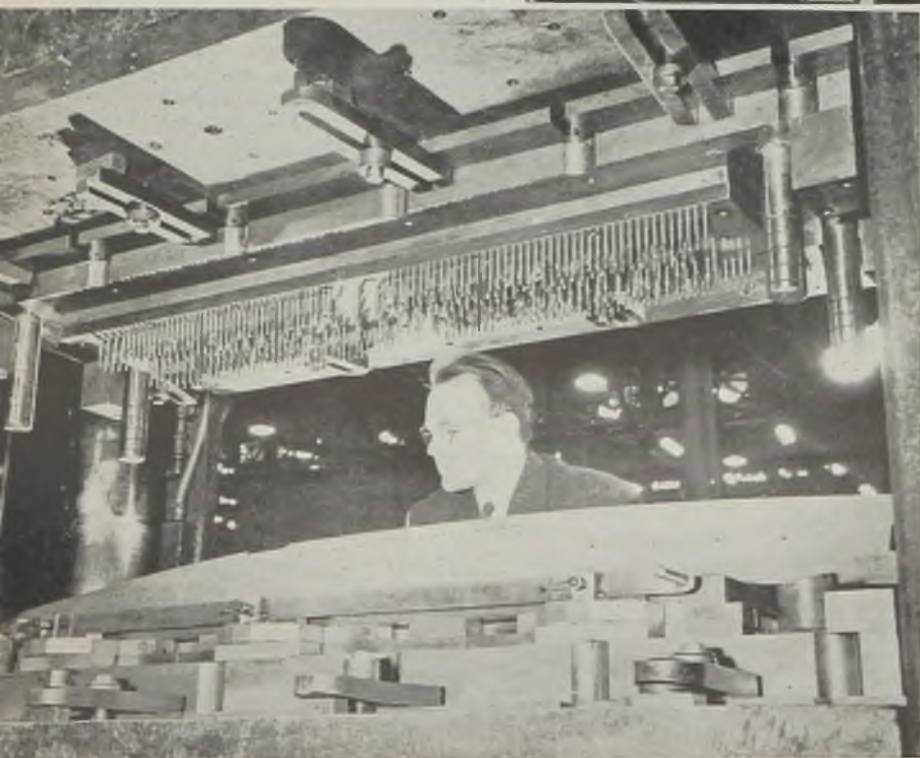
The second stripper plate is used to facilitate leading the four T-sections in the die. The forward extruded T-section receives 40 holes each, while the after two sections get 43. At the point of piercing, these sections are 0.125-inch.

Absolute co-ordination of holes in all parts, both horizontally and symmetrically was necessitated to make for ease and rapidity of assembly. Symmetrical co-ordination was of particular importance in that the walkway called for an upper and lower angle reinforcement on each side of the assembly. By piercing



(Left)—The 388 "quills" of this Boeing "porcupine" help turn out bomb bay parts for Flying Fortresses 30 times faster than former methods. This die is said to contain more closely co-ordinated punches than any other die previously used in aircraft work

(Above) — One of the stripper plates used with the 388-punch die gives a graphic picture of the intricate hole pattern produced in making bomb bay walkway parts. Guide pins are located on punch to facilitate sharpening the die



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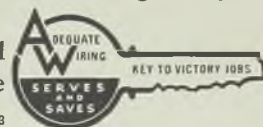
It's an exciting postwar picture any way you figure it. Expanded use of electricity is one of the brightest fields to count on for jobs for our returning service men.

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trical industry, and in every other industry.

But one thing is self-evident. Wiring will have to come first. Adequate wiring will be essential to full utilization of the electrical possibilities of the future. Now—in advance—is the time to plan for it. By all means, give it full weight in your postwar thinking.

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To give enemy machine gun nests, pill boxes or other installations a "treatment," an infantry crew sets up the mortar and calculates the range. Then a high explosive shell equipped with tail fins is dropped fins first into the mortar's muzzle. A firing pin on the tail assembly sets off a charge that sends it back out at terrific

speed—and when it reaches its objective, well, that objective ceases to exist anymore.

The casing, or death-dealing part of these "knockout drops" is a Steel Forging. Making such forgings in the 81 millimeter size is a war job that has recently been handed to us. We are proud indeed to have been awarded this latest assignment to help bring Victory closer... and to it we are devoting the same skill and ability that we have given to the production of thousands of shell forgings for the Army and Navy.

Completed contracts on some of our war assignments give us capacity to handle additional jobs—both Steel Forgings and WELDED STEEL TUBING. Our research facilities and production experience are available to help you solve present problems or to work with you in the development of postwar plans. Write, wire or telephone us for information. You will be under no obligation.

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the upper right side angle on the lower left, and the upper left angle on the lower right side of the die, an extra stripper plate was avoided.

Stock pushers incorporated in the die design include four different adjustment operations, one for each different press operation. This type of adjustment aids substantially in making the die sufficiently flexible to handle the variety of parts. The operation and setting of the stock pushers is thoroughly explained to the press operator through a production illustration dealing with the operation of the die, and turned over to the manufacturing shop simultaneously with the die.

The close co-ordination of holes called for a high degree of accuracy in die design as well as fabrication. The original design was projected in true perspective scale by production illustration, whereby mistakes in design and other flaws were caught on paper rather than in metal. Construction accuracy was maintained by drilling all critical tooling and punch location holes on a jig borer.

To facilitate ease of maintenance, the punches were mounted in two punch retainer plates. This simplifies the job of grinding the punches as well as replacement, which to date has been extremely low. Similarly, the guide pins were located on the punch rather than the die, to make possible the precision grinding of the die plate without necessitating the removal of the guide pins.

Another problem involved in the die design was the wide variety of gages specified by the redesign of the walkway. To provide the proper punch clearance to minimize the possibility of flaring while punching and at the same time still produce a clean stripping action, the diameter clearance between the punch and the die was compromised, leaning slightly in favor of the heavier gages.

That the final result was a satisfactory compromise is evidenced by the fact that cross sectional photos of rivets driven through the series of holes show no unfilled sections, and that no punches have been broken because of improper stripping. Stripping action is aided by maintaining the punch diameter slightly larger than the shank.

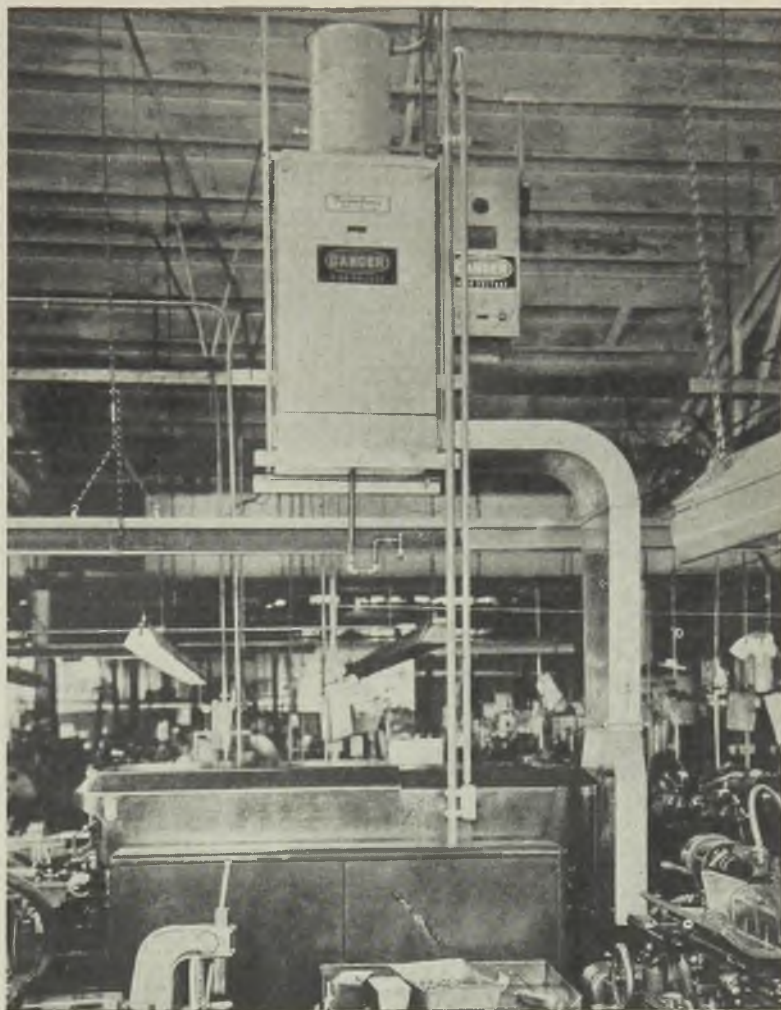
Because the presses in the Boeing plant of sufficient size to accommodate this large pierce die are of the solid bed variety, five slug relief channels had to be provided under the die. This fact further complicated the problem of providing a sufficient amount of material in the die plate between the outer and secondary row of holes, on either side, and still provide the proper clearance for the installation of the angle stock, which was to be pierced by the secondary row of punches. Working to close tolerances and proper pre-positioning of stock, precision workmanship fulfilled the design at these critical points, where 0.167-inch holes are 0.5-inch apart, on centerline, leaving a relatively small amount of material in the die "rail" section. From the outer extremities of the rail to the cutout for holding angle

stock there is but 0.67-inch of material. From this extremity to the edge of the die hole, the material is 0.316-inch, while from the angle cutout to the opposite edge of the hole, the thickness is 0.186.

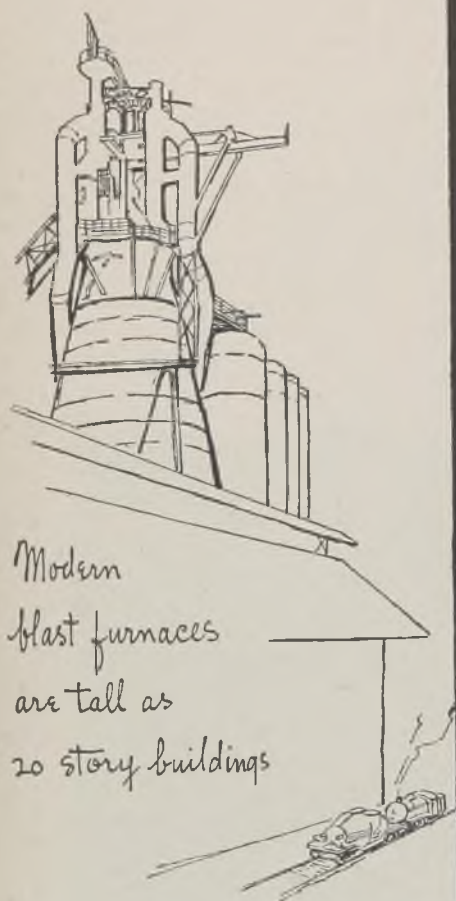
Indexing of the different parts is accomplished by a variety of methods. The secondary web and the reinforcement angles are controlled by the shuttle stock ejector. This makes a positive method of indexing, as well as a rapid means of ejecting parts from the die. The T-sections are indexed against a stock top block installed during the changing of the stripper plate which is used for this piercing operation. The primary web is located in the die by an indexing hole. The reason for not indexing this part on the cutout is that this removal of stock is accomplished on a

router, which does not make a sufficiently accurate cut for indexing purposes.

It is interesting to note that no master gage or template was used in making the die. The base of all hole location is a dimensional layout on which each hole is accurately located in respect to X and Y axes. A portion of the die design, this layout makes possible the reproduction of any part of the die, by drilling all holes on a jig borer, properly positioned in respect to the X and Y axes. Thus costly master tools were eliminated. The inspection of production parts was also simplified by the die. The aircraft inspector checks the die when it is set in a press to make certain it has not been damaged, and that the die bears the stamp of a Boeing tool inspector, signifying that the punches are sharp and properly positioned.



OIL CATCHER: The Precipitron, electronic dust precipitator built by Westinghouse Electric & Mfg. Co., is being used effectively to remove oil mist from the atmosphere around high-speed grinding machines. Spinning grinders heat and thrash cooling oils into a cloud. Without some method of removing it, the vaporized coolant condenses on walls and pipes, causes premature electrical insulation failures, makes working environment unpleasant and creates a fire hazard. Removal of the oil mist at its source not only eliminates these objections but also recovers the lubricant for reuse, making it feasible for a plant to buy more expensive coolants



Modern
blast furnaces
are tall as
20 story buildings



MOUNTAINS SMELTED TO GET IRON FOR STEEL

Mountains of iron ore, coke and limestone are charged every year into America's blast furnaces. The ore is smelted into iron by volcanic fires fanned by tornadic blasts of millions of tons of super-heated air. The molten iron streams out of the towering stacks day and night, week in and week out, to be converted into steel — in 1943, for war,

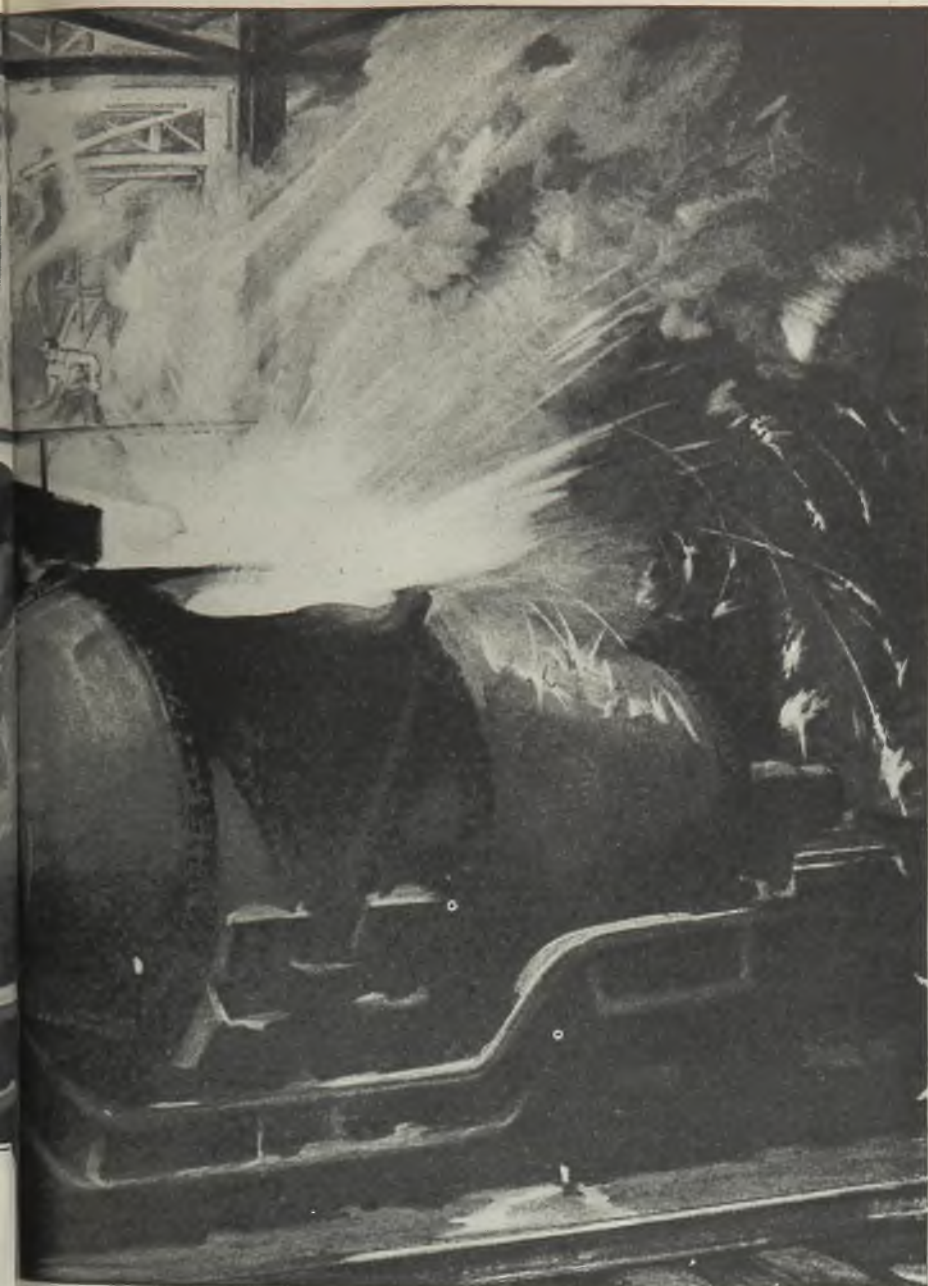
the greatest tonnage of steel ever produced in this country. Blast furnace men, steel men and metallurgists, through long experience and continuous research, are building into iron that better quality essential to production of the new steels now hastening victory — the versatile steels that will serve peacetime needs as soon as the war is won.

JONES & LAUGHLIN STEEL CORPORATION

PITTSBURGH

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PHOTO—JONES & LAUGHLIN STEEL CORPORATION

FROM AN ORIGINAL DRAWING AND SKETCHES BY ORISON MACPHERSON

FLOWING IRON

Flare of conflagration, showering sparks, a blinding white, flowing stream of iron are background for the technicolor action in the cast house of a blast furnace when the iron "notch" is tapped and the metal runs out.

Like wisps of fog, soft blue haze arises from the gutters while molten iron flows inside their sand-made banks, gurgling and sparking as it hurries to ladles waiting on railroad tracks below. Seen dimly through the hot haze and silhouetted against the glow, the "keeper" of the furnace and his skilled crew go about appointed tasks in perfect teamwork. Some at the "skimmer" which separates slag from iron, some to open other runners to other ladles, or to break up floating islands of slag.

Flowing iron spurts and splatters molten drops when the cast comes to an end. The air blast throbs and pulsates. The furnace breathes heavily like a winded monster. The escape valve, released by the blower, roars thunderously. Quickly the mud gun is swung into position to plug the "notch" with clay, and the iron is on its way to the open hearths and Bessemer, to become steel, spearhead of invasion, measure of freedom.

The gorging big stacks, during long hours between casts, stand purring and hissing, letting out a wisp of steam now and then, while the intense heat of fiery coke within their fat, brick-lined bellies smelts iron ore, and burning limestone fluxes impurities into slag.

Blast furnaces are fed at their tops from cable-drawn bucket cars on tracks. These "skip hoists" daily haul up thousands of tons of iron ore, coke and limestone from mountainous stock piles.

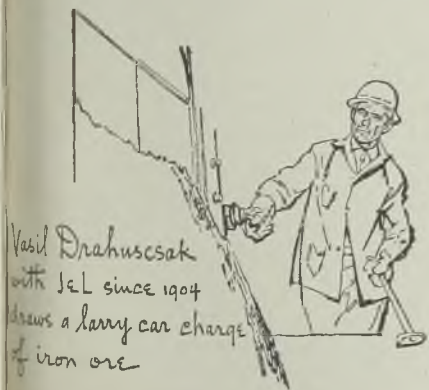
175 million tons of heated air a year are blown into the blast furnaces of America to fan the coke fuel to smelting heat. This air—"wind" furnace men call it—is preheated to 1,200 degrees F., attains velocity of 100 to 300 miles per hr. compared to 150 miles per hr. for hurricanes.

The spectacular flame throwers you see when you pass through a steel town are not blast furnaces, but Bessemer converters (origin of the "hell-with-the-lid-off" cliché) burning carbon, silicon and manganese out of molten iron to "convert" it into steel.

Submarine ladle, shown in illustration and used to convey molten iron from the blast furnaces to the steel works, was cooperatively developed by J&L, is now in use in other plants, can hold iron in molten state 24 hours.

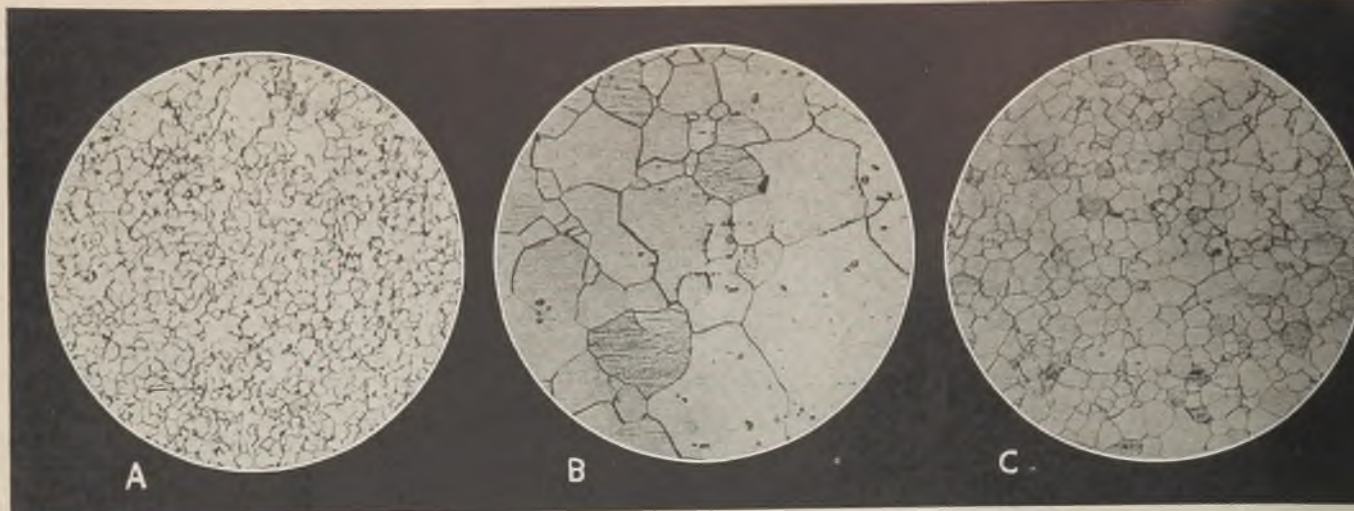
Bead catalyst, strange, rugged agent recently developed by Socony-Vacuum Oil Company, Inc. for aviation gasoline, will greatly increase aircraft engine available power output. In peace-time aviation these new aviation gasolines will mean swifter, more extended, safer world transportation. A catalyst changes the arrangement of the hydrocarbons in gasoline in some mysterious manner to produce better fuel. The bead catalyst resembles a pearl-colored bead.

John R. McCarnay
with J&L 45 years
looks into blast
furnace tapers



Vasil Drahucsak
with J&L since 1904
draws a larry car charge
of iron ore

CONTROLLED QUALITY STEEL FOR WAR



Cold Reduced Strip Steel

By PAUL J. McKIMM
Cleveland

Slight roughness on surface of strip affords the use of higher annealing temperatures, reduces friction in forming operation and improves adhesion of coatings. Changes in physical characteristics of low-carbon steel as a result of cold rolling and type of heat treatment employed to restore values are discussed

STRIP for cold reduction must be of suitable quality; properly heated ingots must yield hot strip with a clean surface, and uniform dimensions and grain structure in order to assure uniformity from band to band and from one rolling to another. Irrespective of the methods of descaling, it is imperative that the hot rolled band be made free of scale and oxides by pickling preparatory to cold rolling.

Cold reducing facilities are either of the 4-high continuous, or the 4-high reversing type of mills. Rolls are made of high-quality steel, generally of 70 to 90 scleroscope hardness. Work rolls are forged steel and were imported up until 10 or 12 years ago; since then, however, they have been made in American shops. Backup rolls are cast steel with or without chill blocks and of widely varying analyses.

The crown of the work roll is governed by individual unit characteristics; it conforms generally to the ultimate shape of the finished product to meet standard tolerances or to gage variance for the total product. The surface condition of these work rolls varies in the degree of roughness. Each type imparts definite characteristics to the surface of the metal being rolled.

Ordinarily cold-rolled strip is produced with three standard finishes (uncoated) as No. 1 or drill; No. 2 or regular; and, No. 3 or best bright. The No. 3 finish has the highest polish. To attain this high gloss special rolling procedure and utmost care of the rolls are necessary

in all stages. This material is used for electroplating and is supplied in any standard temper.

The largest tonnage of cold-rolled strip is made with Nos. 1 and 2 finishes mostly for the stamping trade, and these are obtained by roughening the roll surfaces artificially. Acid etching, that is, etching with micro or macroetching solutions now is almost obsolete because it is costly and does not yield the desired type of roughness. The etching usually follows along dendritic patterns and the embryo is not of sufficient uniformity. Methods now followed for roughening include centrifugal blasting with metallic abrasives in the form of shot or grit. Any degree of roughness can be made on roll surfaces of different hardness by using different sizes of abrasives at a uniform rate of speed. An infinite number of finishes can be secured by varying the time the roll is held in the blast with the different sizes of abrasives.

The objective of roughing is (1) to permit higher temperature and longer saturation at such temperature without the pieces sticking together, thereby causing a loss of material and further permitting an ideal anneal which is only attainable at the high temperature, ample saturation, annealing cycle, thereby yielding a more perfect deep drawing material; (2) it is beneficial in aiding the

drawing operation by reducing the contact friction between the die and the steel; and (3) it improves the adhesion of paint, lacquer and/or other coatings.

With the same size of grit and same blast time the roughness of a roll will vary widely with its hardness. The hardness generally is maintained at a value of 80 to 90 scleroscope especially for the finishing or last pass.

A machine known as a Wheelabrator, Fig. 3, is used to roughen work rolls at critical scaling points in hot-strip mills, usually in the first and sometimes in the second finishing stands. These rolls have a lower hardness value than those used for cold reduction, usually about 60 to 70 scleroscope.

This roughening feature is a vital process in the manufacture of cold-reduced strip steel. Certain mills of the continuous train are critical points for scaling. The roughened rolls act as scale breaking units with routine drafting loads; subsequent sprays clean the surface. The critical units are generally the last roughing stand and the first and/or second finishing stand. With a complete new set of high-polished rolls in all mill stands, it is impossible to obtain a smooth surface on the product until 500 to 1000 tons are processed; then the rolls develop a sand-type roughness which yields the desired surface. After a month or so the

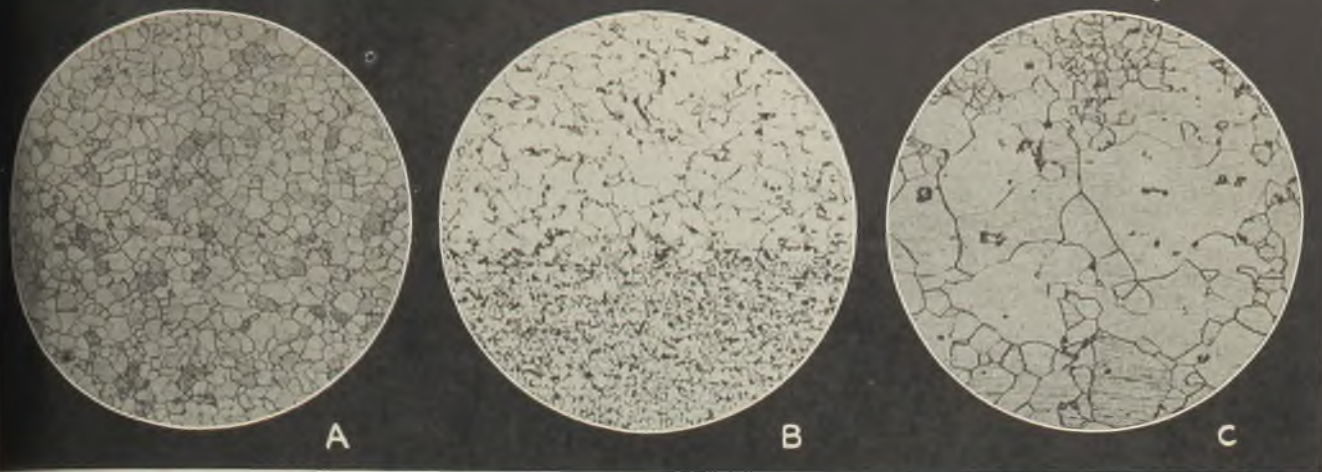


Fig. 1 (Left, opposite page)—A, photomicrograph of unstrained area; B, an area under critical strain; C, annealed section having 62 per cent cold reduction

Fig. 2 (Above)—A, microstructure of 0.08 per cent carbon hot strip with clear demarcation of grain boundaries; B, large surface grain with small core grain formation; C, exaggerated and irregular grain size. X100

roughing rolls gather scale and damage the surface of the product. By artificially roughening the rolls, however, a high-quality surface can be attained right from the start.

Temper of cold-reduced strip is an important characteristic. It is specified by hardness number as follows:

No. 1 is hard or full hard temper; this is, stiff and springy and is intended for flat work where no bending either with or across grain is required.

No. 2 is half-hard temper and is moderately stiff; its qualities for bending depend on whether the temper was attained with chemical analysis or by extensive cold working.

No. 3 is quarter-hard temper and is medium soft and suitable for forming, bending and simple drawing operations; it can be bent flat upon itself across the grain and with the grain to a slightly lesser degree, in other words, directional properties are still evident.

No. 4 is soft skin rolled temper and No. 5 is dead-soft temper. These two tempers are practically the same inasmuch as comparable physical properties can be developed. Both are soft and ductile and the product can be bent flat on itself with or across the grain, thus making it suitable for all types of difficult drawing operations. Principal differences are that the No. 5 temper does not have a tempering pass; it is used where severe drawing operations are required and the formed part is not exposed or where stretcher strains are permissible. No. 4 requires a temper (skin) pass or severe breaker roller pass in order to eliminate the susceptibility of the steel to develop stretcher strain which is objectionable in all exposed parts. Ductility values can be identical with either of their two tempers.

Various tempers are obtained by varying the carbon content. Ordinarily the carbon for Nos. 1 and 2 tempers is maintained up to 0.25 per cent maximum, for No. 3 or quarter hard it rarely exceeds 0.15 per cent carbon, while for Nos. 4 and 5 the carbon is mostly kept below 0.08 per cent. The percentage repre-

sents ladle analysis; the test sample, approximately two points higher than that of the actual steel, is killed with aluminum with a drop in carbon analysis from 0.08 to 0.06 per cent. In the final product after discard or croppage sample usually comes within the range of 0.03 to 0.06 per cent carbon.

Hot-rolled bands after being thoroughly descaled by continuous pickling are cold reduced either dry or most generally with a coating compound which is applied preceding the reduction process. If the surface of the band lacks smoothness due to hot-strip mill pattern or scale pits, it is often cold reduced dry which tends to heal the surface but in this event the percentage of reduction per pass is greatly reduced. Generally a compound is ap-

plied which may act as a coolant and/or lubricant and permit a greater percentage of reduction per pass. The most common coating is palm oil or one having a palm oil base which in either event is costly and at present difficult to obtain for mechanical purposes. A good slushing oil compound much lower in cost per ton of steel coated serves the purpose equally well with identical results. Other domestic oily compounds have been developed for this purpose and are much cheaper than palm oil but more costly than ordinary slushing solutions.

Cold reduction imparts drastic physical changes as well as grain distortion. These are dependent on the stress-strain-load applied plus a definite and marked strain developed from stressing the piece in

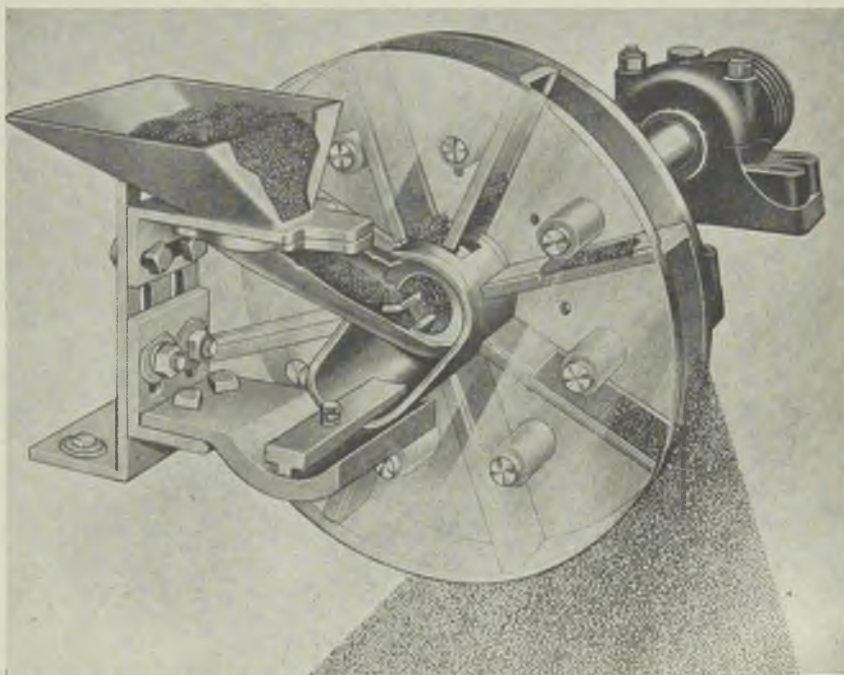


Fig. 3—Machine used for etching cold mill work.

tension. This varies with the arc of the roll curvature which acts to flow the molecules or metal back from the entry side and forward to the delivery side in each respective pass. This action is the same regardless of whether the mill is a tandem or a reversing single stand. However, with reversing mills the work rolls are of smaller diameter which influences the tensional strain. This strain arises at each set of rolls and each pass only and has nothing to do with the tension caused by stretching or pulling the strip between stands or between last stand and coiler.

The change in physical characteristics of low-carbon steel (0.08 per cent, ladle test) developed by cold working in the cold reduction process is shown in Figs. 4 and 5. The micrographical and physical properties of hot-rolled bands formerly were presented in STEEL¹.

Interpretation of Curves

The curves represent the tensile strength and elongation in the longitudinal direction at the different percentages of reduction. The steel was in the "as rolled" condition without any heat treatment. An interesting feature is the change point in the cycle at approximately 70 per cent reduction. A decrease in tensile strength begins at about 118,000 pounds per square inch and this continues to about 115,000 pounds per square inch at 95 per cent reduction. It is apparent from Fig. 5 that a reduction from zero to some point near 7 per cent is within the scope of understrain and this section is not commercially used except for tempering or burnishing. Within the reduction range of 7 to about 27 per cent is a critical strain area; results attainable after heat treatment are not reliable. Grain characteristics may be of abnormal proportions and irregular patterns; and granulation often is encountered. From some point near 27 per cent reduction and upwards the steel is over-strained but it is suitable for the

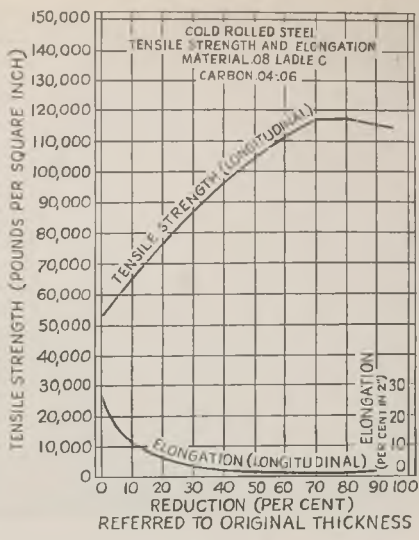


Fig. 4—Tensile strength and elongation of 0.08 per cent carbon steel

manufacture of cold-reduced strip steel. A photomicrograph of an unstrained area is shown in Fig. 1A. The steel with practically no reduction had a rockwell of 47 B-scale and 0.412 Olsen value after annealing. An area under critical strain is shown in Fig. 1B. In this case the percentage of reduction was from 19 to 21 per cent; after annealing the steel has a rockwell value of 24 B-scale and 0.360 Olsen value with an irregular brittle fracture of the cone. The photomicrograph in Fig. 1C represents annealed material having about 62 per cent cold reduction; physical values were rockwell 37 B-scale and Olsen of 0.422.

These photomicrographs are of identical material with a ladle carbon of 0.08 and manganese 0.33 per cent. Check carbons of individual sheets were 0.03, 0.04 and 0.05 per cent. The material after cold reduction was box annealed at 1310 degrees Fahr. and soaked.

Imperfect elasticity created by strain is not stable; that created by aging gradu-

ally drifts back towards the steel's natural physical characteristics.

Prof. H. H. Howe² points out that recently deformed mild steel loses its elasticity. The effect of rest at room temperature is to slowly restore the elasticity and eventually to raise it above the load that caused the previous deformation. The effect of warming is to greatly hasten the recovery of elasticity.

J. Muir³ found that the elastic recovery of recently overstrained steel at 100 degrees Cent. is as pronounced after three or four minutes as in two weeks at room temperature. Mild steel samples showed no change in cooling in water or after heating to 260 degrees Cent. After slightly deforming by tension, however, the material almost lost its elasticity and recovered it gradually, the complete recovery being effected in about two weeks. Mr. Muir states that if the material is allowed to rest at a low temperature, say around 0 degrees Cent., the recovery is much impeded or totally destroyed.

A. T. Adam⁴ points out that cold work has a profound effect on the elastic properties of metals. It produces in the metal a condition of imperfect elasticity. This condition, however, is not stable, he states, and there is a tendency to return to the truly elastic state with time—a tendency which is greatly accelerated by heating to conservatively low temperature.

Includes Box Anneal

Normalizing cold-reduced strip, either in coils or cut lengths, involves a box anneal with no intermediate treatment such as a wash pickle and a bright anneal and subsequently a skin-pass; roller leveling or breaker rolled, inspected and oiled. This short procedure produces a far superior product.

In the normalizing process it is imperative to maintain highly protective atmospheres constantly in the furnace and cooling chamber until the steel drops below its respective scaling point (about 950 degrees Fahr.) to maintain a minimum thickness that will readily pickle clean. One method of control under a normalizing temperature of 1900 degrees Fahr. affords a 50 per cent reduction in scaling by the use of an atmosphere containing 7 per cent carbon monoxide; an atmosphere containing 12 per cent carbon monoxide decreases the scaling loss about 80 to 90 per cent.

Where the long treatment of annealing still is followed an intermediate pickle is necessary to eliminate the normalizing scale as well as a cold mill pass usually on a 2-high mill for flattening preceding the annealing. Box annealing temperatures generally range from 1200 to 1280 degrees Fahr. depending on the preceding treatment or amount of strain applied in the cold-rolled flattening pass.

Steel treated by either the long or short (Please turn to Page 170)

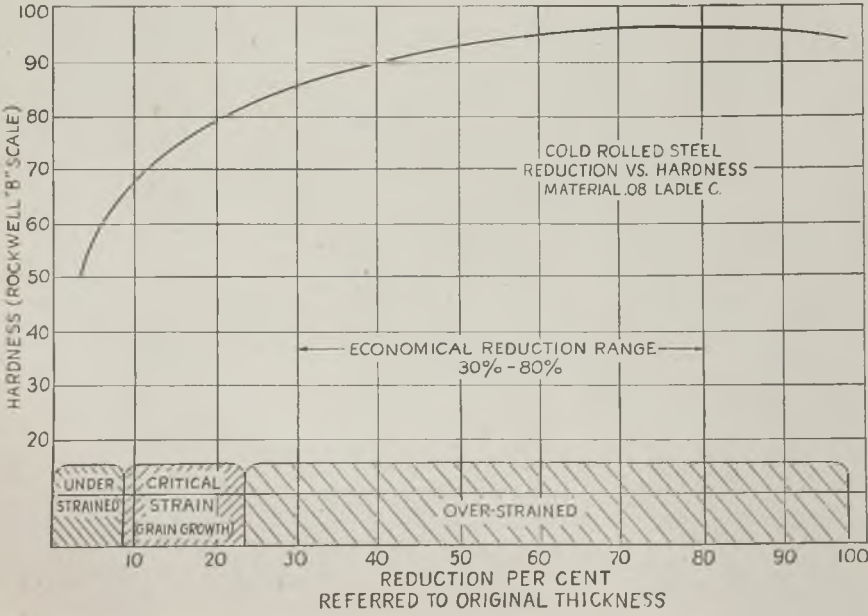


Fig. 5—Reduction and hardness of 0.08 per cent carbon steel

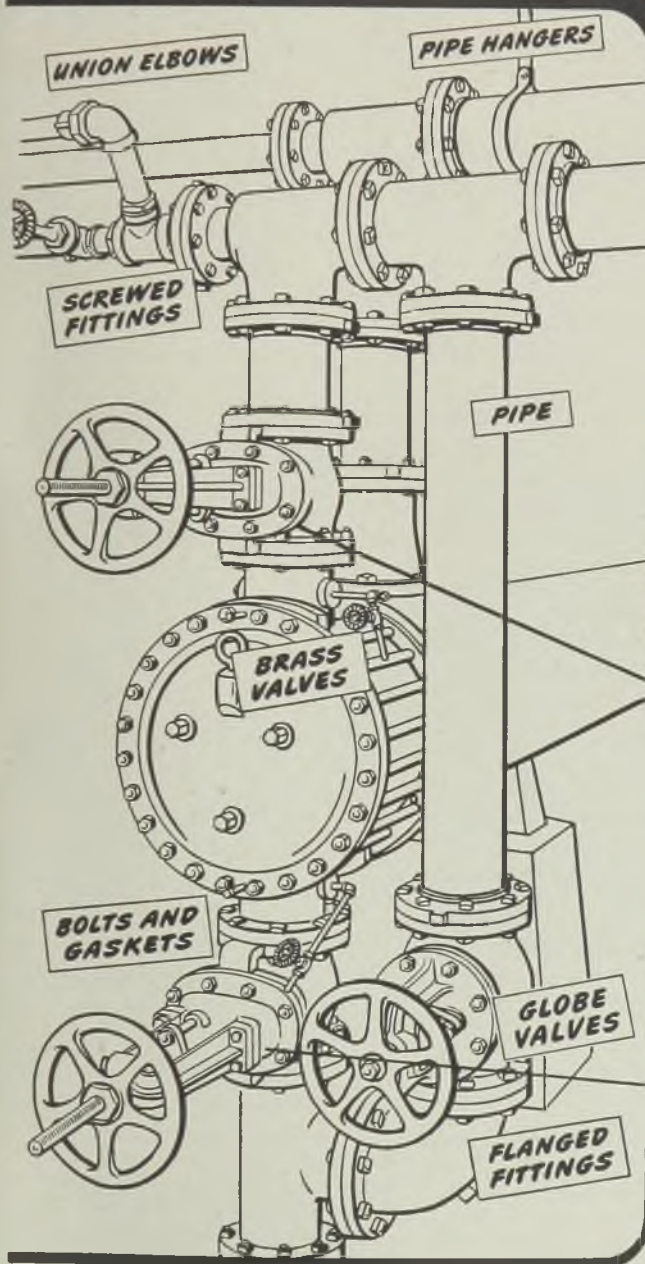
¹"Improving the Quality of Hot Rolled Strip", STEEL, April 28 and May 5, 1941.

²Metallurgy of Steel, 1890, p. 212.
³"On the Overstraining of Iron", Transactions, Royal Society, London, 1900, p. 193 and 1906, p. 77.
⁴Wire Drawing and Cold Working of Steel, p. 126.

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THIS is the fourth article in the current series that deals with all-position mild steel electrodes in the E60xx group. To get this picture clearly, let's look at these previous articles a minute.

Two articles (March 13 and 20) were devoted to electrodes that produced flat fillets and that were distinguishable by the digging arc possessed by each.

Of these electrodes, the E6010 is designed for direct current with reverse polarity only, whereas the E6011 electrode covers the same field with alternating current (although it can be used with direct current as well).

This article and the one immediately preceding it discuss the electrodes that produce a convex fillet and that are identified by a "cold" deposit that sets quickly. Originally the E6012 electrode was useful on direct current with straight polarity alone, although improved coatings and better alternating-current welders have changed this picture. To meet the need for an alternating-current electrode like the E6012, the E6013 type was introduced.

In the period from 1936 to 1940 alternating-current welding experienced an awakening of public interest. Up to that time there were many champions of alternating-current welding but the real acceptance of the process was yet to come. As usual there was a noticeable lag between development and application that happens every time something new is advanced.

One of the handicaps faced by alternating-current equipment makers was a strong feeling in the field that such units were extremely dangerous. Unfortunately a few serious accidents across the country served to confirm this suspicion until the real facts became available. However the sale of alternating-current transformers was slow until two steps were taken to combat the "danger" theory. One of these was to introduce relays in the secondary circuit to prevent the shock of the full open-circuit voltage from reaching the welder should the operator become careless. These relays dropped out when a metal to metal short existed as when the welder touched the end of the electrode to his work. In general, though, these relays and other similar devices have proved to be a nuisance to the user and with reasonable precaution they may be ignored.

The second way in which the danger of high open-circuit voltage was eliminated was in the construction of transformers that possessed inherently lower open-circuit characteristics. Also this

method was considerably cheaper. Thus the several makers of small transformers that have been called "cracker boxes" chose the latter course. But the electrodes that were available did not perform very well. If a suitable electrode could be developed, there would be a

applications in the aircraft plants where thin walled tubing had necessitated gas welding as the only possible process for the purpose.

One manufacturer claims the following eight advantages of his E6013 electrode:

—An alternating-current arc that is easy to strike and maintain.

—Steady, uniform metal transfer.

—Low spatter loss.

—Easy slag removal.

—Smooth, closely rippled welds.

—Minimum "burn-through" on thin sections.

—Easy to handle on vertical and overhead positions.

—Freedom from slag interference when welding vertically down.

Let's examine these several points to see just what they mean in terms of the general group of E6013 electrodes as well as how these factors compare with similar items in the electrode groups discussed.

Of course the E6013 electrodes *do* have an arc that is easy to strike and maintain with alternating current. This is equally true no matter what the open-circuit voltage, that is, a good E6013 electrode will operate well with either low or high open-circuit voltage transformers. Furthermore, the coating ionizes so readily that the arc is started more easily with this electrode group than with any other. To further assist in ease of striking, some manufacturers attempt to have their coating

reach all the way to the starting end of the electrode instead of leaving some bare wire at the end as is done with the other types.

A steady, uniform metal transfer will be found with some makes while other brands have a definitely globular transfer. Welding engineers are prone to recognize two distinct types of metal transfer frequently analyzed as "fine spray" and "globular" transfer. Either extreme as well as almost any point between may be found with the available E6013 electrodes. Of course the fine spray is preferred as manipulation is easier with this kind of transfer. The arc has a soft sound and operator fatigue is slight when good metal transfer conditions obtain.

Although the E6013 electrodes are noted for low spatter loss, this matter, too, is subject to very noticeable differences among the many brands on the market. It is true that the degree of spatter is frequently low but often not as low as that observed with the better E6012 electrodes. Both these convex fillet groups demonstrate low spatter characteristics. Because the E6013 elec-

METALLIC ARC WELDING ELECTRODES

—Class E6013

This is Section V in a series on metallic arc welding electrodes, their characteristics and most important applications. An explanation of the AWS-ASTM electrode classification system was presented March 6; characteristics of class E6010 electrodes March 13; class E6011 electrodes March 20; class E6012 electrodes March 27

By HAROLD LAWRENCE

Metallurgist and
Welding Engineer

limitless opportunity for the expansion of welding through the widespread use of "cracker box" transformers.

As has been the custom with the welding industry, a new electrode appeared and the popularity of small alternating-current transformers followed the predicted course. Instead of requiring from 80 to 100 volts open circuit, the E6013 electrode was useful with an open circuit voltage no greater than 40 volts. This beneficial result was accomplished through a generous use of arc stabilizing chemicals. A soft, steady arc with shallow penetration accompanied the low open-circuit welding properties and the freedom from spatter was quite good.

Had the E6013 electrode made no further contribution than this, it would have been a most worthwhile addition to the welding industry. But outstanding qualities in the welding of thin sections, over and above the excellent characteristics of the E6012 type, extended the use of E6013 electrodes into the sheet metal field where it worked well with alternating current or direct current and, finally, made possible many arc welding