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STEEL

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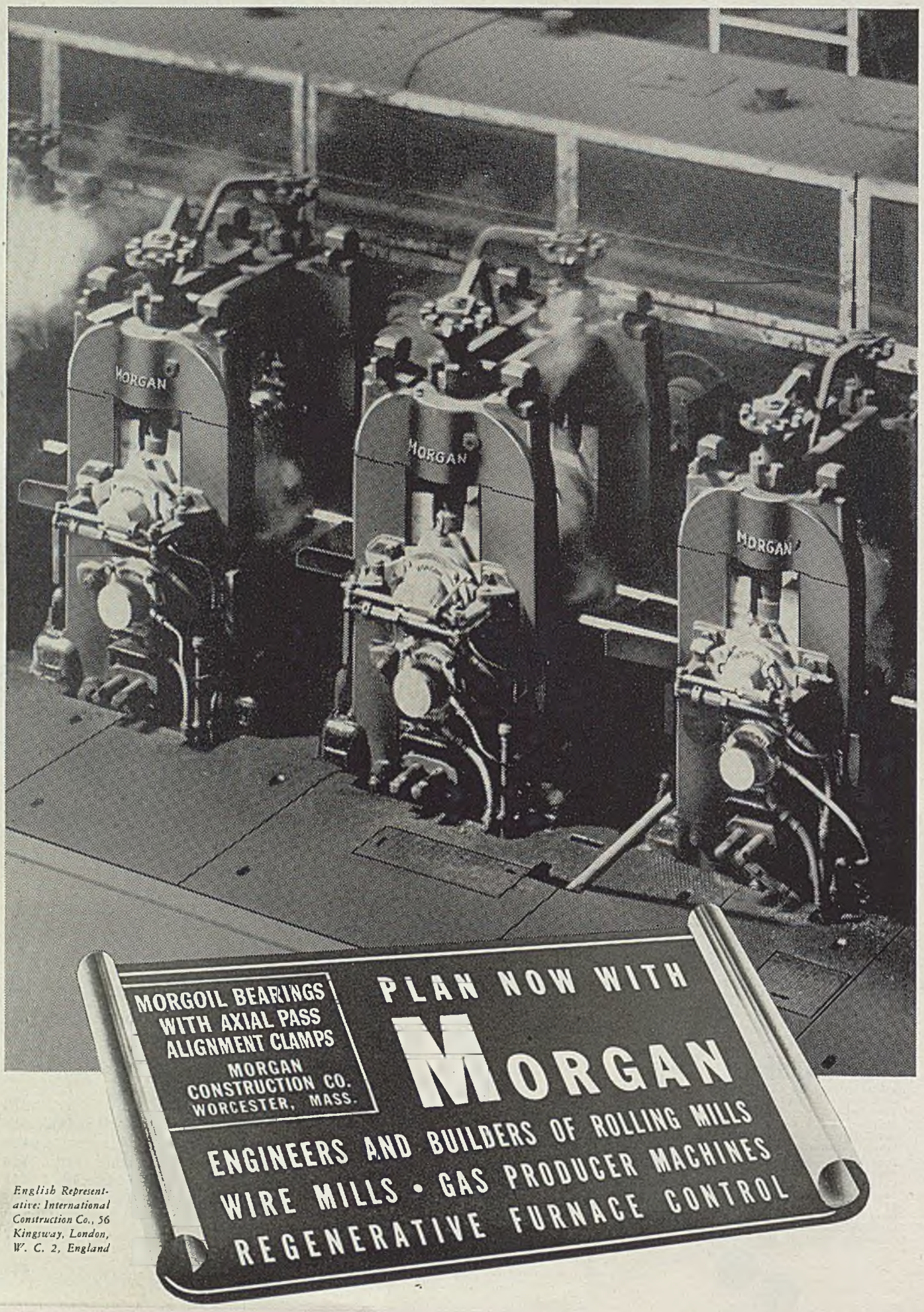


English Representative: International Construction Co., 56 Kingsway, London, W. C. 2, England

As the EDITOR VIEWS the NEWS

Critical Issue

One of the most important issues to be decided in 1946 is that of the status of private business. Is it to be reasonably free of unnecessary government controls and restraints or is it to continue to be subject to whatever regulations the whims of federal authorities can devise?

The question is not new. The basis for it has been developing for a dozen years. Starting with the depression of the thirties and continuing to the present time, some government agencies in an attitude of "mother knows best" have sought more and more to tell business and industry what it can and cannot do.

Much of this tendency to run the nation's private activities by push-button control from Washington was not frowned upon too seriously by the public during the emergencies of depression and war. However, these emergencies are past and the public, heartened by the assurances voiced by President Truman and others shortly after V-J Day that wartime controls would be removed as rapidly as possible and also cheered by the actual removal of many controls, now is puzzled at the apparent decision of the government to reverse its position. Today there is every indication that Washington is staging a new "emergency" under which it can justify new and disturbing means of interfering with business.

Most alarming among these is the attempt of the government to link wages and profits. If this nation embarks upon the present proposed plan to set wages according to ability to pay, the end certainly must be federal control of everything that enters into ability to pay. This means death for the competitive economy that has made this country great.

The immediate test of the administration's ill-advised wage-profit alliance will come in the settlement of the CIO-General Motors dispute. There is no good reason why this mess cannot be settled satisfactorily to both parties if the negotiations are confined to wages. An increase of 12 to 15 per cent probably would be agreeable to the employer and to an overwhelming majority of the employees. That the dispute has not been settled on this basis is due simply to the desire of CIO leaders and government authorities to assume for themselves functions that properly belong to management.

This is a critical issue. If wages and profits can be kept separate now—in the CIO-GM settlement—the nation will be saved untold grief throughout the postwar period.

STEEL
January 7, 1946

WHAT'S AHEAD IN 1946? Our editors began planning this "Yearbook of Industry" issue last October. Sensing that 1946 would be a pivotal year in the nation's transition from a wartime to a peacetime economy, they decided to ask industrial leaders what they expect in 1946 as to production, employment, costs, prices and other pertinent factors. Questionnaires went out to 17,500 companies in the metalworking industries and within a few weeks detailed replies were received from 3600, representing a return of 20 per cent.

Although the responding executives made allowance for labor strife, wage-price confusion and other obstacles discernible in November, they foresee in 1946 a volume of production 50.2 per cent higher and of employment 40.5 per cent higher than in 1939. This would mean production valued at $29 billion and employment of 3,650,000 persons in 1946 compared with $19 billion and 2,597,000 respectively, in 1939. Industry expects unit costs of manufacturing to be 25.7 per cent higher, sales and distribution costs to be 13.7 per cent higher and

(OVER)

selling prices to be 17.1 per cent higher than in 1939.

The figures are broken down into 47 industrial groups and into six size-of-plant classifications, thus enabling any producer or manufacturer to check his own expectancy for 1946 against the consensus of his contemporaries.

—pp. S-1 to 32, following p. 192

° ° °

NEW IDEAS CUT COSTS: To read the comments of the 177 authorities who contributed to STEEL'S annual review of engineering progress is to appreciate the wealth of new materials, equipment and techniques that will be available to the metalworking industries during the coming year. In iron and steel production, casting, forging, drawing, stamping, heat treating, metallurgy, joining and welding, surface treatment, machining, lubrication, materials handling and other operations are new developments which in 1946 will outmode many practices that were rated as ultra-modern as recently as 1939.

Reflected conspicuously in the outline of current engineering development is the powerful influence provided by the peacetime need for efficiency and economy. Throughout the first full calendar year of peace manufacturers will be striving hard to regain the control over costs which they lost during the war. Much of the contemporary progress in technology will help management materially in this important recovery program. —p. 262

° ° °

REBUILDING THE WORLD: High on the list of important problems in 1946 is the rehabilitation of the war-ravished countries in Europe. Vincent Delport, European editor of this publication, emphasizes three factors in reconstruction: First, the overriding preponderance of the United States in capacity to produce things the devastated areas need; second, the scarcity of coal and the inadequacy of transportation which hamper rehabilitation in western Europe; and third, the confusion attending the re-establishment of stable governments, with accent upon the strong trend toward nationalization in Great Britain and rigidly planned economies in France, Holland, Czechoslovakia and other continental nations.

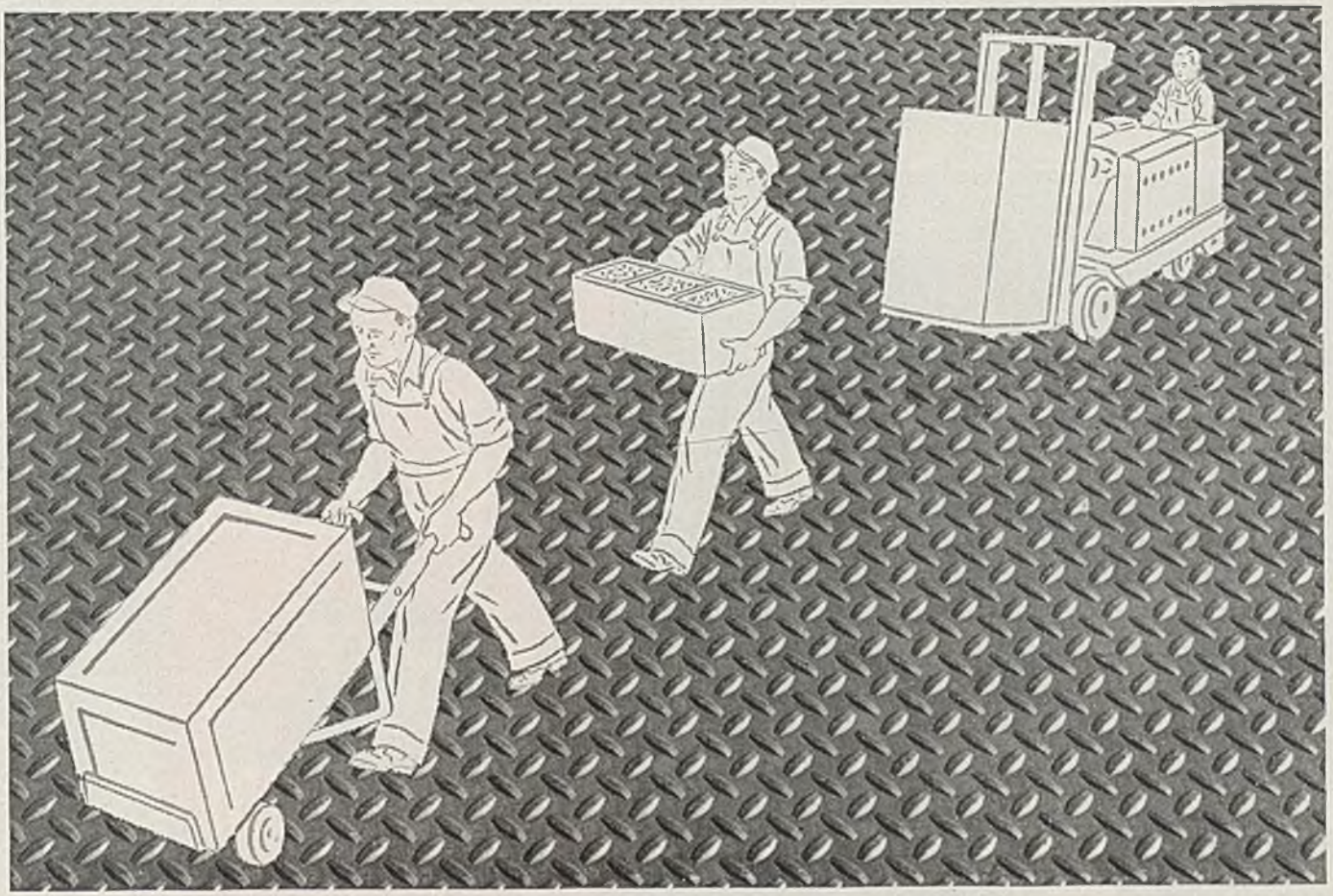
These countries, as well as Russia, China, the American republics and some units of the British Empire all are hungry for American steel and manufactures. While American exporters expect that foreign shipments of finished steel in 1946 will range between 2,750,000 and 3,000,000 tons, this total falls far short of the estimated demand. Credit and allocation complications probably will hold down exports in the first full year of peace.

—pp. 225, 344, 347, 348

FORESEEN FOR FORTY SIX: According to a survey made by this publication, manufacturers in the metalworking industries employing less than 50 employees expect that production and employment in 1946 will be 41.4 and 30.5 per cent, respectively, higher than in 1939 (pp. S-1 to 32, following p. 192), whereas companies employing over 1000 persons expect production and employment in the new year will exceed 1939 levels by 55.9 and 43.7 per cent, respectively. . . . Exporters declare that Russia alone would take 2,500,000 tons of finished rolled steel from American mills in 1946 (p. 226), if the material were available. . . . Heading the list of problems for Congress in the coming year (p. 228) are wages and prices, a modern tax program, international relations, disposal of war surpluses, social security, housing, research and patents. . . . An unprecedented number of personnel changes in the metalworking industries may be expected this year (p. 245), due partly to readjustments occasioned by the end of wartime conditions and also to increasing demands for greater proficiency in labor and public relations among top-ranking executives. . . . STEEL resumes its index of activity in the metalworking industries (p. 254) which was suspended during the war. Surprising is the fact that this index for the week ending Aug. 18, 1945, when the nation was turning from war to peace, stood at 102—precisely the same figure which prevailed in April, 1940, just before the country started defense activity in earnest. . . . The postwar line-up in iron and steel production in 1946 and for some years thereafter (p. 344) will be United States first, Russia second and Great Britain third. Interesting question is how much steel Germany, which consistently ranked second in prewar years (p. 346), will be producing in 1950, or 1955. . . . A contributor to STEEL'S annual review of engineering progress contends that "there is not a job running that cannot be improved upon." After reading the views of many authorities on technical advances (p. 264) one gains the impression that producers and manufacturers will have much assistance in "improving upon" jobs in 1946. Almost every advance in material, equipment, part or process offers advantages in efficiency. . . . During the war about 1000 companies in or allied with the automobile industry turned out war goods estimated at $29 billion (p. 237) which is equivalent to the wholesale value of all cars and trucks built in this country from 1929 through 1941.

E. C. Shane

EDITOR-IN-CHIEF



for MEN AND MATERIALS IN MOTION . . .

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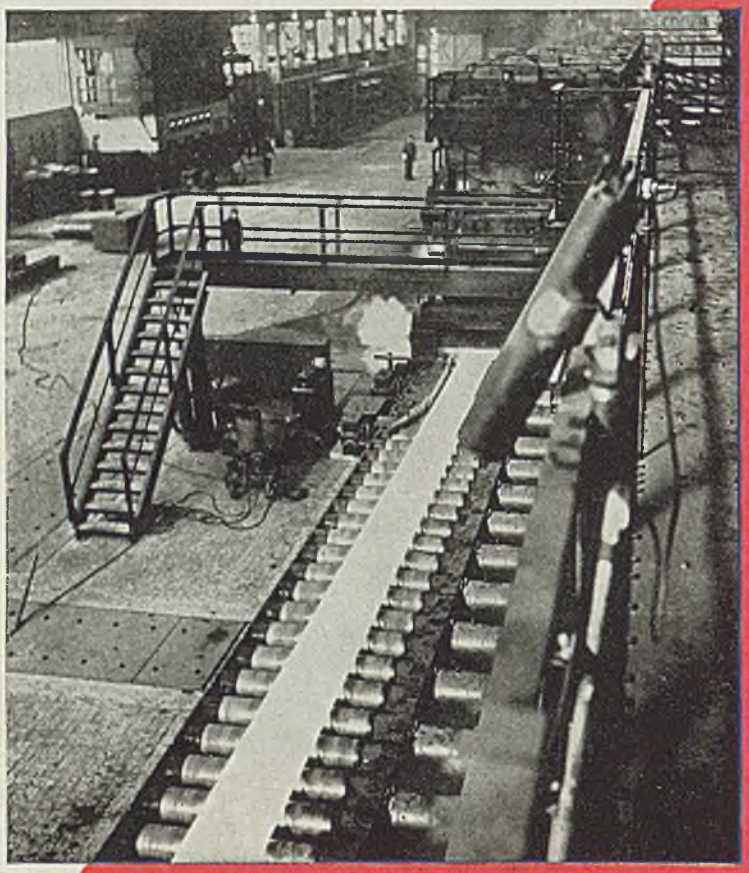

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January 7, 1946

WHAT INDUSTRY EXPECTS IN 1946

A study by the editors of STEEL on the prospects of the metalworking and metalproducing industries in the first full year of peace after World War II as reported by more than 3600 plants.

A Special Report by

PENTON BUILDING **STEEL** CLEVELAND 13, OHIO

The Magazine of Metalworking and Metalproducing

INDUSTRY REPORTS ON CRUCIAL YEAR AHEAD....

EVENTS of the new year are destined to loom important in the panorama of this nation's postwar development. Just as the great achievements of American industry in producing for war in 1943, 1944 and 1945 were dependent in no small degree upon patterns established in 1942, so will the qualitative and quantitative dimensions of the economy in the late forties and early fifties depend heavily upon the kind of foundation that is built in 1946.

Sensing the unusual significance of developments in this crucial year, the editors of STEEL asked executives of the metalworking industries what they expect in 1946 as to volume of production and employment, levels of manufacturing, sales and distribution costs and of selling prices, progress in reconversion and other pertinent factors. They also were questioned as to the desirability of continuing government price controls until supply and demand are more closely in balance.

The replies, received from executives in more than 3600 plants, reflect opinion as of the first two weeks of November. In supplying the requested data, producers and manufacturers took into account the uncertainties and confusion then prevalent. The plants from which replies were received are so thoroughly diversified as to size, nature of product and geographical location that the returns can be relied upon to reflect with unusual accuracy the opinion of executive personnel in the more than 17,500 important plants comprising the metalworking industries in the United States.

Results of this study, which is the latest in STEEL's series on problems affecting the metalworking industries, are shown on the following pages. First are presented tabulations of total returns and of returns classified in six size-of-plant groups. Next are presented breakdowns for each of the five major divisions of the metalworking industries, namely primary metal producers, fabricated metal products, transportation equipment, machinery and electrical equipment. With minor exceptions, these groupings conform to the new government Standard Industrial Classifications, thus making it possible to compare many of the results directly with 1939 census reports, and with the 1946 Census of Manufactures which will be published in 1947.

Returns under these five major divisions are further broken down into 47 subdivisions, enabling each producer or manufacturer to check his own expectancy in 1946 with the consensus of replies received from his own industrial group.

The overall significance of this study is that management of the metalworking industries sees in 1946 an opportunity to set new records in peacetime production and employment. It expects substantial increases in costs and somewhat lesser increases in selling prices, indicating an ability to absorb a portion of increased costs. It favors a continuance of price control, but not necessarily the type of control in effect late in 1945. It indicates deep concern over confusion on wage-price policy. Small operators are definitely more critical of government curbs upon business than are large companies.

In short, the metalworking industries foresee in 1946 a year beset by numerous difficulties, but a year of great activity and tremendous opportunity.

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Metalworking plants look for 50.2% increase in 1946 over 1939

EMPLOYMENT S-6
To top prewar by million workers; some plants to exceed war levels

MANUFACTURING AND SALES COSTS S-8
Rise of 25.7% seen in cost of production; 13.7% in selling costs

SELLING PRICES S-10
Products expected to sell at prices 17.1% higher; many favor price controls

PLANTS AND EQUIPMENT S-12
Heavy purchases planned in next two years; reconversion well under way

PRIMARY METAL PRODUCERS S-14
Steel and metal plants, foundries and forge shops see 36.4% gain in output

FABRICATED METAL PRODUCTS S-18
Makers of hardware, valves, stampings and kindred lines see bright future

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Auto, aviation, shipbuilding and railroad equipment groups expect high output

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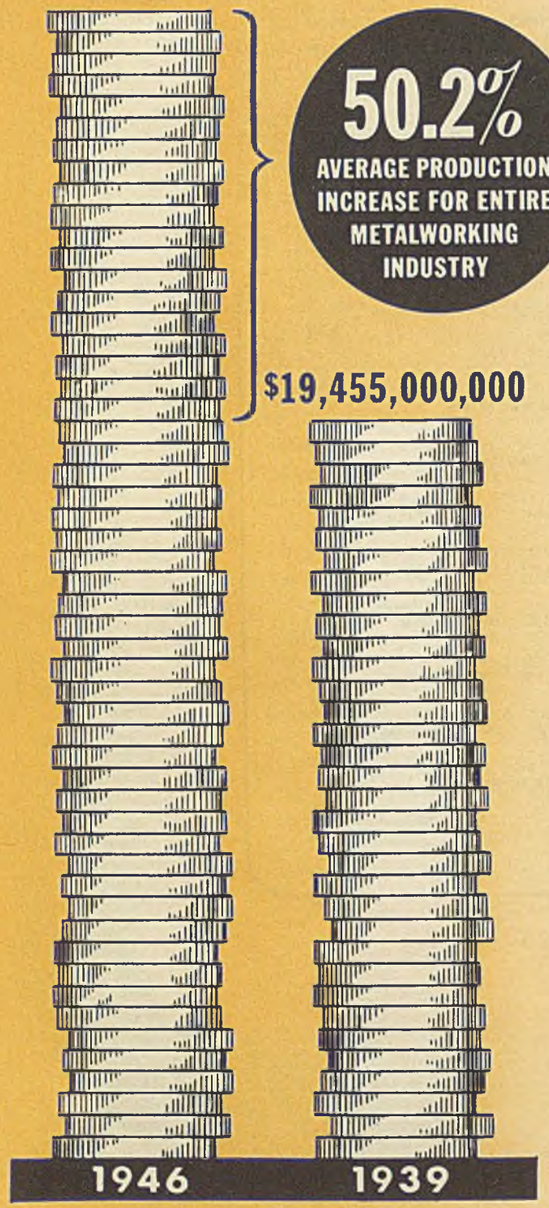
57.6% gain in output seen for metalworking equipment, farm tools, etc.

ELECTRICAL EQUIPMENT S-30
Prospective 65.9% gain in production tops that for all other groups

PRODUCTION VOLUME

(EXPECTED 1946 LEVEL COMPARED TO 1939)



Expect Greatest Peacetime Production Year in History

BARRING accidents and other contingencies, U. S. metalworking industry believes firmly it is heading toward a production plane never before achieved, estimated increases over the 1939 level ranging all the way up to 63 per cent, although the average for all plants reporting is somewhat below this figure. This optimism is reflected from the vast majority, 83 per cent, of metalworking plants.

Recognizing the U. S. as chronically optimistic, even in the face of stern realities, it is possibly futile to bet too much these pleasant dreams will be achieved. Yet when you comb carefully through the nation's thousands of producers of "things to make things" you snag few dissenters, only a few lonely statistical per cents.

Examining the estimated percentage increases in production volume by plants in various employment groups, a noteworthy point is that the larger plants, those employing over 1000, profess to see the greatest gains in their output, which could mean that the trend is for larger industries to grow larger at a somewhat accelerated rate over the expansion in smaller plants. Such reasoning could indicate still greater concentration of large industries in concentrated industrial centers, but this runs contrary to the idea of decentralization which is being carried out by many companies, moving away from metropolitan centers into areas where there is less congestion, a better labor supply and a more leisurely pace of living.

Such decentralization of large companies which operate multiple plants would not necessarily run contrary to the forecast that their growth will accelerate beyond that of their smaller competitors who might operate single plants only.

The greater production volume anticipated by larger operators also could arise from the further mechanization of their operations, to the end that more output per man might be realized. It seems fairly obvious most larger producers can mechanize their operations more conveniently, both from a physical and financial standpoint, than can the smaller plants.

This is not to infer those manufacturers in the middle ground of from 50 to 1000 employes are at all discouraged about the production outlook. They are all well up in the 50 per cent region. It must be remembered these figures are in comparison with 1939 and not 1945; many plants had realized production increases of 20-30 per cent from 1939 when civilian production was shut off by the war in 1942. Hence the actual physical level of production in 1946 as against the wartime year of 1945 may not be appreciably greater, perhaps even less, since war production volume in many cases ran two or three times the peacetime level, at least in dollar volume.

It is of interest to note that about one out of every eight plants expects its operations to be on a par with 1939.

In considering production levels for this year, one of the gravest questions relates to the productivity of labor and its relation to wage rates in the face of current pressure for sizable increases. Basically, if efficiency is unchanged, a rise in wage rates simply puts the pinch on the demand for labor. Thus: Either the price of the product is unchanged, which reduces profits to a less attractive level and discourages employers from increasing or maintaining their operations, (hundreds of examples of this condition could be cited today); or else the price of the product is increased, which reduces demand on the part of consumers, except by that fraction of the consumers which has received the increased wages (one danger for tomorrow). If the demand for goods is decreased, obviously the demand for labor is decreased.

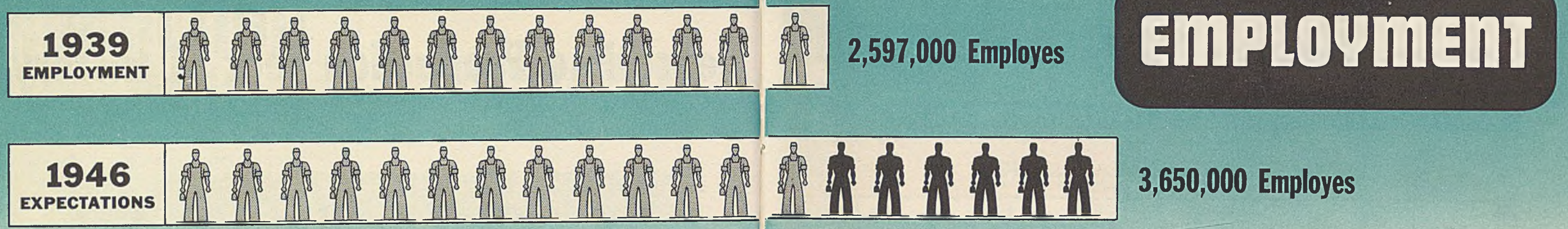
Understanding of these economic precepts is vital to interpretation of statistics showing projected increases in the production level. Skyward-moving curves and indices are by no means assured. There are many "ifs" to be cleared. In fact, many of those who furnished information for STEEL's study have footnoted these hurdles and underscored them. "If we can find sufficient labor . . . if the unions leave us alone . . . if we could get some price relief . . . if the government would stay out of business . . . if our men would really work . . . if we have no strikes . . ."—so they read.

Blind acceptance of higher production level estimates carries a measure of dynamite, for it is true that increased production can maintain profits in the face of higher unit manufacturing costs, without disturbing the price level. BUT — and this seems vital: Until such production is achieved, no balance can be struck; and steadily declining productivity and efficiency such as industry has experienced in the past five years utterly precludes the attainment of any such welcome millennium.

AVERAGE PRODUCTION INCREASE BY SIZE OF PLANTS

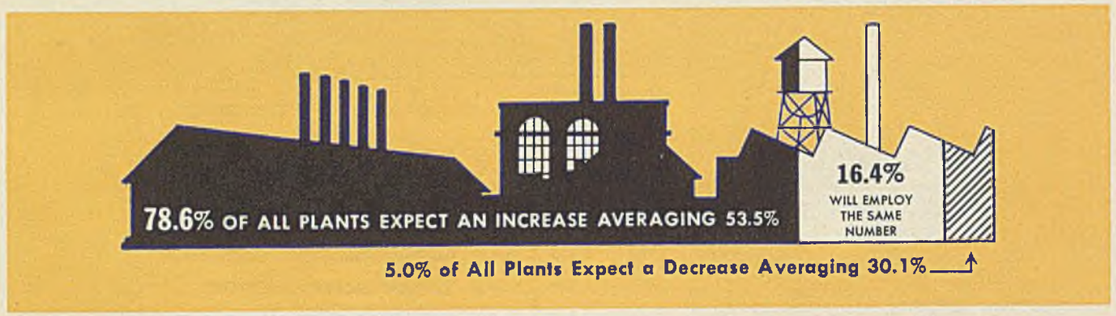
(000,000 OMITTED)

	1939 Volume	Expected 1946 Volume	PERCENTAGE OF EXPECTED INCREASE
Less than 50 Employes	$1,709	$2,417	41.4%
50—100 Employes	1,224	1,805	47.5%
100—250 Employes	2,536	3,845	51.6%
250—500 Employes	2,769	4,273	54.3%
500—1000 Employes	2,930	4,266	45.6%
Over 1000 Employes	8,286	12,606	55.9%
Total—Entire Industry	19,455	29,212	50.2%



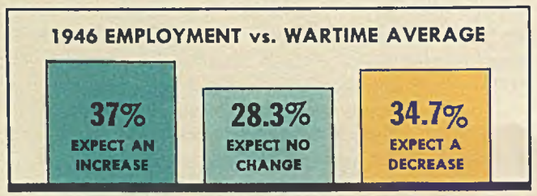
EMPLOYMENT

Industry Looks for Employment in 1946 to Top 1939 Level by 40.5%



JOB prospects in the metalworking industries for the next 12 months are highly encouraging. Two out of three companies in the field confidently count on providing employment for as many or more people as they did during the war, which is no small achievement. The industry en masse anticipates payrolls during 1946 will be 40.5 per cent greater numerically than in 1939, an increase from 2,597,000 to 3,650,000.

These expectations, necessarily based on the assumption there will be a substantial measure of industrial peace and continuous sustained employment during the months ahead, indicate the metalworking industries are ready to exceed their obligations toward full employment.



Total job requirements in the first full postwar year have been estimated variously at from 50 to 58.5 million. The Committee for Economic Development in a study completed last summer preferred an estimate of 54 million, compared with slightly less than 45 million actually employed in 1939. "Full employment," on the basis of the CED estimate, would necessitate an increase in employment for 1946 over 1939 of 9 million, or 20 per cent.

Among the manufacturing industries, food, leather, textile, lumber, paper, and the like are not expected to increase physical production and employment as much as are the durable goods industries.

Nearly two thirds of all metalworking plants expect to hold 1946 employment at or above levels of the war years. Thirty-seven per cent reported they expect to increase peacetime employment over the wartime level, 28.3 per cent expect to hold at the same level; and 34.7 per cent anticipate some decrease.

While employment expectations as revealed in the study are fairly optimistic for the immediate future, a somewhat similar survey by the Civilian Production Administration indicates even greater gains in employment by the middle of this year. The CPA study, covering 55 reconversion industries, most of which are in the metalworking field, revealed expectations that employment by June would be 100 per cent more than in 1939. According to the CPA survey, the metalworking industries which employed 2.5 million in 1939 will be providing jobs for 5 million by June, provided, the report points out, production is not interrupted by prolonged industrial disputes. The survey by CPA, however, covered only 806 factories in the process of reconverting, whereas STEEL's study covers more than 3600 representative metalworking plants.

However, comments by many metalworking executives point out some hazards incident to realization of this bright employment pattern. The greatest stumbling block of all, they believe, is the attitude of labor. Scores of companies stress their inability to obtain workers, even though many in their communities are unemployed and are drawing unemployment compensation. Another hazard indicated is the obstructionist attitude of some union leaders insisting on featherbedding and calling work stoppages for minor or imaginary grievances. Still another hurdle is the cost of labor, which many plants reported has risen 50 per cent or more since 1939, with new demands still being made. These swollen labor costs in some cases are making manufacturing costs prohibitive and thus retarding expansion of employment.

Typical comments of metalworking company executives: "Big IF is cost of labor;" "key to whole future of our employment depends on labor's attitude;" "too many prefer the dole (unemployment compensation) to reasonable wages;" "labor unions are killing the goose that lays the golden eggs."

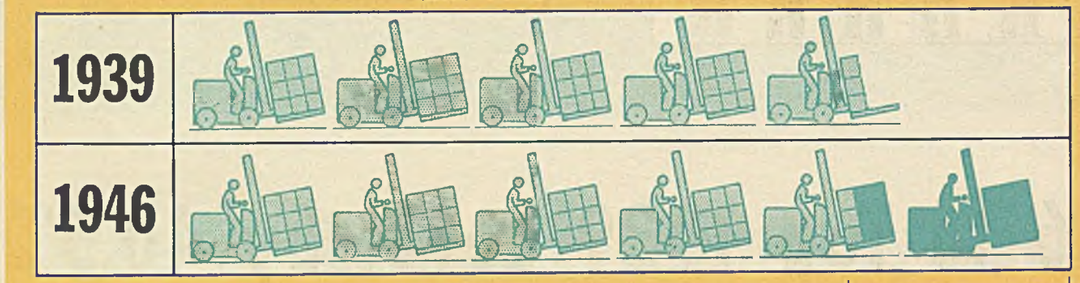
AVERAGE EMPLOYMENT INCREASE BY SIZE OF PLANTS
(000 OMITTED)

	1939 LEVEL	Expected 1946 LEVEL	PERCENTAGE OF EXPECTED INCREASE
Less than 50 Employes	265	346	30.5%
50—100 Employes	189	258	36.6%
100—250 Employes	361	506	40.1%
250—500 Employes	375	540	44.0%
500—1000 Employes	363	500	37.8%
Over 1000 Employes	1,044	1,500	43.7%
TOTAL—Entire Industry	2,597	3,650	40.5%

Manufacturing, Sales and Distribution COSTS

ANTICIPATED COSTS AS COMPARED WITH 1939

UNIT COST OF MANUFACTURING
(Labor, Materials and Other Costs)

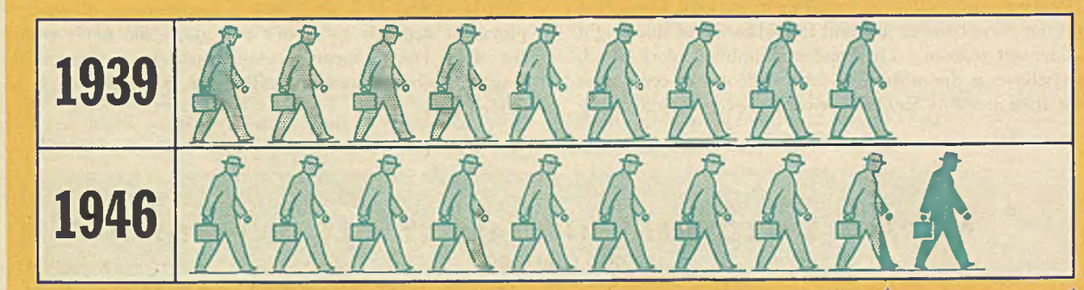


OF ALL METALWORKING PLANTS

- 95.6% Expect Increased Costs Averaging 27.3%
- 2.4% Expect No Change
- 2.0% Expect Lower Costs Averaging 16.7%

= 25.7% AVERAGE INCREASE IN MANUFACTURING COSTS

SALES AND DISTRIBUTION COSTS



OF ALL METALWORKING PLANTS

- 66.1% Expect Increased Costs Averaging 22.1%
- 27.9% Expect No Change
- 6.0% Expect Lower Costs Averaging 16.6%

= 13.7% AVERAGE INCREASE IN SALES & DISTRIBUTION COSTS

Production Costs per Unit Expected to Rise 25.7%; Selling Costs 13.7% over 1939

LIBERALLY interpreted, the anticipated percentage increase of 25.7 per cent in unit manufacturing costs of the metalworking industry in 1946, including labor, raw materials and other overhead, but exclusive of taxes, sales and distribution expense, and converted on a 1939 dollar basis, means manufacturing costs will be up almost $3 billion, on the same volume as in 1939. However, production in 1946 is expected to be up 50.2 per cent.

In the American system of private enterprise the cost of doing business is the chief determinant of success or failure, so the import of cost data is obvious. Cost is the main element in establishment of prices which determine the spread of markets, which in turn regulate employment volume.

Also, the cost-price ratio must be sufficiently broad to permit a reasonable profit on investment if risk capital is to be attracted for financing expansion of existing businesses and the launching of new undertakings.

Manufacturing, sales and distribution costs have risen sharply since 1939. The rise in metalworking has been particularly onerous under inflexible price ceilings, the price freeze preventing compensatory sales income. Wage increases alone of 50 per cent or more over 1939 are reported by some.

Large volume business enabled metalworking companies to keep on the profit side of the ledger during the war. But soaring costs cut unit profit margins severely and the end is not in sight. With labor seeking a 30 per cent postwar wage increase to maintain wartime take-home pay, and government price control relaxed to minor degree, the ratio of costs to prices threatens to shrink to the point where profit margins will be precarious or nonexistent. Some firms because of improved efficiency and increased volume, may be able to absorb additional wage costs without endangering their financial stability, but STEEL's study indicates these are not typical.

Higher wages and reduced worker efficiency are the chief gremlins scampering over the cost mechanism. A high degree of production efficiency already has been attained through plant modernization and mechanization. Further progress in this direction can be expected.

Greatest increase in manufacturing cost is anticipated in plants employing 100 to 250 while, significantly, the smallest rise is expected by the larger plants, those employing over 1000. The implications are plain that medium sized plants face the tightest squeeze between costs and selling prices, with the grip most severe in the 100 to 250 employe classification.

In the area of sales and distribution costs, the metalworking industry expects an average rise in 1946 over 1939 of 13.7 per cent. Expected increases are fairly uniform among the various plant groupings.

Consensus of the industry is that a more realistic view of the cost of doing business must be adopted by government and labor if manufacturing is to expand and provide more jobs and more goods at prices consumers can pay.

AVERAGE INCREASES IN COSTS BY SIZE OF PLANTS

1946 vs 1939	Manufacturing Costs	Sales and Distribution Costs
Less than 50 Employes	24.7%	13.9%
50—100 Employes	26.6%	13.0%
100—250 Employes	28.8%	13.3%
250—500 Employes	26.7%	12.0%
500—1000 Employes	25.8%	10.3%
Over 1000 Employes	24.0%	14.2%
TOTAL—Entire Industry	25.7%	13.7%

SELLING PRICES

Industry Looks for Price Increases Averaging 17.1% . . . . . .

PROBABLY the most crucial problem confronting American industry concerns re-establishment of an equitable ratio between production costs and selling prices. Solution of the problem, however, for the present and on into the future, is completely beyond the control of industry itself, with government bureaucracy in the driver's seat refusing to face the economic facts of life.

Though inflationary forces at work throughout the war have already brought a serious unbalance in the economy, industry's hands are tied and it can do no more than hope the cost-price squeeze in which it finds itself will be eased before economic confusion ensues.

Consequently, any predictions with respect to selling prices in 1946 can be little more than conjecture. Too many "ifs" and "buts" must be wrestled with to establish any firm position on prices at this stage of the game. Nevertheless, it is reasonable to assume some price relief may be afforded as conditions become progressively worse and those at the government controls see the light.

On this assumption, most participants in STEEL's study of the metalworking industry hazard a prediction on 1946 price expectations. It is not surprising that higher levels are looked for as compared with 1939 but, strikingly, the average increase anticipated is moderate, only 17.1 per cent. Since such an increase is considerably under the anticipated rise in manufacturing costs, and is only slightly higher than the indicated increase in sales and distribution costs, 25.7 per cent and 13.7 per cent respectively, the implications would seem to be that manufacturers hope to absorb at least part of higher costs through more efficient production methods and higher volume of business.

It is important to note that any increase foreseen in the 1946 price level over 1939 takes into account advances effected since that year. It is true that since 1942 prices have been in a strait-jacket which permitted little movement. Nevertheless, prices did advance some in the period 1939-1945, though chiefly before the price freeze went on. The Bureau of Labor Statistics index for all metal products rose almost 10 points between 1939 and 1945, but a rise of 9 points alone was effected prior to the freeze in 1942, since which time the index has risen less than a point. In iron and steel products the index in 1939 stood at 95.1, advancing to 97.2 in 1942 and to around 98 last year. The nonferrous metal index rose about seven points between 1939 and 1942, but went up less than 1 point throughout the war years.

ANALYSIS OF SELLING PRICES BY SIZE OF PLANTS

Size of Plants	Average Increase Expected	FAVOR PRICE CONTROLS Until Supply and Demand are in Closer Balance
Less than 50 Employes.....	18.1%	57.6%
50—100 Employes.....	17.8%	55.7%
100—250 Employes.....	17.7%	54.5%
250—500 Employes.....	18.7%	51.9%
500—1000 Employes.....	16.4%	53.8%
Over 1000 Employes.....	16.1%	48.2%
TOTAL—Entire Industry.....	17.1%	55.4%

EXPECTED 1946 SELLING PRICES COMPARED WITH 1939

For all practical purposes it can be concluded the metalworking industry hopes for a price level over 1939 which would come fairly close to matching the rise in its manufacturing costs. The minority of plants anticipating unchanged price levels, or a decrease, largely predicate their views on possible lower unit costs resulting from increased efficiency, greater worker productivity, and expanded volume of business. Also some of these latter plants may not face as severe a pricing problem as the majority because of wider profit margins at the time the price freeze went on, or because they have been able to wheedle out of the government control authority a measure of relief permitting them greater latitude in cost absorption.

That production efficiency and volume business are being leaned upon to bear some of the cost increase is indicated by the fact the largest metalworking plants, those employing 1000 or more, anticipate the lowest percentage rise in prices over 1939 levels. Next lowest grouping is the 500 to 1000 classification, with the medium sized and the smallest plants, estimating the highest average price rise.

It appears from the data tightest squeeze between costs and prices is being exerted on the medium sized and smaller plants which are not in position to take as full advantage of cost-saving methods as the larger manufacturers.

The majority of metalworking manufacturers favor government price control until supply and demand are in closer alignment, 55.4 per cent signifying approval. However, opinion is highly mixed and runs from one extreme in favor of complete lifting of government regulation to the other extreme of strict controls until supply is sufficient to assure prevention of a runaway price spiral. Many manufacturers feel that except in certain lines where supply is far out of balance with demand, price control can be safely lifted, believing that competition within the various markets will keep prices within reason.

Continuance of price control is favored by more small plants than large ones. In fact 57.6 per cent of the very smallest grouping, those employing less than 50, favor control as against 48.2 per cent of those manufacturers employing more than 1000. It can be taken from this that the smaller interests see in price control a degree of protection for them. If controls were removed, small plants might find it more difficult to cope with rising raw material prices than would large companies.

Time and again comments by individual manufacturers emphasize that the unfavorable cost-price ratio must be corrected if a stable economy is to be attained. No comparison pricewise with conditions after World War I is apropos in present circumstances. When the war ended in 1918 price controls were quickly removed. Further, wages had not risen as much as wholesale prices of manufactured products. During World War II just the reverse of this occurred due to governmental policies aimed at raising wage rates while curbing the rise in prices.

It appears that manufacturing industry cannot be kept trapped indefinitely between high costs and inflexible price ceilings if the incentive to produce is to be fostered and larger employment made possible. The cost-price issue must be faced without hesitation by those in government in position to take constructive action looking toward correction of the distortion in the economy resulting from a shortsighted policy of political expediency.

Heavy Purchases for Plant and Equipment Indicated for 1946

RECONVERSION OF WARTIME PLANTS:

21% Found Reconversion Necessary

BREAKDOWN BY SIZE OF PLANTS:	Found It Necessary	Was Completed Jan. '46	Will Be Completed April, '46	Will Be Completed Later
Less than 50 Employes...	13.4%	67.4%	25.0%	7.6%
50—100 Employes.....	17.9%	77.7%	20.5%	1.8%
100—250 Employes.....	22.8%	70.4%	28.2%	1.4%
250—500 Employes.....	29.5%	78.9%	20.2%	0.9%
500—1000 Employes.....	38.1%	65.1%	28.6%	6.3%
Over 1000 Employes.....	37.9%	67.3%	29.1%	3.6%
TOTAL—Entire Industry	21.0%	71.8%	24.7%	3.5%

GOVERNMENT-OWNED PLANTS:

3.6% Operated Government-Owned Plants

BREAKDOWN BY SIZE OF PLANTS:	OPERATED GOV'T-OWNED PLANTS	BOUGHT OR INTEND TO BUY
Less than 50 Employes.....	0.6%	.....
50—100 Employes.....	0.8%	75.0%
100—250 Employes.....	1.5%	77.7%
250—500 Employes.....	7.3%	65.0%
500—1000 Employes.....	13.0%	55.0%
Over 1000 Employes.....	26.4%	61.8%
TOTAL—Entire Industry.....	3.6%	61.6%

NEW PLANTS AND ADDITIONS:

41.4% Expect to Buy or Build In Next 2 Years

BREAKDOWN BY SIZE OF PLANTS:	EXPECT TO BUY OR BUILD	TO INCLUDE RESEARCH FACILITIES
Less than 50 Employes.....	37.3%	33.2%
50—100 Employes.....	41.4%	39.7%
100—250 Employes.....	43.4%	43.5%
250—500 Employes.....	40.6%	35.9%
500—1000 Employes.....	48.2%	60.3%
Over 1000 Employes.....	56.3%	58.2%
TOTAL—Entire Industry.....	41.4%	40.8%

EXPANSION of plants and facilities by metalworking companies will be at a booming level during 1946 and the year following if expectations and hopes of the 3600 companies co-operating in STEEL's study are realized.

Two out of five of these companies intend to build or buy new plants or additions, other than government-owned plants, within the next two years. Eighty-five per cent of those which had government-owned equipment in their plants at the end of the war intend to buy all or part of it. More than half of the companies expect to buy other surplus government equipment. Nearly half are planning substantial purchases of other new equipment this year.

Industrial facilities in the United States in 1939 were valued at $40 billion. During the war years. an additional $25 billion was expended for such facilities, about $8 billion privately financed and the rest underwritten by the government.

Taking into consideration higher costs prevailing during war years, and also the increased efficiency of new facilities, it is estimated the wartime expansion boosted industrial capacity by 50 per cent. A portion of this expansion, of course, was for facilities which will have little or no peacetime use. Vast sums were poured into aircraft plants, shipyards, nonferrous metal plants and other facilities to produce war goods; many of these will represent excess capacity in peacetime. However, a large portion of the $17 billion government investment in facilities will be adapted for peacetime use. Presumably the bulk of the $8 billion private investment in wartime expansion represents facilities which can be utilized for peacetime production by their owners.

Typical of the expansion in industrial facilities is the increase in machine tools. At the end of 1939, there were 934,000 machine tools in place. Four years later the number had increased about 50 per cent to nearly 1,400,000. This includes prewar tools placed in storage in the course of conversion to war production; but, on the other hand, the new tools generally were heavier and more efficient than those displaced, so that the rise in actual operating capacity was at least as great as the numerical comparison indicates.

A majority of metalworking companies report they intend to purchase government-owned equipment, although only 23.2 per cent report they had such equipment in their plants when the war ended. More than half the companies indicated interest in buying government-owned equipment which they did not operate during the war. Substantial amounts of new equipment will be purchased by nearly half of all metalworking companies.

An accompanying table shows that a greater percentage of the larger companies had government-owned equipment than did the smaller plants. Also a large number of the big plants plan to buy a part of the government-owned equipment in their plants. However, more of the small plants intend to purchase all the government equipment in their plants, this being explained by the fact that many of them had only a few tools and those of a type readily adaptable to peacetime operations.

Companies in all size categories are interested in buying surplus government equipment from the other fellow's plant; more than half already have purchased or are shopping around for such equipment.

More of the larger plants intend to buy substantial quantities of new equipment this year. Among plants employing more than 1000, 64.9 per cent are contemplating large purchases, whereas slightly more than two-fifths of those employing under 50 intend to purchase substantial amounts of new equipment.

Only 3.6 per cent of companies questioned operated government-owned plants, but of these, 61.6 per cent have bought or intend to buy them. As naturally expected, the largest number of government-owned plants were operated by the larger companies, 26.4 per cent of those employing more than 1000 having such plants, and only a negligible number of small companies operating government plants. However, where smaller companies have been operating government plants, a larger percentage have bought or intend to buy them. Here again, the indicated explanation is that where a small company undertook to operate a government-owned plant, the plant was of a type which fitted into the company's postwar plans.

More than two-fifths of the companies, 41.4 per cent, intend to buy or build new plants or additions within the next two years. Of these, 40.8 per cent are making provisions to include new research facilities, indicating an increase in emphasis to be placed on industrial research.

More of the larger companies plan new plants than do the smaller firms, 56.3 per cent of those employing more than 1000 planning expansions while only 37.3 per cent of those employing under 50 are making such plans. The larger companies are placing more emphasis on research, three-fifths of the companies employing more than 500 including research facilities, compared to one-third of those employing under 50.

Reconversion was a problem for only 21 per cent of the metalworking companies; 71.8 per cent of those finding it necessary to reconvert had completed the job by the first of the year and practically all of the remainder expect to have completed reconversion by April 1. Only 3.5 per cent of those having reconversion problems will not have them solved by the end of the first quarter.

SURPLUS GOVERNMENT-OWNED EQUIPMENT:

23.2% Had Gov't Equipment in Their Plants V-J Day

BREAKDOWN BY SIZE OF PLANTS:	Had Gov't Equipment	Bought or Expect To Buy All	Bought or Expect To Buy Part	Will Buy None Of It
Less than 50 Employes...	8.5%	24.7%	40.7%	34.6%
50—100 Employes.....	16.5%	38.1%	48.6%	13.3%
100—250 Employes.....	24.1%	22.9%	62.1%	15.0%
250—500 Employes.....	41.2%	16.3%	74.9%	8.8%
500—1000 Employes.....	59.0%	10.4%	70.8%	18.8%
Over 1000 Employes.....	64.6%	5.4%	84.8%	9.8%
TOTAL—Entire Industry	23.2%	19.4%	65.2%	15.4%

OTHER SURPLUS GOV'T-OWNED EQUIPMENT:

(OPERATED IN OTHER PLANTS)

53.6% Have Bought or Intend to Buy

BREAKDOWN BY SIZE OF PLANTS:	Have Bought or Intend To Buy Other Gov't Equipment
Less than 50 Employes.....	49.9%
50—100 Employes.....	54.4%
100—250 Employes.....	55.3%
250—500 Employes.....	60.8%
500—1000 Employes.....	53.1%
Over 1000 Employes.....	49.2%
TOTAL—Entire Industry.....	53.6%

NEW EQUIPMENT PURCHASES:

46.8% Will Buy Substantial Amount in 1946

BREAKDOWN BY SIZE OF PLANTS:	Will Buy Substantial Amount of New Equipment
Less than 50 Employes.....	41.5%
50—100 Employes.....	47.3%
100—250 Employes.....	45.8%
250—500 Employes.....	50.0%
500—1000 Employes.....	55.5%
Over 1000 Employes.....	64.9%
TOTAL—Entire Industry.....	46.8%

PRODUCTION VOLUME

$8,046,000,000 IN 1946

5,897,000,000 IN 1939

36.4%

NET INCREASE EXPECTED OVER 1939

OF ALL PLANTS
IN PRIMARY METAL PRODUCTION

- **79.0%** EXPECT INCREASE AVERAGING 48.9%
- **14.6%** EXPECT NO CHANGE
- **6.4%** EXPECT A DECREASE AVERAGING 32.8%

EMPLOYMENT

824,000 EMPLOYES IN 1946

645,000 EMPLOYES IN 1939

27.8%

NET INCREASE EXPECTED OVER 1939

OF ALL PLANTS
IN PRIMARY METAL PRODUCTION

- **73.7%** EXPECT INCREASE AVERAGING 39.9%
- **19.0%** EXPECT NO CHANGE
- **7.3%** EXPECT DECREASE AVERAGING 22.1%

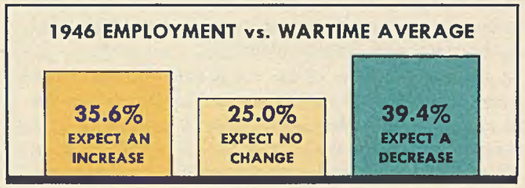
1. Primary Metal Producers

ALTHOUGH producers of primary metal products perceive a rough road ahead in necessary readjustments from wartime, the industry expects 1946 will prove one of the best, if not the best, full peacetime years in its history. In fact, this group expects to account for about 28 per cent of the $29 billion business which the entire metalworking industry plans on doing in 1946.

At war, the primary metal industry was presented with the problem of expanding its capacity to what would have seemed like astronomical figures only a few years earlier. In 1929, which was considered a lush year, the steel industry had capacity of 71,000,000 tons but now it is 34 per cent greater at 95,000,000 tons. Immediate prospects are that this huge capacity will not be kept busy in serving peacetime requirements, yet it conceivably could be if the government succeeds in achieving a peacetime national income goal of $130 billion plus.

In reporting to STEEL on its 1946 prospects, the steel industry was somewhat less optimistic than the metalworking industry as a whole. It expects 1946 volume of business will be 30 per cent greater than in 1939 as compared with an average increase of 36.4 per cent for the metal producing group and 50.2 per cent for the entire metalworking industry. Interpreted in terms of steel ingots, the 30 per cent increase bears out the prediction made by Walter S. Tower, president of the American Iron and Steel Institute, that initial postwar demand would be around

1946 EMPLOYMENT vs. WARTIME AVERAGE



65,000,000 to 70,000,000 tons annually. Based on an increase of 30 per cent over actual 1939 production, the industry may expect a 69,000,000-ton year in 1946.

Were it not for the unknown factors of labor and prices, the steel industry would be in an excellent position to keep pace with the needs of an expanding national economy. Some 40 blast furnaces with 25 to 28-ft hearths are a far cry from the old stone stacks with their 6 and 9-ft hearths when all were operated on charcoal. In fact, the industry with its 243 blast furnaces can produce 10,000,000 more tons of pig iron per year than it could with precisely the same number of stacks in 1938 or only seven years ago.

Utilization of some government-financed steel plants such as the sprawling Geneva works and the partially completed plant operated by Republic Steel Corp. at South Chicago may prove to be a problem but reconversion promises not to be overly difficult. Only 13 per cent of the plants find reconversior necessary and of these, 80 per cent had completed work by Jan. 1 and another 10 per cent will finish by Apr. 1. In many cases, scrambled facilities were involved which do not interfere particularly with production of peacetime products and which may eventually revert to the steel companies on a reasonable basis.

Despite the fact that the steel industry appears overbuilt, it will continue to go ahead with modernization. Forty-one per cent of the industry expects to build new plants or additions in 1946 and of this group 23 per cent will include research facilities. Many years of the usual research effort for all industry were packed into the war period and the steel industry will participate in the impetus given to postwar research.

No illusions are held over costs and selling prices, as will be observed in the accompanying data. In fact, as compared with 1939, steel plants expect manufacturing costs in 1946 will go up more than twice as much as selling prices and, in addition, relatively greater sales and distribution costs will serve to eat further into the margin available for profit. As for employment, the industry looks for an increase of 18.2 per cent over 1939 which would make the total working force about 500,000. This figure would compare with the 1942 wartime peak of 568,000 and the 1939 figure of 425,000.

Nonferrous metal producers are confronted with many of the same problems as steel. For the aluminum and magnesium industries, these problems are greatly accentuated. Enormous capacity was constructed at government expense to provide topheavy requirements of the aircraft industry and there is little immediate hope of utilizing all of these facilities for civilian products. Back in 1939 the magnesium industry produced what was then considered the very satisfactory output of 6,700,000 lb but during the war years capacity skyrocketed to 586,000,000 lb. A large share of this capacity cannot be operated economically and apparently will be abandoned or held for standby purposes. However, the magnesium industry may be expected to make an aggressive play for its share of the materials business.

The aluminum industry's capacity also has been increased by several hundred per cent with government-financed production units spread across the country from the silver-bus-bar-equipped plant in Brooklyn to the great plants in the Pacific Northwest operated on power from the Bonneville Dam project. Capacity figures for earlier years are not available but production for 1939 was 327,000,000

UNIT COST OF MANUFACTURING

28.2%

NET INCREASE EXPECTED OVER 1939

OF ALL PLANTS
IN PRIMARY METAL PRODUCTION

- **96.7%** EXPECT INCREASE AVERAGING 29.4%
- **1.8%** EXPECT NO CHANGE
- **1.5%** EXPECT DECREASE AVERAGING 15.0%

SALES & DISTRIBUTION COSTS

13.4%

NET INCREASE EXPECTED OVER 1939

OF ALL PLANTS
IN PRIMARY METAL PRODUCTION

- **68.1%** EXPECT INCREASE AVERAGING 20.9%
- **27.9%** EXPECT NO CHANGE
- **4.0%** EXPECT DECREASE AVERAGING 19.6%

SELLING PRICES

19.8%

NET INCREASE EXPECTED OVER 1939

OF ALL PLANTS
IN PRIMARY METAL PRODUCTION

- **83.7%** EXPECT INCREASE AVERAGING 23.7%
- **15.1%** EXPECT NO CHANGE
- **1.2%** EXPECT DECREASE AVERAGING 20.0%

(53.9% Favor Continuance of Price Controls)

lb. During the war capacity shot up to 2,300,000,000 lb annually and production came close to that figure. Disposal of surplus government plants so far remains a problem for which RFC will have to find a solution. In the meantime, private industry is going ahead with amibitious plans for marketing the output from its own plants and there appears to be every assurance that volume will be substantially higher than in prewar.

Copper and its alloys were in such persistent demand during the war that they were used only for the most essential purposes and one section of the WPB devoted its entire efforts to finding substitutes. Primary copper production, as well as output of lead and zinc, were stimulated by government subsidy to make operation of marginal mines profitable with the result that about 1,500,000 tons annually were turned out during the war compared with slightly over 1,000,000 tons in 1939. Unless the base price of copper rises sharply after the present ceiling is lifted, production could logically be expected to settle back to prewar levels.

Iron and steel and nonferrous foundries view the future through rose colored glasses of somewhat different tints. The former look for an increase of 35.2 per cent in 1946 production as compared with 1939 while the latter place the increase at 47.4 per cent. The difference of opinion on the outlook is readily explained by an examination of the several types of foundries.

Gray iron foundries may be expected to benefit greatly from the resumption of manufacture of consumer goods such as automobiles, refrigerators, washing machines and the many other items which require gray iron castings in quantity.

Gray iron, as well as other type of foundries, are being made more efficient and at the same time more attractive to workers through the use of automatic molding machines, conveyor lines, mechanical shakeouts, improved melting and other equipment. Technically, the industry has improved its status through closer control over melting procedure, sand, molding and gating, and chemical and physical testing. Gray cast irons in the 100,000 psi tensile strength range are no longer uncommon as compared with around 60,000 psi before the war.

The malleable casting industry is in a greatly improved position to compete for postwar business. Early in the war, malleable castings did not receive proper attention but their adaptability for many purposes, especially where tensile strength and resistance to shock are important considerations, was soon recognized. As a result, available capacity soon proved insufficient. Two new modern straight-line production plants were constructed and other units of the industry added to and improved existing facilities. One plant employs cupola-electric furnace duplexing and another coupla-air furnace duplexing for the purpose of providing continuous pouring.

No radically new production techniques were developed by steel casting producers during the war although existing methods were revised and improved. As an example, quenching in water to improve physical characteristics had been confined to small castings for many years but it was found that the method could be readily applied to castings of large size and several foundries installed heat treating equipment for this purpose. Large castings now are being produced to specified hardenabilities which are not unlike wrought steels. The industry also succeeded in erasing the prejudice against converter steel which was used for many specifications. As in the case of the steel industry it also was found that high-grade alloy steels could be made in a basic open-hearth furnace.

In the nonferrous casting group, spectacular increases in capacity were effected by aluminum and magnesium foundries as the direct result of war demand. In 1939, the aluminum casting industry had a capacity for the production of somewhere in the neighborhood of 80,000,000 lb of castings annually. Wartime capacity in private hands increased to around 640,000,000 lb, which figure did not include the now-idle government-built foundries for the production of aircraft cylinder head castings.

In 1939, the production of magnesium sand, permanent mold and die castings totaled 1,800,000 lb which was more than four times greater than 1935 production of 375,000 lb. In 1944, production was approximately 86,000,000 lb, of which about 90 per cent represented sand castings, 7 per cent permanent mold castings and 3 per cent die castings. Not included in the 1944 total was the large number of cast incendiary bomb bodies. War experience in making aircraft castings taught the industry to make castings of high quality, of close dimensional specifications and in complicated shapes which cut down on machining and assembly time. This experience will stand the industry in good stead in bidding for peacetime business.

Makers of copper base castings operated under difficulties during the war because of the critical shortages of copper and tin. Despite these difficulties, the industry operated at top capacity, expanded and modernized facilities and aided in solving the materials problem through downgrading of specifications. Manganese bronze which contains only 58 per cent copper (balance 39 Zn and 1 each Mn, Al and Fe) and practically no tin was adopted for use in making small castings in place of the tin bronzes which required around 90 per cent copper and 5 to 10 per cent tin. One important source for manganese bronze was in fired cartridge cases. Tin bronzes, such as Navy "G" metal were downgraded to Navy "M" to conserve copper and tin.

Forge shops are the most optimistic of the primary metal group. It is not possible to project 1939 figures since these are not available but a clue to the volume of business done by the industry is offered by figures on shipments gathered by the Bureau of the Census. Shipments of steel forgings in 1944 were about 4,200,000 net tons, of which 2,500,000 were drop and upset forgings and the balance open hammer and press forgings. Shipments of all types dropped off sharply last summer and by August were down to the basis of 2,300,000 tons annually.

Reconversion was no particular problem for the forging industry, since only 5 per cent found it necessary and the work has all been completed. The same percentage had government plants of which half will be purchased. About 25 per cent plan new plants and additions. Substantial quantities of new equipment will be purchased by 35 per cent.

ANALYSIS OF PRIMARY METAL PRODUCERS BY PRODUCT CLASSIFICATIONS

(PERCENTAGE OF INCREASE EXPECTED IN 1946 OVER 1939)

Product Classification	PRODUCTION VOLUME	EMPLOYMENT	UNIT COST OF MFG.	SALES & DISTRIBUTION COSTS	SELLING PRICES
Blast Furnaces, Steelworks, Rolling Mills	30.3%	18.2%	25.3%	14.3%	12.7%
Iron and Steel Foundries	35.2%	25.2%	30.1%	13.1%	22.8%
Nonferrous Smelters, Refiners, Rolling Mills	45.0%	39.0%	27.1%	13.1%	8.7%
Nonferrous Foundries	47.4%	42.3%	26.7%	14.9%	21.9%
Iron and Steel Forgings	51.2%	45.9%	27.9%	13.3%	21.0%
Weighted Average—Primary Metal Producers Group	36.4%	27.8%	28.2%	13.4%	19.8%

RECONVERSION OF PLANTS IN PRIMARY METAL PRODUCTION:

- **10.1%** Found Reconversion Necessary
  - 69.5% OF THESE RECONVERTED BY JAN. 1, 1946
  - 25.3% WILL BE RECONVERTED BY APRIL 1, 1946
  - 5.2% WILL NOT BE RECONVERTED BY APRIL 1, 1946

GOVERNMENT-OWNED PLANTS:

- **6.7%** Operated Government-Owned Plants
  - 56.5% OF THESE HAVE BOUGHT OR EXPECT TO BUY

NEW PLANTS AND ADDITIONS:

- **33.0%** Expect to Buy or Build in Next 2 Years
  - 35.0% OF THESE WILL INCLUDE RESEARCH FACILITIES

SURPLUS GOV'T-OWNED EQUIPMENT:

- **47.9%** Had Gov't Equipment on VJ-Day
  - 29.6% OF THESE HAVE BOUGHT OR WILL BUY IT ALL
  - 55.6% HAVE BOUGHT OR WILL BUY PART ONLY
  - 14.8% WILL BUY NONE OF IT

OTHER SURPLUS GOV'T-OWNED EQUIPMENT: (Operated in Other Plants)

- **48.5%** Have Bought or Intend to Buy

NEW EQUIPMENT PURCHASES:

- **42.8%** Will Buy Substantial Amount in 1946

2. Fabricated Metal Products

BECAUSE plants fabricating metal products cover such a wide range of enterprise—all the way from stamping out toys to the fashioning of metal doors and building hardware—and further because they cater not only to the ultimate consumer but to other fabricating plants as well, it is treading on dangerous ground to draw any sweeping generalizations as to their prospects for 1946, unless they all follow the same general pattern. The charts presented herewith demonstrate that they do, with a few spotty exceptions.

Striking a broad general average of replies to questionnaires, it may be postulated that business in 1946 will be good, perhaps half again as good as in 1939, bringing along with it a sharp increase in employment from the level of six years ago, appreciably higher unit manufacturing costs, moderately higher sales and distribution costs, moderately higher selling prices.

Those expecting a lower volume of business this year are almost negligible in number, while only one out of eight sights an unchanged order level. Three out of four expect their employment to lift 50 per cent beyond 1939 payrolls, with the indicated possibility of opening 200,000 more jobs in these industries which in 1939 gave livelihood to 584,000. Many of these jobs obviously have already been filled, but even so two out of five plants expect to hire more people than their wartime average.

As to costs, there is no argument; practically all concede higher unit figures are inevitable, and they believe the boost over 1939 will average out at 25 per cent or better. Percentage increases in sales and distribution costs average only half as much as the expected hike in unit manufacturing costs, suggesting that anticipated increases in the wage level will outstrip the rising trend in such items as remuneration of salesmen, advertising, etc. Despite the upward movement of cost elements, selling prices probably will not follow suit to the same extent which can indicate only two things: Either manufacturers expect to absorb higher unit costs by reducing profit margins and making up the difference on the increased volume; or, barring the hoped-for 1946 volume, they will lose money. The latter of these alternatives can be suffered temporarily, and probably will be, but unless the trend gradually moves in the direction of the former, the economic machine will strip its gears and something will have to be adjusted.

Majority of opinion seems to favor retention of price controls, for awhile at least, but there is just a suspicion that the sentiment in favor of price control leans toward leaving the controls on what is purchased, (materials, parts supplies) but taking them off what is sold (the product), which obviously won't work.

Reconversion from war production assignments in metal fabricating plants was not the critical task involved in other industries, such as the transportation group, only a quarter of the plants surveyed having any particular problem in this respect, and of these most have already concluded the job. By April 1, reconversion will be but a memory for all.

In common with all industry, expansion of production facilities is on the 1946 agenda, with two out of five contemplating such work in the next 24 months. Research facilities stand high on the list of proposed new departments. Only one plant in five had government-owned equipment in its possession when the war ended and much of this machinery will be purchased, in whole or in part, by its operators. Over half the metal fabricators see additional needs for production equipment other than government-owned.

Running down the list of product classifications in the metal fabricating field, it is noted the greatest increases in anticipated 1946 production volume are, in order: Bolts, nuts, washers and rivets; metal doors, sash, frames, molding and trim; cutlery and hand tools; sheet metal work; and stamped and pressed metal products. The first, fourth and fifth in this group of five figure importantly in the supply of standard parts and components for motor cars and trucks. In fact, the dollar volume of their annual business far exceeds that of any of the other listings and perhaps all of them combined. This must be taken into account in arriving at a weighted average—46.3 per cent—for the entire group.

Since the motor vehicle group looks for an increase in its production of 59 per cent over 1939, it is entirely logical that plants supplying bolts, nuts and stamped and pressed

PRODUCTION VOLUME

$5,804,000,000 IN 1946

3,411,000,000 IN 1939

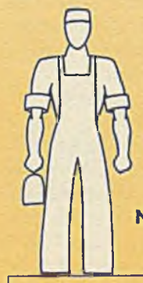
46.3%

NET INCREASE EXPECTED OVER 1939

OF ALL PLANTS PRODUCING FABRICATED METAL PRODUCTS

- 81.8% EXPECT INCREASE AVERAGING 58.6%
- 12.3% EXPECT NO CHANGE
- 5.9% EXPECT A DECREASE AVERAGING 27.6%

EMPLOYMENT



796,000 EMPLOYES IN 1946

584,000 EMPLOYES IN 1939

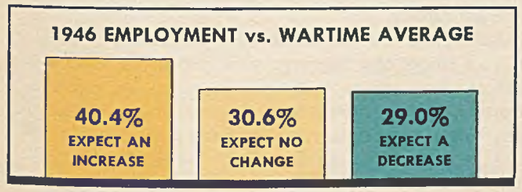
36.3%

NET INCREASE EXPECTED OVER 1939

OF ALL PLANTS PRODUCING FABRICATED METAL PRODUCTS

- 75.3% EXPECT INCREASE AVERAGING 49.9%
- 19.3% EXPECT NO CHANGE
- 5.4% EXPECT DECREASE AVERAGING 23.7%

1946 EMPLOYMENT vs. WARTIME AVERAGE



UNIT COST OF MANUFACTURING

25.6%

NET INCREASE EXPECTED OVER 1939

OF ALL PLANTS PRODUCING FABRICATED METAL PRODUCTS

- 96.1% EXPECT INCREASE AVERAGING 27.0%
- 2.4% EXPECT NO CHANGE
- 1.5% EXPECT DECREASE AVERAGING 21.5%

SALES & DISTRIBUTION COSTS

13.1%

NET INCREASE EXPECTED OVER 1939

OF ALL PLANTS PRODUCING FABRICATED METAL PRODUCTS

- 67.1% EXPECT INCREASE AVERAGING 21.0%
- 27.4% EXPECT NO CHANGE
- 5.5% EXPECT DECREASE AVERAGING 17.4%

SELLING PRICES

18.4%

NET INCREASE EXPECTED OVER 1939

OF ALL PLANTS PRODUCING FABRICATED METAL PRODUCTS

- 82.7% EXPECT INCREASE AVERAGING 22.4%
- 16.7% EXPECT NO CHANGE
- 0.6% EXPECT DECREASE AVERAGING 19.0%

(54.9% Favor Continuance of Price Controls)

RECONVERSION OF PLANTS PRODUCING FABRICATED METAL PRODUCTS:

23.5% Found Reconversion Necessary

- 72.2% OF THESE RECONVERTED BY JAN. 1, 1946
- 25.6% WILL BE RECONVERTED BY APRIL 1, 1946
- 2.2% WILL NOT BE RECONVERTED BY APRIL 1, 1946

GOVERNMENT-OWNED PLANTS:

1.6% Operated Government-Owned Plants

- 57.0% OF THESE HAVE BOUGHT OR EXPECT TO BUY

NEW PLANTS AND ADDITIONS:

41.5% Expect to Buy or Build in Next 2 Years

- 33.2% OF THESE WILL INCLUDE RESEARCH FACILITIES

SURPLUS GOV'T-OWNED EQUIPMENT:

18.8% Had Gov't Equipment on VJ-Day

- 20.1% OF THESE HAVE BOUGHT OR WILL BUY IT ALL
- 59.3% HAVE BOUGHT OR WILL BUY PART ONLY
- 20.6% WILL BUY NONE OF IT

OTHER SURPLUS GOV'T-OWNED EQUIPMENT: (Operated in Other Plants)

54.5% Have Bought or Intend to Buy

NEW EQUIPMENT PURCHASES:

51.2% Will Buy Substantial Amount in 1946

metal parts should expect a commensurate increase. Bolt and nut plants, it will be observed, show almost identical projections with the motor vehicle industry. A surprising aspect is that the screw machine products and fabricated wire products classifications do not reflect a similar sentiment.

A possibility in respect to metal finishing, which includes electroplating, is that motor companies may be trending toward taking their work away from commercial platers in favor of bringing it in to their own plating departments, possibly with the aim of lowering costs and improving quality. Further confirmation of this possibility might be inferred from the comparatively low increase in selling prices—11.5 per cent—anticipated by metal finishers. This figure is well below the weighted average of 18.4 per cent, is in fact the lowest on the entire product classification list.

The classification covering cutlery and hand tools needs further explanation, since it includes as well edge tools, cutting dies used on paper and leather, hand tools such as hammers, wrenches, pliers, screw drivers, shovels, rakes and a variety of special tools used by artisans; files, hand saws and saw blades. Disappearance of many of these items during the war, partly as a result of large military purchases and partly as the result of discontinuance of manufacture of some under limitation orders of the WPB, has created a three-year void which could be filled rapidly, given sufficient production. Thus, manufacturers in this group doubtless are on safe ground in predicting production volume 51 per cent beyond 1939.

High volume predictions in the field of metal doors, both ferrous and nonferrous, and metal covered doors and sash, window and door frames, store fronts, molding and trim are a concomitant of accelerated activity and planning in respect to small buildings, stores, showrooms, automobile dealer establishments and the like.

Another classification falling below the weighted averages for production volume increase and employment increase in the metal fabricating industries is containers. It includes plants engaged in manufacturing packers' cans, beer cans, oil containers, general-line cans, milk and ice cream cans, plus other tinware, excepting household and hospital utensils, with tin plate, terne plate, black plate or enameled sheet used in their fabrication. This has been an enormously expanded industry which by 1941 had reached a new peak, tin mill products alone aggregating 3,509,399 tons. Advent of war meant a considerable decline in this tonnage because of necessary restrictions on the use of tin for coatings. Now, however, with the suspension of most restrictions covering manufacture and use of metal cans, and some improvement indicated in tin supply, it is possible 1946 may top the record tonnage of 1941.

Significant development in the tin can industry has been the introduction of electrolytic tin plate which first became important in 1942, when 82,426 tons were produced. Last year, output was over ten times this amount, for around 884,000 tons. Experts believe there is going to be considerable readjustment between the tonnages of hot-dipped and electrolytic tin plate produced, once the supply of tin becomes freer. Actual capacity for both forms of tin plate is far in excess of production last year, for electrolytic being 2,231,850 tons and for hot-dipped 3,795,850 tons, or over 6 million tons in all. Thus, if full capacity could be used, and a market established for the output, 60 per cent more electrolytic plate could be supplied and 45 per cent more hot-dipped.

Outlook for the structural steel fabricating industry, where a 40 per cent improvement in production volume is averaged from replies to STEEL's questionnaire, points to structural steel requirements for 1946 of around 1,650,000 tons, with a possible average over the next five years of 2,400,000 tons. This places no strain on capacity for fabricating, which is estimated at 3,500,000 tons annually, or rolling mill capacity for structurals of several times that amount. Given material and men, capacity of neither fabricator nor rolling mill has been overtaxed in recent years, the best year for structural fabricating being 1929 when 3,597,825 tons of steel rolled through shops.

Bridges and buildings are the coffee and cakes of the structural industry, and its components are returning to that fare avidly. Total bookings and shipments of fabricated steel for bridges and buildings have been mounting for some months, and were nearly 50 per cent higher in 1945 than in 1944. Of this volume, an estimated 40-45 per cent was purchased direct by the government.

Production of light and heavy shapes in 1945 is estimated at 4,250,000 tons, or about 400,000 tons below the previous year. Decline was sharpest in heavy shapes, although slackening in shipbuilding somewhat affected the rolling of light sections.

The metal fabricating industries find themselves in no position which is peculiarly their own as far as basic economic issues are concerned. What affects other industry will affect them. Precipitate wage increases bludgeoned through by autocratic union leaders in major industrial groups will lose no time in being forced upon the fabricating industries.

From a manufacturer of padlocks and hardware specialties come these typical comments: "It seems to me our government officials have their economics badly twisted. They preach that prices need increase only to absorb a portion of the labor cost increase in a particular plant. They are observing only one phase in the cycle of cost increases. They do not seem to realize that nationwide labor increases will bring corresponding cost increases for materials, supplies, salaries, services, etc. . . .

"When it is all done, we shall have had a merry ride with chaos in its wake. In the end we shall have inflation —higher incomes for some and higher prices for all, but not as many goods, and thus a lower standard of living for everybody and ruin for many.

"It may be old-fashioned to suggest that the nation think in terms of how much it can produce for how little, instead of how little it can produce for how much, but it's fundamental."

ANALYSIS OF METAL FABRICATORS BY PRODUCT CLASSIFICATIONS

(PERCENTAGE OF INCREASE EXPECTED IN 1946 OVER 1939)

Product Classification	PRODUCTION VOLUME	EMPLOYMENT	UNIT COST OF MFG.	SALES & DISTRIBUTION COSTS	SELLING PRICES
Containers	33.7%	23.8%	20.2%	10.7%	12.1%
Cutlery and Hand Tools	51.3%	38.0%	22.0%	13.8%	13.5%
General Hardware	41.7%	34.2%	28.4%	11.2%	16.5%
Plumbers' Supplies, Valves, Fittings	39.8%	28.2%	26.5%	10.6%	16.3%
Fabricated Structural Steel, and Ornamental Iron Work	39.9%	21.8%	24.9%	17.6%	22.8%
Metal Doors, Sash, Frames, Molding and Trim	51.6%	35.9%	26.3%	12.0%	18.0%
Boiler Shop Products and Fabricated Plate	43.6%	36.8%	26.6%	16.3%	19.2%
Sheet Metal Work	45.9%	35.1%	25.9%	14.2%	18.6%
Stamped and Pressed Metal Products	44.2%	33.3%	26.4%	10.8%	18.9%
Toys and Light Metal Specialties	33.2%	17.8%	26.3%	12.7%	16.7%
Metal Finishing	37.5%	30.4%	18.6%	14.2%	11.5%
Lighting Fixtures	37.9%	30.3%	23.9%	12.4%	14.7%
Fabricated Wire Products	33.4%	32.8%	23.4%	14.0%	19.0%
Bolts, Nuts, Washers and Rivets	55.6%	39.3%	25.5%	11.7%	18.5%
Screw Machine Products	34.7%	29.6%	27.1%	11.6%	22.4%
Weighted Average—Fabricated Metal Products Group	46.3%	36.3%	25.6%	13.1%	18.4%

3. Transportation Equipment

UNBOUNDED optimism characterizes the tenor of the transportation equipment industries, which include automotive, aircraft, shipbuilding and railroad.

Lumping all four industries together, and recognizing the predominant influence on combined indexes exerted by the automotive group, virtually a 60 per cent increase in production volume over 1939 rates is anticipated, which would boost their combined output to better than $7.5 billion in terms of 1939 dollars. However, it must be remembered the 1946 dollar is equivalent to considerably less than the 1939 dollar, which would raise this production valuation possibly another 30 per cent to something under $10 billion. Against this must be weighted the industry's estimate of only a 20 per cent increase in selling prices over 1939, which would trim the total again to around $9 billion.

Employment statistics on a collective basis are interesting in that they project an increase for this year over 1939 somewhat less precentagewise than the anticipated volume increase, yet still substantial at about 47 per cent.

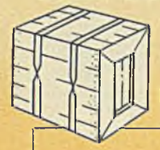
On the question of costs, outlook is for an appreciable increase over 1939 levels, with scarcely a dissenting voice. Of the four groups comprising transportation equipment industries, shipbuilding is considerably out of line as far as increases in unit cost of manufacturing are concerned. Why this should be is not too clear, except perhaps what little ship construction work is placed will have to be spread over more yards than was the case in 1939, bringing a sharp reduction in total volume of business for each yard and thus increasing unit costs.

Sales and distribution costs likewise are counted on to advance over 1939, although not by as wide a margin as manufacturing costs. Here again the shipbuilding group sees the most precipitate increase, all other groups holding pretty close to 15 per cent.

Consider, for a moment, the matter of selling prices as it relates to this effect. The motor vehicle group, for example, foresees an 18 per cent increase from 1939 prices. Now the automobile price level increased from 1939 to 1942 by almost this much, in some cases more, in some cases less. Recently the OPA set ceiling prices for a number of producers which were virtually at the 1942 level. This of course would confirm estimates of the motor vehicle industry in this survey that it intends to hold to the 1942 price pattern generally. How this can be done in the face of higher materials, parts and wage costs and still yield a profit may turn out to be the neatest trick of the year, or it may mean motor companies operating at a loss next year.

Again the shipbuilding group falls far out of line on the matter of selling prices, being practically double the per-

UNIT COST OF MANUFACTURING



26.9%

NET INCREASE EXPECTED OVER 1939

OF ALL PLANTS PRODUCING TRANSPORTATION EQUIPMENT

95.2%	EXPECT INCREASE AVERAGING 28.8%
2.1%	EXPECT NO CHANGE
2.7%	EXPECT DECREASE AVERAGING 18.7%

SALES & DISTRIBUTION COSTS

15.6%

NET INCREASE EXPECTED OVER 1939

OF ALL PLANTS PRODUCING TRANSPORTATION EQUIPMENT

69.2%	EXPECT INCREASE AVERAGING 23.6%
25.8%	EXPECT NO CHANGE
5.0%	EXPECT DECREASE AVERAGING 15.0%

PRODUCTION VOLUME

$7,628,000,000 IN 1946

4,931,000,000 IN 1939

58.1%

NET INCREASE EXPECTED OVER 1939

OF ALL PLANTS PRODUCING TRANSPORTATION EQUIPMENT

83.8%	EXPECT INCREASE AVERAGING 71.8%
10.2%	EXPECT NO CHANGE
6.0%	EXPECT A DECREASE AVERAGING 35.0%

EMPLOYMENT

817,000 EMPLOYES IN 1946

556,000 EMPLOYES IN 1939

46.9%

NET INCREASE EXPECTED OVER 1939

OF ALL PLANTS PRODUCING TRANSPORTATION EQUIPMENT

81.0%	EXPECT INCREASE AVERAGING 59.6%
14.8%	EXPECT NO CHANGE
4.2%	EXPECT DECREASE AVERAGING 33.8%

centages shown for others in the transportation equipment industries. Answer here probably is that a more expensive type of construction is contemplated, such as luxury liners, and fast streamlined freighters, instead of the wartime Liberty and Victory ships, which would involve sharply higher selling price per deadweight ton.

Two out of every five plants surveyed in the transportation equipment classification reported some degreee of reconversion of their wartime operations was necessary. Encouragingly enough 70 per cent of this work has already been completed, and it will be practically 100 per cent complete by the end of the first quarter.

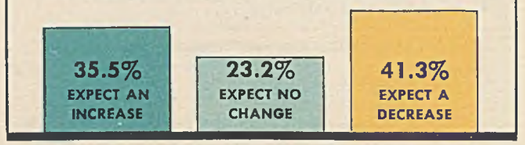
Only about one out of twelve companies covered by the study indicated operation of a government-owned plant during the war, and of these only a third have been or will be purchased by their operators. This confirms the generally held belief that most government-owned plants are not readily adaptable to peacetime production, either by virtue of location or their physical aspects. It is not that new facilities are unnecessary to handle projected increases in production volume, for over half the plants in the group indicate they expect to buy or build additional space before the end of next year. Interestingly, almost half of these projects will include research facilities, aimed to perfect new products, new methods and new equipment.

Government-owned equipment was more widely distributed, and most of its operators either already have acquired some or all of it or intend to do so. A majority of the plants also are going outside their own lists of government-owned equipment to make purchases from other surpluses. But government equipment alone will not fill the bill, since half the plants covered will be in the equipment market actively this year.

AUTOMOTIVE: Production of passenger cars and trucks in the U. S. and Canada in 1939 aggregated 3,732,718, with wholesale value something over $2.4 billion. This was not a particularly brilliant year for the motor industry since in eleven other years from 1923 through 1941 output exceeded this figure, often by a wide margin. Top year was 1929, when 5,358,420 units were built, closely followed by 1941 when 5,108,726 were assembled. Thus, if the industry's estimate of a 59 per cent increase for 1946 over 1939 is translated into units, the figure becomes 5,938,754 which is a new all-time high.

As the year starts, it seems apparent the industry will be a long way from achieving anywhere near such volume. This is not to say its sights were never set to this high level. They may have been, but unforeseen complications have developed. No. 1 of course is labor which is and will continue to be strike-minded probably through most of this year. No. 2 is the materials and parts bottleneck which may ease somewhat as suppliers get into the swing of their customary automotive production, but it is unlikely they

1946 EMPLOYMENT vs. WARTIME AVERAGE



SELLING PRICES

20.1%

NET INCREASE EXPECTED OVER 1939

OF ALL PLANTS
PRODUCING TRANSPORTATION EQUIPMENT

(63.9% Favor Continuance of Price Controls)

will be able to move beyond their top 1941 pace if indeed they even get that far. No. 3 problem is the matter of new plants and facilities, many of which are still in the planning stage and cannot be pried loose because of the lack of the necessary engineering and layout talent.

General Motors is actively planning increased capacity to handle a production volume 50 per cent beyond the 1941 level. It will be at least 18 months before this rate conceivably can be reached, so it is out as far as 1946 is concerned. Corporation officials stated late last year they would be more than satisfied if their assemblies reached the peak pace of 1941, and it is a good bet other officials in the industry feel likewise. Of course, there will be at least one newcomer in the industry but it will not produce over 200,000 units, and even that number would be a miraculous performance.

Some motor officials are more than a little disturbed over the announced intentions of many prospective buyers to defer new car purchases until the 1947 model appears. Widespread support of this procedure might put a serious crimp in 1946 model sales, even in spite of the complete lack of new cars for four years. It would make mince meat of statistical charts purporting to show unlimited markets for new automobiles.

AIRCRAFT: Considerable caution must be exercised in studying figures submitted by the aircraft parts industries. In the first place it must be remembered in 1939 total aircraft output was only 3700, valued at about $325 million. This figure soared to 12,000 in 1940, to 19,000 in 1941, to 48,000 in 1942, to 86,000 in 1943, to 96,000 in 1944 and back down to around 35,000. Taking the 1939 figure and applying the industry's estimated increase for 1946 of 53 per cent, the indicated production is 5600, a far cry from the levels of wartime years and probably considerably on the conservative side.

Industry spokesmen have stated the immediate outlook calls for a production level of about 10 per cent of the wartime peak. This would mean production of around 10,000 units. Against this, however, must be weighed the likelihood of vastly increased production of the light, personal-type airplane, not built during the war. One engine builder, supplying power units for this type of aircraft is optimistic enough to predict construction of 40,000 such craft in a year's time. In the face of these widely varying estimates, it seems obvious no sound conclusions can be drawn as to production.

Financially the primary aircraft manufacturers have emerged from the war in good shape, with ample working capital as a result of excess profits tax refunds, ranging from $2 million on up to $16 million. The primary problem now is orders.

In the commercial transport field a considerable volume of business had been placed with at least four of the large producers. Douglas has backlogs of around $265 million. Glenn Martin plans to be building 40 a month of its Model

ANALYSIS OF TRANSPORTATION EQUIPMENT MANUFACTURERS BY PRODUCT CLASSIFICATIONS

(PERCENTAGE OF INCREASE EXPECTED IN 1946 OVER 1939)

Product Classification	PRODUCTION VOLUME	EMPLOYMENT	UNIT COST OF MFG.	SALES & DISTRIBUTION COSTS	SELLING PRICES
Motor Vehicles	59.1%	40.1%	23.9%	13.3%	17.8%
Motor Vehicle Bodies and Trailers	51.4%	41.5%	26.9%	13.4%	21.8%
Motor Vehicle Parts and Accessories	54.3%	46.8%	24.1%	15.2%	18.2%
Aircraft and Aircraft Parts	52.7%	51.6%	24.2%	15.8%	14.2%
Ship and Boat Building and Repairs	42.9%	38.1%	40.3%	22.1%	34.8%
Railroad Equipment	33.4%	22.2%	25.7%	14.7%	19.4%
Weighted Average—Transportation Equipment Group	58.1%	46.9%	26.9%	15.6%	20.1%

202 two-engine transport by the first of next year. Boeing has orders from Pan-American for 20 Stratocruisers to cost $25 million. Lockheed has thousands at work building Constellations for the airlines.

SHIPBUILDING: As in the case of aircraft, the estimates furnished by shipbuilding and repair yards must be viewed in the light of comparatively small production in 1939. For example, the Maritime Commission reports production of but 28 vessels in that year, with deadweight tonnage of 341,219. Contrast this with the booming pace of 1943 when 1896 ships were slid down the ways for a deadweight tonnage of over 19,000,000.

So the estimate of a 43 per cent increase in production over the 1939 total is not as strange as it sounds and actually represents a further contraction of the industry from its 1945 proportions. Latest figures show navy work estimated for completion this year amounts to approximately 950,000 displacement tons, as against 2,700,000 tons last year, or about a two-thirds shrinking.

Shipyards are being realistic about this dwarfing of their wartime output. Some are considering the diversion of their operations to other lines, at least two giving serious thought to manufacture of freight cars. Another large yard is planning to divert some of its facilities to oil refinery fabrication work. A fourth has been reported studying the possibilities of prefabricated houses. Time alone will tell what can be accomplished in this direction, but prospects appear only fair.

The U.S. Merchant Marine has expanded to enormous proportions, encompassing 5700 ships of 55 million deadweight tons. Probably less than half of it can be operated in postwar trade. Current business in yards includes a score or so ships for foreign accounts, and hungry eyes are being cast on a proposal of the Maritime Commission to build a fleet of eleven fast liners ranging from 22,720 to 37,500 deadweight tons each and costing $250 million. However, Congress must appropriate funds for them.

RAILROAD: By all yardsticks, the railroads should be on the threshold of a tremendous upsurge in rehabilitation work to make up for the ravages of unprecedented wartime freight and passenger hauling, which in turn should make for important boosts in business for the railroad equipment industries. Yet comparisons with 1939, as furnished by manufacturers in this field do not appear too reassuring. The group foresees the lowest increase in production volume, as well as the lowest increase in employment of any group in the transportation equipment field.

The explanation probably lies in the fact railroad equipment production is not subject to the violent up and downswings which have characterized aircraft and ship construction, nor does it experience the sudden surges and vacuums in demand which are common to industries furnishing to the ultimate consumer.

Nevertheless the necessity to look ahead and plan improvements in equipment and service which will meet the competition of other forms of transportation is as pressing in the railroad field as ever in the history of the business. An appreciable slump in freight car loadings this year is a foregone conclusion, while gradual demobilization of the armed forces should bring steadily increasing reduction in passenger loads as well.

RECONVERSION OF PLANTS PRODUCING TRANSPORTATION EQUIPMENT:

37.9% Found Reconversion Necessary

- 69.3% OF THESE RECONVERTED BY JAN. 1, 1946
- 26.6% WILL BE RECONVERTED BY APRIL 1, 1946
- 4.1% WILL NOT BE RECONVERTED BY APRIL 1, 1946

GOVERNMENT-OWNED PLANTS:

8.1% Operated Government-Owned Plants

- 36.4% OF THESE HAVE BOUGHT OR EXPECT TO BUY

NEW PLANTS AND ADDITIONS:

52.0% Expect to Buy or Build in Next 2 Years

- 44.2% OF THESE WILL INCLUDE RESEARCH FACILITIES

SURPLUS GOV'T-OWNED EQUIPMENT:

35.3% Had Gov't Equipment on VJ-Day

- 15.4% OF THESE HAVE BOUGHT OR WILL BUY IT ALL
- 63.1% HAVE BOUGHT OR WILL BUY PART ONLY
- 21.5% WILL BUY NONE OF IT

OTHER SURPLUS GOV'T-OWNED EQUIPMENT: (Operated in Other Plants)

53.8% Have Bought or Intend to Buy

NEW EQUIPMENT PURCHASES:

49.6% Will Buy Substantial Amount in 1946

About 35,000 new freight cars were put in service last year by Class I roads, along with about 550 new locomotives, most of them the diesel type. On order late last year were some 38,000 freight cars and better than 500 locomotives. Also on order were a good number of articulated streamline passenger trains in stainless steel, as well as 1200 individual passenger coaches and pullmans.

Marked progress is expected, even this year, in the introduction of new designs for railroad passenger equipment. Enhanced comfort, better vision, reduced weight, less noise and lower passenger cost all are goals toward which the new equipment is aimed.

4. Machinery

UNIT COST OF MANUFACTURING

26.5%

NET INCREASE EXPECTED OVER 1939

OF ALL PLANTS PRODUCING MACHINERY

- 95.1% EXPECT INCREASE AVERAGING 28.1%
- 2.6% EXPECT NO CHANGE
- 2.3% EXPECT DECREASE AVERAGING 16.0%

SALES & DISTRIBUTION COSTS

12.7%

NET INCREASE EXPECTED OVER 1939

OF ALL PLANTS PRODUCING MACHINERY

- 64.5% EXPECT INCREASE AVERAGING 21.7%
- 27.9% EXPECT NO CHANGE
- 7.6% EXPECT DECREASE AVERAGING 17.1%

EXPECTATIONS of manufacturers of a wide range of equipment classified by the Bureau of the Census under "Machinery, Except Electrical" are considerably more optimistic than for the metalworking industry as a whole.

Reference to the charts and tables shows that this group looks for an average increase of 57.6 per cent in 1946 production over 1939, compared with a 50.2 per cent gain for the metalworking industry as a whole. In addition, the more detailed breakdowns show that some producers of the various types of equipment expect increases ranging up to 74 per cent.

In dollar volume, the machinery group expects to account for 17 per cent or slightly in excess of $5 billion of the metalworking industry's total business. Employment will be made available for 240,000 more workers than in 1939. With the exception of jobbing machine shops, increases in employment by individual groups are considerably less than the increases in production. This may be attributed to greater production efficiency, but the fact remains more jobs will be made available for more workers.

The machinery group expects to experience a slightly greater shrinkage in the margin available for profit than the whole metalworking industry. The anticipated 17.1 per cent increase in selling prices precisely matches that for all metalworking but a relatively greater increase is seen in manufacturing costs which is not offset by a one point smaller rise in sales and distribution costs.

Prospects for metalworking equipment are not entirely clear. In the machine tool industry, for example, the outlook is befogged by the government surplus situation. There is no exact accounting of the number of surplus machines owned by the government and estimates range as high as 700,000. Undoubtedly, many of these are special machines which cannot be used for anything except the war work for which they were originally designed and tooled. As yet, no decision has been announced by the government as to the number of standard machines which will be set aside for future war emergencies.

Both the builders and distributors are convinced the facilities set up by the government for liquidating surplus machine tools are not functioning with the speed and intelligence this huge task demands. If redistribution is to be accomplished within the next two years—as it should be for the benefit of industry and to avoid deterioration of the machines—the government should immediately call upon the builders and distributors for the professional help which they are willing to give.

Despite this situation, the market for machine tools has not fallen off to the extent predicted. There are several reasons. One is the difficulty of locating the right machines in surplus stocks; another is the fact that many companies prefer to buy new machines in order to get exactly what they want; and several builders already have placed on the market greatly improved models capable of sensational speeds and feeds and remarkable automatic operation. There will be many more new models available in the next few months.

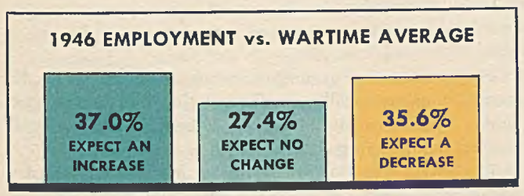
Plant reconversions were reported necessary by only 10 per cent of the machine tool builders. Two-thirds of the work already is completed but one-sixth will remain to be done after April 1. One-third of the plants have government equipment and practically all will buy at least part. Twenty-eight per cent will build new plants or additions and 42 per cent plan substantial new equipment purchases.

In contrast to many of the machine tool builders, whose business has been tapering from the high levels of the war period, manufacturers of punch presses and allied equipment have entered 1946 with a record amount of business on their books. This is not in line with the predictions of those who foresaw merely the unwrapping of equipment stored under tarpaulins during the war.

There are many reasons for this situation, not the least of which is the swing to pressed metal in the design of many new postwar products. Also, it usually is difficult to find just the right press in government surplus stocks. With economy the watchword in the production of many postwar metal products, emphasis is on automatic presses, die casting equipment and the like which will turn out products at high speed. As an example, presses are reported available which will produce as many as 3000 pieces per minute:

In the field of forging machinery, many new lessons were learned from the war which makes this method of metal fabrication a "must" in producing many metal parts. Forge shops with experience little beyond the usual carbon and alloy steels became familiar with the fabrication of aluminum and magnesium into intricate parts for many purposes. At least one forge shop now is in the process of installing a huge press specifically for the purpose of forming magnesium parts.

1946 EMPLOYMENT vs. WARTIME AVERAGE



Welding equipment and methods have been further refined so that most metals may be readily joined by the electric arc, resistance or gas methods. Resistance welding, for instance, now can be used in joining thick sections thought impossible only a couple of years ago. Important in the arc welding field is the development of a new heavily-coated electrode for welding high-alloy high tensile steels for high pressure steam lines.

In the steel mill equipment field there are many new developments about which more will be heard in the near future, these including rolling steel under tension and drawing wire with automatic equipment at exceptionally high speeds.

PRODUCTION VOLUME

$5,127,000,000 IN 1946

3,254,000,000 IN 1939

57.6%

NET INCREASE EXPECTED OVER 1939

OF ALL PLANTS PRODUCING MACHINERY

- 83.4% EXPECT INCREASE AVERAGING 70.8%
- 11.4% EXPECT NO CHANGE
- 5.2% EXPECT A DECREASE AVERAGING 29.9%

EMPLOYMENT

765,000 EMPLOYES IN 1946

523,000 EMPLOYES IN 1939

46.3%

NET INCREASE EXPECTED OVER 1939

OF ALL PLANTS PRODUCING MACHINERY

- 81.3% EXPECT INCREASE AVERAGING 58.5%
- 14.4% EXPECT NO CHANGE
- 4.3% EXPECT DECREASE AVERAGING 29.1%

ANALYSIS OF MACHINERY MANUFACTURERS BY PRODUCT CLASSIFICATIONS

(PERCENTAGE OF INCREASE EXPECTED IN 1946 OVER 1939)

Product Classification	PRODUCTION VOLUME	EMPLOYMENT	UNIT COST OF MFG.	SALES & DISTRIBUTION COSTS	SELLING PRICES
Engines and Turbines	52.0%	46.5%	28.3%	10.0%	12.9%
Agricultural Machinery and Tractors	67.7%	49.9%	21.3%	5.3%	12.8%
Construction and Mining Machinery	46.5%	32.3%	26.6%	13.5%	12.6%
Machine Tools	37.6%	26.9%	28.5%	13.5%	18.0%
Metalworking Machinery, Except Machine Tools	51.6%	39.3%	27.9%	17.8%	18.1%
Machine Tool Accessories	47.4%	38.8%	29.3%	16.5%	21.3%
Special Industry Machinery	48.5%	40.0%	26.7%	12.2%	18.4%
Pumps and Compressors	51.6%	37.9%	23.4%	13.6%	15.7%
Materials Handling Equipment	74.1%	58.7%	18.7%	9.3%	12.6%
Heating, Ventilating, Refrigerating and Air Conditioning	48.9%	35.1%	24.7%	8.5%	15.4%
Power Transmission Equipment	66.1%	46.9%	26.8%	18.1%	18.7%
Industrial Furnaces and Ovens	62.5%	44.6%	21.8%	21.8%	18.3%
General Industry Machinery, Not Elsewhere Classified	52.4%	37.2%	27.1%	12.5%	17.8%
Office and Store Machines	62.6%	37.4%	29.6%	12.0%	15.8%
Household Machines and Appliances	59.9%	40.6%	24.1%	11.5%	14.4%
Jobbing Machine Shops	36.3%	34.6%	25.4%	13.2%	20.6%
Weighted Average—Machinery Group	57.6%	46.3%	26.5%	12.7%	17.1%

SELLING PRICES

17.1%

NET INCREASE EXPECTED OVER 1939

OF ALL PLANTS PRODUCING MACHINERY

- **81.0%** EXPECT INCREASE AVERAGING 21.4%
- **17.0%** EXPECT NO CHANGE
- **2.0%** EXPECT DECREASE AVERAGING 11.6%

(54.2% Favor Continuance of Price Controls)

Equipment such as forging presses and hammers, die casting machines, rolling mills and the like are included under "Metalworking Machines, Except Machine Tools" in the accompanying data.

During the war, the order backlogs for "Special Industry Machinery" piled up for the reason that more essential types of equipment were given the green light. This classification includes food processing equipment, textile machinery, woodworking equipment, paper mill machinery, printing presses and the like. As one example, makers of printing presses are as much as two years behind on deliveries.

The most spectacular increase in production among the machinery builders is anticipated by makers of materials handling equipment. It is generally conceded that industry in general has a long way to go before it exhausts the possibilities for more efficient handling of its products from raw material storage, through various manufacturing processes and on to the shipping platform. This fact was brought home during the war when it was pointed out and proved by the armed services that handling of goods on pallets literally shortened the road from factory to beachheads. Highly mechanized plants set up for making certain armament items turned out totally unanticipated volume. In one case, capacity for the production of one type of aerial bomb proved to be two to three times actual needs.

Marked strides ahead have been registered in the industrial heating field which are being continued in postwar. All types of heat sources are involved, including electric power, gas and fuel oil. In the steel industry, for instance, thought is being given to the use of high speed gas heating equipment which would restore steel to rolling temperature while it is passing from one mill to another on a roller conveyor. Steel parts of large area may be heated in a continuous furnace, quenched in a press without distortion, passed on to a draw furnace and emerge practically ready for ultimate use.

Makers of industrial heating equipment see a bright future ahead with business in 1946 placed 62.5 per cent ahead of that for 1939. For this group, reconversion already is a thing of the past and for about a quarter of the industry there remains only the problem of obtaining delivery on new equipment and completing plans for new plants and additions.

The heating, ventilating, refrigerating and air conditioning industry found its market confined principally during the war to high-priority government business and one-third of the industry had to convert at least part of its facilities to war products. Conversion to peacetime activities has been completed by 78 per cent of these plants and the balance will finish within the next three months.

There can be no question about the tremendous demand ahead for farm machinery. All manufacturers are cognizant of it and are preparing for it. New manufacturers in the field and new plants and expansion running into millions of dollars provide adequate proof. Postwar models are going into production featuring reduction in attending manpower, more economical operation, simplified controls, greater utility and longer life. Experimental machines now are ready for mass production, such as beet pickers, one-man hay balers, hay choppers, corn and cotton pickers and the like. Small tractors complete with implements and selling at the price of a team of horses and horse-drawn equipment are likely to find a broad market.

The agricultural implement industry optimism is expressed in its expectation that 1946 business will run 67.7 per cent ahead of 1939. In fact, one-third of the industry expects its business to more than double that of 1939. Finished steel requirements in 1946 will exceed 1,000,000 tons by a substantial margin and might even approach the 1929 peak of 2,100,000 tons if the industry can swing into high-gear production.

With civilians literally starved for household appliances in the past four years, dozens of companies in the automotive, aircraft and other industries have entered the field with products ranging from a single item to a complete line. One hundred and ninety-two manufacturers figure that the home freezer, the newest product in the appliance field, has caught the fancy of the public sufficiently to provide a market.

Estimates of retail sales in the first postwar year run into the millions. Here are a few covering smaller items: Radios 15 million, electric clocks and irons 7 million each, toasters and mixers 4 million each, vacuum cleaners 2.3 million, fans 2 million and coffee makers 1.3 million. The appliance industry as a whole expects 1946 business will run 59.9 per cent ahead of 1939. Twenty per cent expect business to more than double.

This segment of the metalworking industry faced an especially difficult problem in reconverting since the equipment had been ripped out of many of its plants during the war. Reconversion has been pursued vigorously in the past few months since over half of the appliance plants which found such reconversion necessary already have completed the work and the balance will be finished by April 1.

RECONVERSION OF PLANTS PRODUCING MACHINERY:

19.1% Found Reconversion Necessary

- 74.8% OF THESE RECONVERTED BY JAN. 1, 1946
- 21.6% WILL BE RECONVERTED BY APRIL 1, 1946
- 3.6% WILL NOT BE RECONVERTED BY APRIL 1, 1946

GOVERNMENT-OWNED PLANTS:

2.9% Operated Government-Owned Plants

- 76.0% OF THESE HAVE BOUGHT OR EXPECT TO BUY

NEW PLANTS AND ADDITIONS:

39.2% Expect to Buy or Build in Next 2 Years

- 45.1% OF THESE WILL INCLUDE RESEARCH FACILITIES

SURPLUS GOV'T-OWNED EQUIPMENT:

39.9% Had Gov't Equipment on VJ-Day

- 18.3% OF THESE HAVE BOUGHT OR WILL BUY IT ALL
- 70.6% HAVE BOUGHT OR WILL BUY PART ONLY
- 11.1% WILL BUY NONE OF IT

OTHER SURPLUS GOV'T-OWNED EQUIPMENT: (Operated in Other Plants)

55.8% Have Bought or Intend to Buy

NEW EQUIPMENT PURCHASES:

44.7% Will Buy Substantial Amount in 1946

5. Electrical Equipment

PRODUCTION VOLUME

$3,254,000,000 IN 1946

1,962,000,000 IN 1939

65.9%

NET INCREASE EXPECTED OVER 1939

OF ALL PLANTS
PRODUCING ELECTRICAL EQUIPMENT

- **89.5%** EXPECT INCREASE AVERAGING 73.8%
- **9.4%** EXPECT NO CHANGE
- **1.1%** EXPECT A DECREASE AVERAGING 17.5%

EMPLOYMENT

448,000 EMPLOYES IN 1946

289,000 EMPLOYES IN 1939

55.0%

NET INCREASE EXPECTED OVER 1939

OF ALL PLANTS
PRODUCING ELECTRICAL EQUIPMENT

- **85.7%** EXPECT INCREASE AVERAGING 64.8%
- **11.5%** EXPECT NO CHANGE
- **2.8%** EXPECT DECREASE AVERAGING 20.0%

BUSINESS this year for electrical equipment builders apparently is more promising than for any other segment of the metalworking industry as evidenced by their report to STEEL that an increase of 65.9 per cent in production is anticipated in 1946 as compared with 1939. This is 15 percentage points more than the gain expected for industry as a whole. By the middle of next year the industry is expected to have a volume of business within 80 per cent of the first quarter 1945 rate when military commitments were still heavy.

The past few years have witnessed a decided trend toward the use of individual drives on machines—and not only one motor for each machine but several motors, each performing an individual and separate function—often controlled by limit switches, timers, relays and similar devices. This principle has been applied even to such heavy drives as those employed by the steel industry where the rolls on at least one mill are driven by individual motors.

This development has been accompanied by many others too numerous to more than highlight here. One especially significant and destined to find many applications involves the use of electronic equipment to provide stepless controls over motor speeds. The thyratron motor control system permits direct-current motors to operate from alternating current supply lines. Thyratron tubes make it possible to vary the armature voltage and thus regulate motor speed. In one grinder installation, speed range of 160 to 2300 rpm is provided. For larger horsepower requirements, adjustable voltage drives using generators and amplidynes are being used.

In the late stages of the war there was a decided trend in the aircraft industry toward the use of 3-phase, 400 cycle, 208 volt current for driving the numerous electric

1946 EMPLOYMENT vs. WARTIME AVERAGE

33.3% EXPECT AN INCREASE	33.3% EXPECT NO CHANGE	33.3% EXPECT A DECREASE

motors required in aircraft. These 400-cycle motors are light in construction and provide unusual power in relation to size. Elimination of commutators and brushes also contributes to a definite improvement in service life. Industrial applications for these motors are being studied.

High speed induction motors operating at 50,000 rpm now are commonplace for a number of applications, such as for certain internal grinding jobs and investigations now under way indicate speed requirements in the neighborhood of 100,000 rpm can be met in the near future.

In the power generation field, significant new improvements have been effected in equipment. One of these is the adoption of 13 per cent chromiuum steel for all blading in steam turbogenerators. These blades are machined from bar stock and heat treated in such a manner as not to alter their physical properties during assembly. At least one gas turbine-driven generator now is in operation and considerable thought is being given to additional installations, these possibly including drives for railroad locomotives.

Other developments include the use of lower loss transformer steel, silver-bearing copper for greater mechanical strength and new types of insulating materials such as glass fiber, silicone varnishes and resins and melamine. These improved insulating materials open up an entire field of designing lighter equipment to operate at higher temperatures than had been thought possible until recently.

As will be noted by referring to accompanying data, manufacturers of motors, generators and motor-generators, expect an increase of 70.5 per cent in business over 1939, which is somewhat higher than for the entire electrical industry. Ground has already been broken for entire new motor and generator plants and 57 per cent of the industry have plans under way either for new plants or additions. A third of the industry plans purchase of new equipment in quantity.

Necessary replacements of switchgear, switchboard apparatus and transformers was neglected during the war years. This was due to a shortage of steel, copper and other materials and the heavy demand from shipbuilding for apparatus. Confirmation of this situation seems apparent from the expectation that 1946 production will be 74.3 per cent greater than in 1939. Nearly 50 per cent of the group expects production will more than double.

The "Industrial Electrical Equipment" group includes the manufacturers of a wide range of products such as wiring devices and supplies, carbon and graphite products, electric heating units for furnaces and ovens, insulated wire and cable and electric lamps. Expected increase in production of 54.6 per cent this year as compared with 1939 is slightly less than the average for the entire electrical industry but nevertheless exceedingly satisfactory.

Manufacturers of communications equipment were busy during the war making radio, radar, telephone and telegraph and similar lines for the armed services. These products, plus electric traffic signals, burglar alarms, railroad signalling devices and the like were not available in quantity to civilian industry. Back-up demand for all types of conventional communications equipment, in addition to the new products coming on the market, make the prospects for this group exceedingly good. Production this year is

UNIT COST OF MANUFACTURING

25.5%

NET INCREASE EXPECTED OVER 1939

OF ALL PLANTS
PRODUCING ELECTRICAL EQUIPMENT

- **96.0%** EXPECT INCREASE AVERAGING 26.6%
- **1.7%** EXPECT NO CHANGE
- **2.3%** EXPECT DECREASE AVERAGING 10.0%

SALES & DISTRIBUTION COSTS

15.3%

NET INCREASE EXPECTED OVER 1939

OF ALL PLANTS
PRODUCING ELECTRICAL EQUIPMENT

- **67.3%** EXPECT INCREASE AVERAGING 23.3%
- **29.4%** EXPECT NO CHANGE
- **3.3%** EXPECT DECREASE AVERAGING 12.5%

SELLING PRICES

15.6%

NET INCREASE EXPECTED OVER 1939

OF ALL PLANTS
PRODUCING ELECTRICAL EQUIPMENT

- **75.8%** EXPECT INCREASE AVERAGING 21.2%
- **20.7%** EXPECT NO CHANGE
- **3.5%** EXPECT DECREASE AVERAGING 13.5%

(58.2% Favor Continuance of Price Controls)

RECONVERSION OF PLANTS PRODUCING ELECTRICAL EQUIPMENT:

27.3% Found Reconversion Necessary

- 72.0% OF THESE RECONVERTED BY JAN. 1, 1946
- 26.0% WILL BE RECONVERTED BY APRIL 1, 1946
- 2.0% WILL NOT BE RECONVERTED BY APRIL 1, 1946

GOVERNMENT-OWNED PLANTS:

7.5% Operated Government-Owned Plants

- 69.2% OF THESE HAVE BOUGHT OR EXPECT TO BUY

NEW PLANTS AND ADDITIONS:

55.9% Expect to Buy or Build in Next 2 Years

- 47.7% OF THESE WILL INCLUDE RESEARCH FACILITIES

SURPLUS GOV'T-OWNED EQUIPMENT:

25.8% Had Gov't Equipment on VJ-Day

- 8.4% OF THESE HAVE BOUGHT OR WILL BUY IT ALL
- 72.9% HAVE BOUGHT OR WILL BUY PART ONLY
- 18.7% WILL BUY NONE OF IT

OTHER SURPLUS GOV'T-OWNED EQUIPMENT: (Operated in Other Plants)

45.6% Have Bought or Intend to Buy

NEW EQUIPMENT PURCHASES:

44.3% Will Buy Substantial Amount in 1946

expected to top 1939 by a margin of 67 per cent. Forty-four per cent of the plants had to revamp their plants for peacetime operation but three-fourths have completed this work and the balance will finish in the next 90 days. Fifty per cent plan new plants and additions and nearly the same number will buy substantial quantities of new equipment.

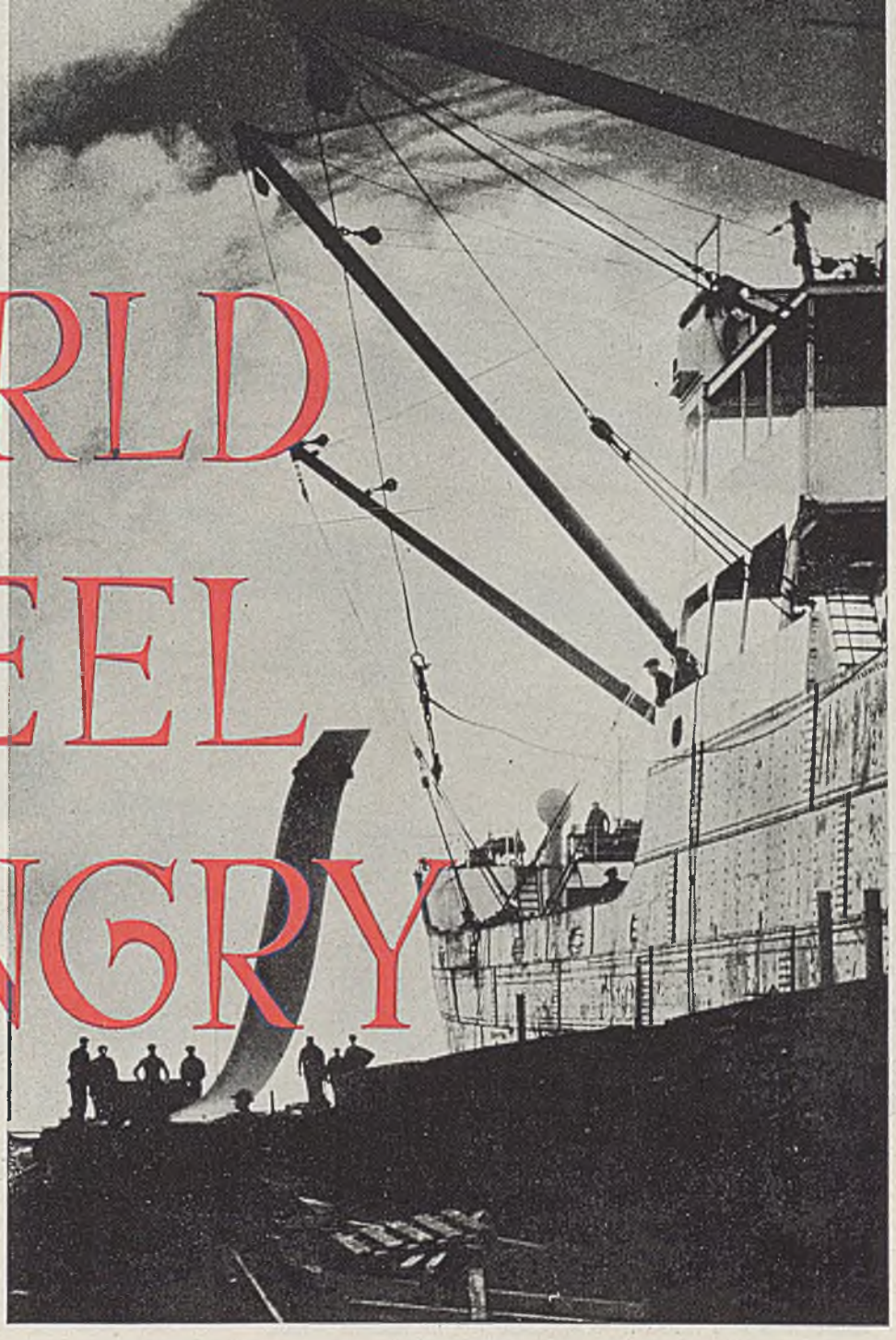
A market is seen for a number of products developed during the war emergency. A wire recorder already has been announced for sale by one of the radio companies and, in time, may take a substantial chunk of the radio-phonograph market. This recorder, incidentally, requires a fine grade of steel with no inclusions and which will withstand winding and rewinding without breaking. Two-way radio-telephone systems already are in commercial use and are likely to find applications in the railroad and motor truck fields and among fleet-truck operators such as bakeries and department stores.

The "Instrument" classification includes laboratory and scientific equipment, engineering instruments, along with the various indicating, recording, measuring, temperature control and similar devices. New plants and equipment are contemplated by 49 per cent and equipment purchases by 39 per cent. About one out of five plants found reconversion necessary of which 50 per cent have completed the work and 35 per cent will finish by April 1.

ANALYSIS OF ELECTRICAL EQUIPMENT MANUFACTURERS BY PRODUCT CLASSIFICATIONS

(PERCENTAGE OF INCREASE EXPECTED IN 1946 OVER 1939)

Product Classification	PRODUCTION VOLUME	EMPLOYMENT	UNIT COST OF MFG.	SALES & DISTRIBUTION COSTS	SELLING PRICES
Motors, Generators, and Motor-Generators	70.5%	65.2%	22.7%	15.4%	11.0%
Switchgear, Switchboard Apparatus and Transformers	74.3%	54.7%	27.8%	15.2%	15.3%
Industrial Electrical Equipment	54.6%	40.8%	22.7%	13.4%	14.5%
Communications Equipment	67.1%	53.8%	26.4%	20.1%	20.8%
Instruments	50.1%	45.7%	25.3%	13.3%	12.2%
Weighted Average—Electrical Equipment Group	65.9%	55.0%	25.5%	15.3%	15.6%



Loading steel plate for export shipment at an eastern seaport

WORLD STEEL HUNGRY

By B. K. PRICE
Associate Editor, STEEL

ALTHOUGH demand should prove heavy, iron and steel exports in 1946 will be substantially restricted by the pressure for steel at home and because of the fact that production will not be able to reach the wartime peak due to the change in character of demand, the emphasis now being on the light peacetime products.

Steel exporters look for finished steel production to run between 55 million and 60 million tons and estimate foreign shipments at around 5 per cent of that total, or 2,750,000 to 3,000,000 tons. In arriving at this percentage, they point out that while some of the leading producers, who have always been active in the export field, have set up quotas of possibly 10 per cent of total shipments, others will export on a substantially lesser basis, and still others will export none at all.

Should this estimate prove correct, export shipments of steel will be substantially less than in the immediate prewar years. For instance, in 1940, shortly following the outbreak of the war in Europe, steel exports soared to 8,752,712 net tons, with the United Kingdom alone taking close to 4,000,000 net tons, or a third more than the tonnage likely to be shipped from this country during the current year. Then in 1941, exports from the United States totaled 7,166,055 tons, and there the figures went under censorship as this country entered the war on the closing month of that year.

Exports of possibly less than 3,000,000 tons this year, on the basis of present estimates,

Loading coils of spring wire for export shipment from United States. Heavy world demand for steel products assures active foreign trade in steel for several years

will not exceed, or even equal, those in certain of the better normal years. In 1937, as a case in point, steel shipments abroad actually amounted to 3,914,923 tons.

Precisely how much steel was shipped during the year just ended cannot be accurately gaged at this time, because it is still difficult to appraise the movement which occurred during the first eight months or so under Lend-lease. One thing is certain, however, commercial shipments have risen sharply.

There has been much speculation as to the ability of foreign countries to finance their purchases of steel. Undoubtedly requirements abroad, or at least what the foreign nations would like to buy, would well exceed their ability, in general, to finance. However, there is very little doubt but what foreign countries would be able to arrange credits for more steel than they will likely receive. Even Greece, which has been undergoing such a particularly severe political upheaval, is said to be in a position to finance substantial purchases.

On the basis of present quotas, some leading steel producers are already booked up for the entire year on tonnage for export. Certain others have little to offer for delivery before well into the second half, and all in all it would appear as if new buying would be principally for 1947, rather than for the present year.

Heaviest pressure for steel continues to come from Russia, and unquestionably her potential needs are the largest of all. Leading exporters say that this country would take at least 2,500,000 tons from here next year if the material were available. One complication is that she entered the market too late. She has been moving heaven and earth with the steel companies and with Washington to get tonnage entered for fairly nearby shipment.

Steel companies have much tonnage on their books for South America, placed principally last spring under FEA licenses, and Russia has taken the position that she, as an active ally in the war, should have preference over the Latin American countries. Russia has been able to pick up but relatively little tonnage to date, with some leading producers, at least, adhering rigidly to the handling of contracts in the order of their acceptance, and with Washington so far endeavoring to exert little influence.

As a matter of fact, it is said that Washington has taken little hand in the matter of diverting tonnage already booked, except in the case of tin plate for certain of the devastated countries of Europe.

In general, steel exporters are being given increasing freedom in doing business, the major and by far the most

distressing handicap being the lack of available steel. The licensing system now provides for a general overall license, except on a very few products, pig iron, tin plate and galvanized sheets, notably, which require special licenses, and except on shipments to possibly one or two other countries, Spain and Argentina where special licenses continue necessary for the shipment of any type of steel. Meanwhile, Lend-lease has gone out of the picture, being terminated promptly within a month after the war, as scheduled.

While exporters are still handicapped by scarcity of shipping space and continued high ocean rates, the situation has eased some. Leading steel exporters in fact claim they are not having too much difficulty obtaining ships. One major difficulty is in making shipments by rail to Mexico. No more cars are permitted to enter Mexico than Mexico releases, and she has been lagging seriously in this respect.

Problems of exchange and financing continue complicated, although Export-Import Bank loans are helping out considerably at this time, with the possible unfreezing of blocked assets, along with other developments, expected to contribute as time goes on. But whatever the handicaps in this respect at present, they in no way represent the major bottleneck; it is the demand for steel at home.

Prepare For Trade Through Normal Channels

Unfavorable from the exporters' point of view also is the fact that much current demand is coming through purchasing commissions of foreign governments. In general, exporters would prefer to trade with private agencies, as stronger and more lasting commercial ties can thus be built up. However, there is some easing even in this respect and certain countries, which haven't had purchasing commissions here, are getting in the position where they for the first time since the beginning of World War II can resume trading through normal channels.

Norway has gone back to normal commercial methods of buying, after having pooled her purchases through an agency which ended its activities Dec. 31. This country continues active in the placing of tin plate, wire products, wire rods, plates and strip.

Among countries that have recently resumed buying on a commercial basis are Denmark and Greece. The former is buying plates, tin plate, alloy bars and stainless sheets. Greece is covering on tin plate, galvanized sheets, wire products, pipe, bars and some plates.

Bulgaria, Hungary and Roumania have begun inquiring on a limited basis, although little buying has actually been reported.

Russia's requirements are principally sheets, tin plate, oil country goods and strip; France is particularly interested in semifinished and auto body sheets; and Belgium in semifinished and stainless sheets. France, incidentally, is now said to have gotten her own steel production up to about 20 per cent of capacity (from 10 per cent not so very long ago); and Belgium (and Luxemburg) up to about 35 per cent of capacity. Both of these countries are normally exporters of steel but are being handicapped in getting back to normal by poor transportation and shortage of fuel.

In addition to France, both England and Italy have been particularly interested in obtaining semifinished, and Italy, along with Sweden, has also been actively inquiring for pig iron. Sweden has made substantial purchases and some iron has been going to Italy. Incidentally, Italy's needs for iron and steel have been handled to date principally through UNRRA, it is said. Sweden, in addition to pig iron has been actively in the market for plates, sheets, strip, pipe, bars and wire products.

South America's requirements cover a large range of commercial steel and also stainless sheets. Probably her principal interest is in reinforcing bars for road work and other types of construction. Cut off from her normal sources of European supply, South America is pressing hard for tonnage here and under the "good neighbor" policy there is a disposition among American shippers to give her as much assistance as possible.

England resumed purchases of steel late last year, trading on a cash basis. This followed a period after the termination of Lend-lease when a number of steel orders were suspended by England and, in fact, some actually canceled.

South Africa during the war was able to build up her own steel industry to a considerable degree, but is still interested in buying tin plate, bars and wire products from this country. Likewise, Australia, which has also developed her own industry over recent years, is still a substantial buyer of tin plate and auto body sheets.

Canada, another country which has built up her industry to considerable degree, is nevertheless actively inquiring in this country for sheets, strip and skelp and such specialties as certain types of tubing, alloy bars and stainless sheets.

The Philippines are pressing hard for galvanized sheets, wire products and pipe and also such items as bolts and nuts, but, along with all other foreign buyers, are finding material difficult to obtain because of the heavy demands in this country. China has a long list, and much of it which could be financed. However, her ports have only been recently opened and as a result she has received only a small portion of the relatively little that is available for shipment from this country at this time. India and Egypt and certain other countries are sterling areas and little business consequently is likely to develop in these directions for some time, steel exporters declare.

Mandatory Allocation of Steel Considered

At the end of last year mandatory allocation of steel for export was under consideration in government circles. The subject was discussed at a meeting late in December between representatives of the Civilian Production Administration and the Steel Industry Advisory Committee and following this session a statement was issued to the effect initial export requests for 4,000,000 tons of steel during the first half of 1946 had been screened down to about 850,000 tons.

The steel officials were told that the export requests had been reduced to the minimum tonnage necessary to meet essential rehabilitation needs in Europe and Africa, and that the 850,000 tons represented only about 3 per cent of expected finished steel production next year.

Industry representatives, it was reported, offered fullest co-operation in the effort to meet this emergency export demand. In the trade, however, it was pointed out that heavy shipment of steel out of the country would intensify the already tight supply situation in the domestic market with many consumers complaining they were unable to obtain steel in sufficient tonnage to enable them to get into full production of civilian goods.

windows of WASHINGTON

By E. C. KREUTZBERG
Editor, STEEL

Victory does not ease, only changes, problems of Congress and administration. Wages and prices, postwar taxes, aid to foreign countries, disposition of surplus war property, control of atomic bomb are among chief worries of law and policy makers

One of the toughest jobs in Washington is that of Price Administrator Chester Bowles. While it is generally conceded Mr. Bowles has done an effective job, many of the policies of his agency are under attack in Congress

THE PROBLEMS of peace now confronting Congress and the national administration are as trying as the problems of preparing for and waging war have been for the past five years.

For Congress, they are even more difficult. Where many of the war measures were practically dictated by the administration and the military and were approved as emergency acts, forthcoming legislation relating to peacetime will be a more direct responsibility of Congress.

Among the foremost problems are those of wages and prices, of modernization of the tax program, of American relations with other countries, of disposition of surplus war property, social security, housing, research, patents and standardization.

To prevent wartime inflation, the government had assumed a firm control over prices and a more shaky control over wages. When the war ended and the time came to resume the manufacture of civilian goods, price ceilings established during the war proved in many cases to be a reconversion bottleneck. Manufacturing costs, including wages, had risen sharply during the war, but prices generally held at prewar levels. Many manufacturers contended they would lose money producing urgently needed goods under these conditions. Also, organized labor came forth with demands for sharp increases in wages to compensate for the loss of overtime pay, thus further complicating the situation. The result was that needed materials were not manufactured in the volume required for speedy reconversion; workers in some industries struck to enforce wage demands, and the entire reconversion program bogged down to everyone's dissatisfaction.

As 1945 drew to a close, a fight was brewing in Congress over future powers of the Office of Price Administration.

Apparently majority sentiment in Congress is that ceiling prices will continue necessary on scarce goods to fight inflation for some time to come. But many congressmen are dissatisfied with OPA's arbitrary pricing policies, particularly that of forcing distributors to absorb increases in prices of manufactured goods which they handle. All have had complaints of unfair price treatment.

This situation should furnish many headlines to the newspapers beginning early in the year, for not only must Congress act on the extension of the Stabilization Act, now due to expire next June 30, but it will have to act on an appropriation to finance such activities as will remain to be carried on after that date. Numerous committees, including Appropriations, Banking and Currency, Labor, Small Business, Postwar Policy and others, are expected to contribute to the debate.

A further addition to the dynamite in this situation is the power given to the OPA by President Truman to act as a judge of what constitutes "fair profits" for industry. In a speech and executive order on Oct. 30, the President introduced something new in the American scene by establishing a relation between wages and profits.

First, he attempted to persuade employers to grant increased wages on the basis of profit expectations, in the following language:

"There are several reasons why I believe that industry as a whole can afford substantial wage increases without price increases. Business is in a very favorable profit position today, with excellent prospects for the period that lies ahead."

Secondly, he put teeth in his policy by ordering the OPA to exercise judgment as to the amount of "fair profit" industry might be entitled to make after granting a voluntary wage increase.

"After a reasonable test period which, save in exceptional cases, will be six months," his order read, "if the industry has been unable to produce at a fair profit, the entire wage increase will be taken into account in passing upon applications for price ceiling increases."

Some members of Congress did not like this situation,

It is reported that . . . . . .

A technical magazine states that the war-developed arc-oxygen electrode will cut quarter-inch steel plate at the rate of a foot per second while under 40 feet of water. *Metal and Thermit Corp.*

get ready with CONE for tomorrow

It is estimated that within a few years 80% of the coal mined underground will be removed from the mines on conveyor belts instead of in cars. *Scientific American.*

get ready with CONE for tomorrow

The PV-3 helicopter has a long fuselage with a rotor on each end and carries twelve persons. It is being tested by the Coast Guard and Navy. *Popular Science.*

get ready with CONE for tomorrow

A new cement, for use in concrete flooring, is said to drive away insects, kill bacteria, and prevent the formation of molds. It also dissipates static electricity. *H. H. Robertson Co., Pittsburgh.*

get ready with CONE for tomorrow

An appliance manufacturer announces an electric washing machine that can also, by the use of attachments, wash dishes, peel potatoes, churn butter, and freeze ice cream. *Hurley Machine Division Elec. Household Utilities.*

get ready with CONE for tomorrow

A new gasoline-powered lawn mower resembles a floor scrubbing machine. It is mounted on four wheels and uses a rotary knife revolving at 3,000 r.p.m. *Whirlwind Lawn Mower Corp., Milwaukee.*

get ready with CONE for tomorrow

The manufacturer of the jet engine used in the P-80 Shooting Star prophesies that all transcontinental planes will be jet-propelled within five years. *General Electric.*

One of the war devices that may survive to help the motorist is the tire gauge that registers on the dash, developed for the Army's amphibious "duck." *GMC Truck and Coach Div.*

get ready with CONE for tomorrow

A magnetic survey of the state of Florida shows large areas in the southern part that are favorable for the occurrence of petroleum. *U. S. Dept. of Mines.*

get ready with CONE for tomorrow

Meals are being served in the Naval Air Transport Service that are pre-cooked, packed in a covered paper plate and frozen. On the plane they are thawed and heated in a special oven. *Maxon Sky Plate, W. L. Maxon Corp., 460 W. 34th St., New York.*

Air conditioned trolley cars are being introduced in a Southern city. This is said to be the first use of such equipment in city vehicle transportation. *Atlanta, Ga.-Pullman-Standard.*

get ready with CONE for tomorrow

A new household electric light switch can be set for delayed action up to three minutes. *T. J. Mudon Co., 1240 Merchandise Mart, Chicago.*

get ready with CONE for tomorrow

Rubber V-belts molded around a steel cable have been developed to replace chain drive on Army motorcycles. *Goodyear, Akron 16, Ohio, Whizzer Motor Co., Los Angeles.*

get ready with CONE for tomorrow

Even the common wire nail has been improved. The new type has a notch in place of the point and is claimed to be non-splitting. *E. S. Gair, Snyder, New York, inventor.*

particularly because it dressed the stage for a fundamentally important question which the auto workers' union was quick to ask, namely: What share of the profits from business and manufacturing should go to labor, and what share to capital?

This question probably will be raised frequently in the future, for the labor legislation President Truman asked the Congress to pass "before Christmas"—and which the Congress is expected at this writing to approve in substantially the form requested by the President—merely envisions application of the principles of the Railway Labor Act to all industry.

But in wording his request, the President indicated that his earlier thinking about relating wages to profits still ruled. In his message of Dec.3 he recommended that the proposed fact-finding board be given "full power to subpoena individuals and records." That is, he appears to envision a policy of publicizing cost, profit and other information.

While Congress engaged in considerable thought and debate over proposed remedial legislation in the field of labor relations, its entire preoccupation over labor was in terms of organized labor. It was apparent all through 1945 that labor unions "have arrived" and are fixtures in the American way of life. Unorganized labor receives no recognition whatever in Washington.

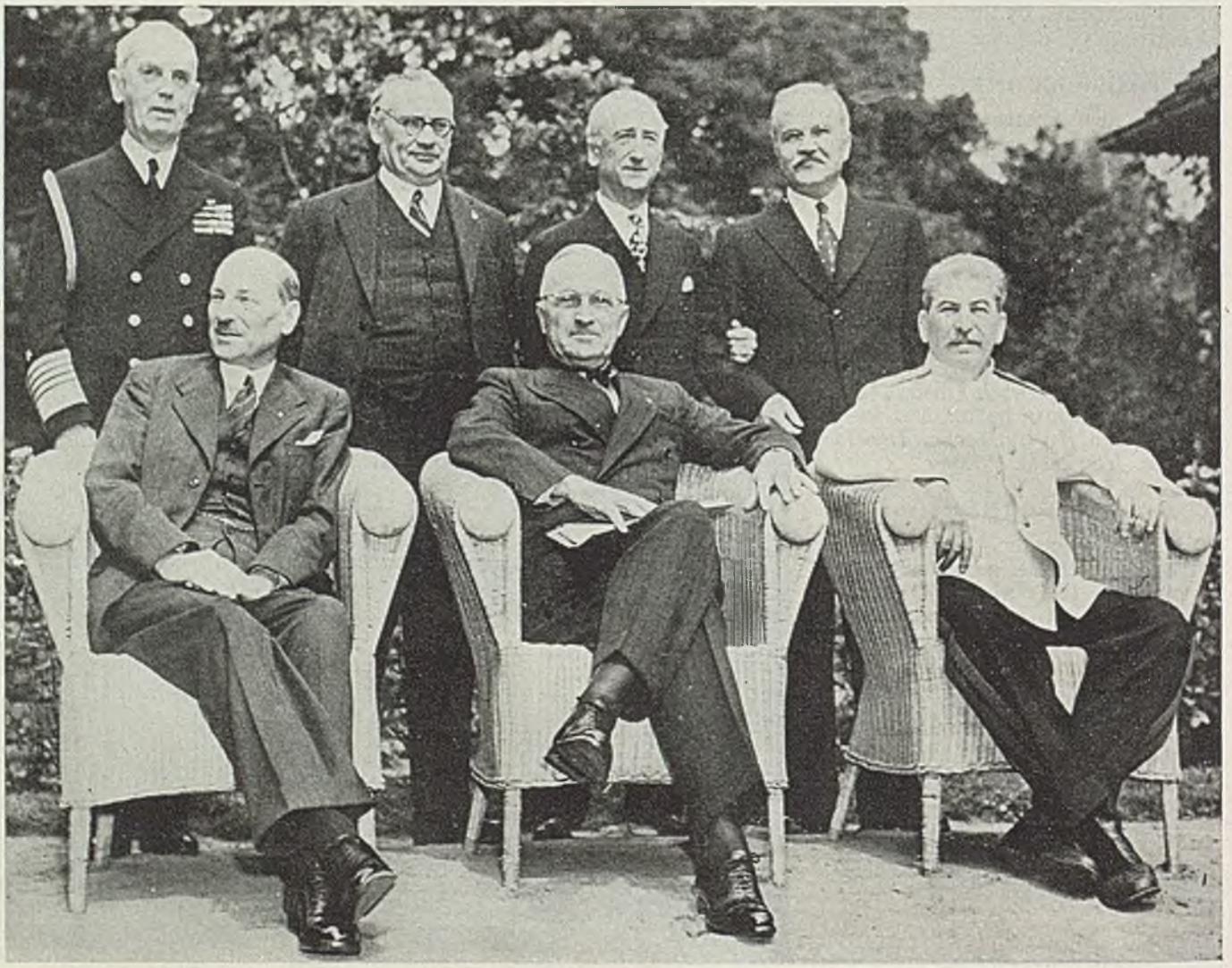
In the President's Labor-Management Conference, for example, "labor" was represented by the heads of the American Federation of Labor, the Congress of Industrial Organizations, the United Mine Workers and one of the railroad brotherhoods. The millions of unorganized American workers were given no opportunity to participate in the conference.

Administration leaders are less worried over the short-term than over the long-term outlook. They believe current labor disputes will be settled, in general, by the granting of increased wages, and toward this end they are prepared to offer such support as they can muster. After that, they believe, will come a period in which "inflation will have to be guarded against on the one hand and deflation on the other."

For instance, there will be a customer for every automobile that can be produced over a term of years. Against this will be a drop of 15 to 20 per cent in food prices during 1946 due to reduced take-home pay.

"We think we can handle that immediate situation," an administration economist said. (*Please turn to Page* 233)

Big Three confer at Potsdam. Front row, left to right: Prime Minister Clement Attlee; President Truman; Marshal Stalin. Back row: Admiral Leahy; British Foreign Secretary Bevin; Secretary of State Byrnes; Russian Foreign Secretary Molotov



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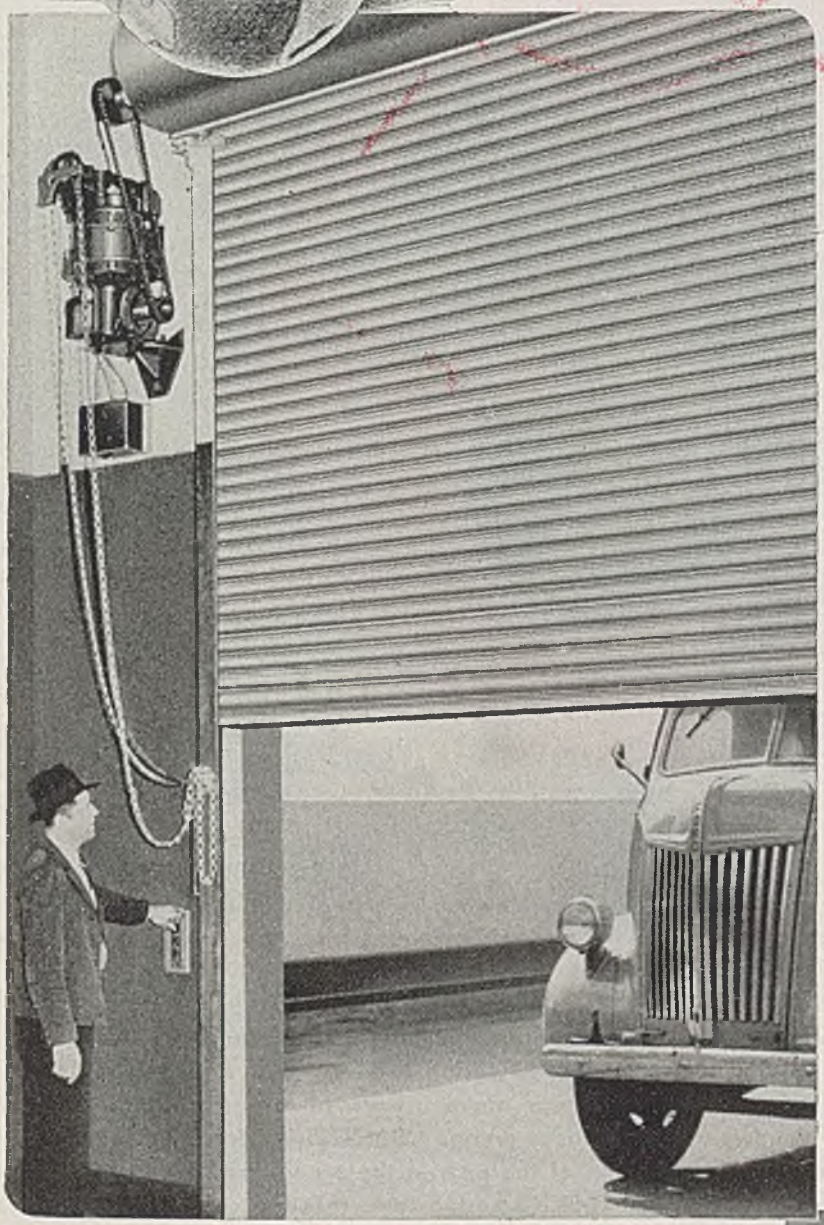
are First Choice for Efficiency



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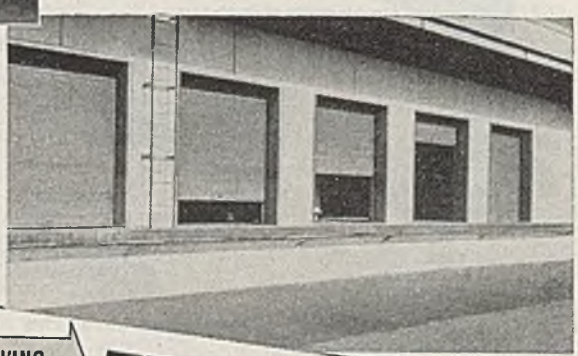

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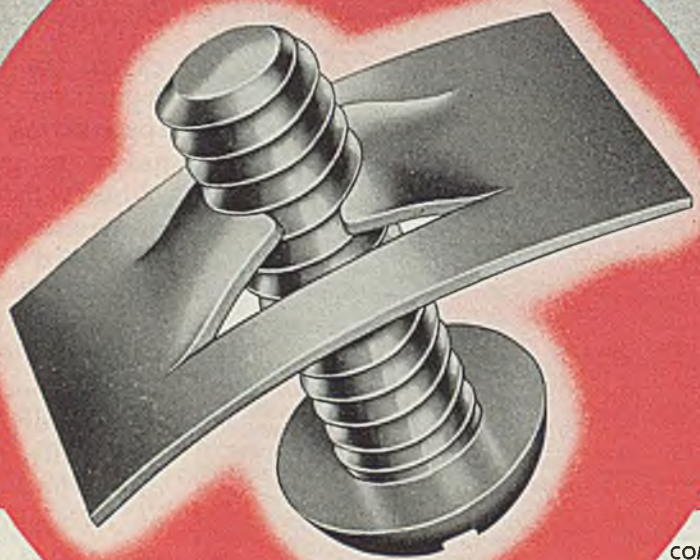
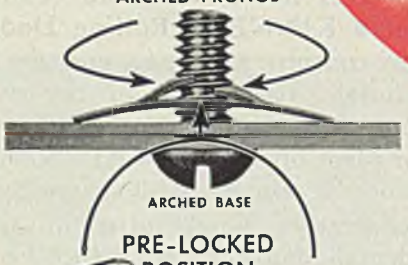
KINNEAR ROLLING DOORS

NOTHING *Locks* LIKE A SPEED NUT



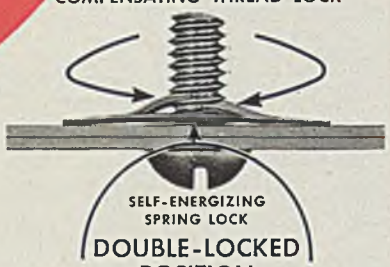
ARCHED PRONGS



ARCHED BASE

PRE-LOCKED POSITION

COMPENSATING THREAD LOCK



SELF-ENERGIZING SPRING LOCK

DOUBLE-LOCKED POSITION

ANGLE BRACKETS
Combine bracket and fastener in one.

AUTOMOTIVE FENDER NUT
Self-retaining for blind location assembly.

"PUSH-ON" TYPE
Locks on unthreaded studs, rivets, nails or tubing.

"U" TYPE
Self-retaining in bolt-receiving position.

CAPPED "J" TYPE
Self-retaining and provided with cap to cover end of screw.

HOSE CLAMP
One piece, self-locking clamp—no gears; bolts or nuts.

TWIN TYPE
Combines two fasteners into one piece.

SPEED NUTS are the only fasteners made that provide a COMPENSATING thread lock and a SELF-ENERGIZING spring lock. As bolt or screw is tightened the two arched prongs move inward to lock against the root of the screw thread. These prongs COMPENSATE for tolerance variations. Compression of the arch in the prongs and the base creates a SELF-ENERGIZING spring lock. It is the combination of these two forces that definitely prevents vibration loosening • SPEED NUTS also show a drastic reduction in total net assembly costs. They are lighter in weight, applied faster and prevent damage to porcelain enamel, glass or plastic parts. Billions are in use in over 3,000 shapes and sizes • Write for literature today and you'll soon be assembling the SPEED NUT way.

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**Trade Mark Reg. U. S. Pat. Off.*

FASTEST THING IN FASTENINGS...

(*Continued from Page* 230)

"Our chief worry," he continued, "is the big depression which inevitably follows every great war—and which should develop in four to six years from now. Tied in with that depression will be the future of our economic system. The government will have to be prepared to do plenty; you cannot have 10 million to 20 million unemployed over any sustained period without inducing changes in our economic system."

FUTURE TAXES: The first peacetime general tax law is among the major tasks facing the congressional session that begins this month. Already, from Congress, from the administration through the Secretary of the Treasury, it has been indicated that only moderate relief can be expected by any group, except possibly the smaller income taxpayers.

While it has been forecast that federal expenditures during the calendar year 1946 would be much lower than during 1945, the outlay for 1946 is still projected at better than $66 billion, just for the fiscal year, which means that the government would be operating at a deficit of more than $30 billion. The relationship of the deficit to the tax prospects in the coming year is such that it can be expected to operate to limit the overall tax reductions.

Wartime Peak Reached In Fiscal Year 1945

Peak of federal wartime expenditures was reached during the fiscal year 1945, $90 billion for war purposes and overall $100 billion. The estimate for the fiscal year, 1946, was $66 billion. Expenditures are expected to decline progressively rather than precipitously, henceforward.

Even after dropping several levels, the Treasury believes, government revenue demands will still remain at a higher plane than prewar. Over-riding any other consideration, the annual cost to the government of the war debt, over $5 billion, is henceforth a fixed charge on the revenue whatever else may be discarded.

The next general tax legislation, nevertheless, should be a first step toward modernization of the tax structure, the first postwar overhaul, if the initial reconversion measures are excluded. Suggestions for basic revision, in this light, are expected to be made by the Secretary of the Treasury early in the year. In the present state of mind at the Capitol, it can be expected that before a bill is finally shaped, much later in 1946, Congress will have gone further than the Treasury proposals, and the Treasury may be expected to have this possibility in mind when it gives the House Ways and Means Committee its views.

The interim bill already has repealed the entire excess-profits tax effective after Dec. 31, 1945.

As revealed by congressional action on the interim bill, the prevailing Ways and Means Committee sentiment is against excess profits taxes in peacetime, and for progressive reductions in corporate surtax rates, where practicable. Treasury views echo this attitude toward excess profits taxes. The forthcoming tax legislation certainly will be more comprehensive, move much further toward a literally peacetime tax program.

Pressure possibly may arise from business interests whose reconversion has been seriously set back in the year-end strikes, and, collaterally, from any resulting expansion of unemployment. There could be a legitimate demand from the former for added relief, and from the unemployed a campaign for revival of government spending as an employment stimulus. It will take time to clarify this question.

Most spectacular scientific development in years, if not in all time, was the harnessing of cosmic energy and the introduction of the atomic bomb. Further development and control of this development is a major problem. This photo shows the explosion of second atomic bomb dropped on Japan, at Nagasaki, with smoke billowing 20,000 feet above the city. USAAF photo from NEA

One proposal the House Ways and Means Committee is studying is a revision of the internal revenue law to impose federal income taxes on socalled nonprofit enterprises which heretofore have been exempt. These would include labor unions, and farm and other co-operatives.

The Treasury Department's first report, on Nov. 16, on the income of nonprofit organizations, so called for by the 1943 revenue act, disclosed that the nontaxpaying organiations had a gross income of more than $5 billion for that year. The total was based on returns from 86,647 nonprofit organizations. Of these, 28,638 came from labor unions which reported gross income and receipts of $389,686,000.

Tax-exempt organizations whose primary functions are business activities, reported gross income and receipts of $3,206,572,000, of which farmers' co-operatives and marketing and purchasing organizations accounted for $2,233,904,000.

GUARANTEED WAGES: Considerable discussion of guaranteed wage and employment systems is expected

in 1946 as a result of the study which the late President Roosevelt asked the Office of War Mobilization & Reconversion to undertake. This request originated in the United Steelworkers' demand, in December of 1944, for a guaranteed annual wage.

The Guaranteed Wage Study staff is headed by Murray W. Latimer, head of the Railroad Retirement Board, and Arthur S. Meyer, New York State Mediation Board.

In the meantime, the Bureau of Labor Statistics has ascertained that out of some 90,000 establishments reporting employment and payroll statistics, some 700 operate under some form of guaranteed wages of guaranteed employment. The bureau is trying to classify these systems by patterns and will turn its data over to the Guaranteed Wage Study staff.

In the meantime, industrialists are giving serious thought to the practicability of voluntary minimum wage guarantees. The great stumbling block is the fear of consequences from making wages a fixed charge just like insurance and taxes; it would be all right while business was good but might threaten bankruptcy in periods of severe depression.

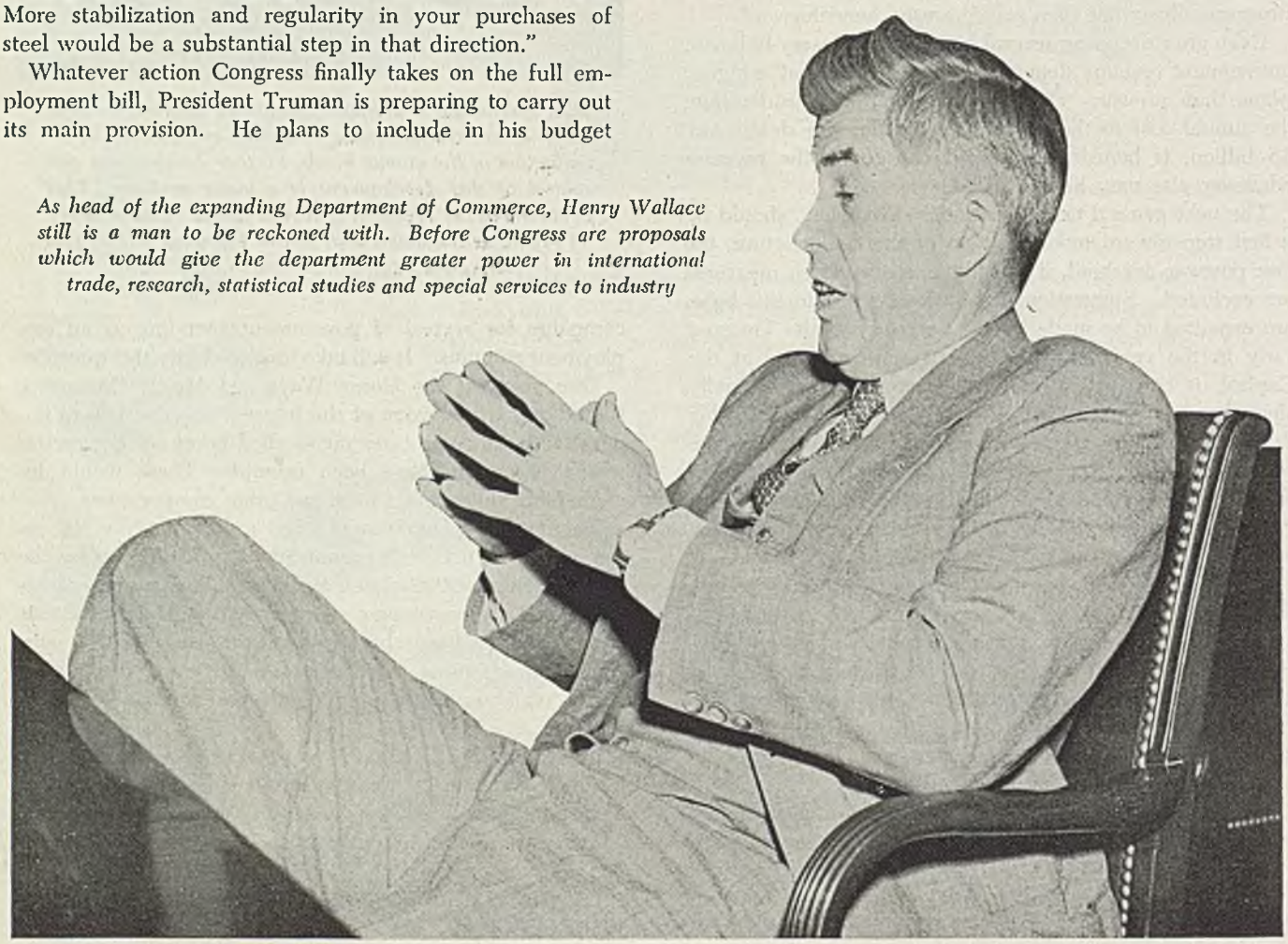
Irving S. Olds, chairman, United States Steel Corp., discussed this angle in a speech before the Detroit Economic Club in May of 1945. He brought out that regularization of production and employment is necessary to make a guaranteed minimum wage system possible.

"You in Detroit," said Mr. Olds, "can be most helpful by co-operating with the steel industry in an effort to stabilize its employment and wage payments as far as practicable. More stabilization and regularity in your purchases of steel would be a substantial step in that direction."

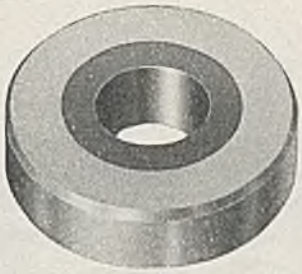
Whatever action Congress finally takes on the full employment bill, President Truman is preparing to carry out its main provision. He plans to include in his budget message to Congress in January a "national budget" based on studies by a cabinet committee headed by Secretary Vinson. The President will discuss scheduled federal expenditures during 1946 and the amount of employment they will furnish. He will forecast state and municipal expenditures insofar as possible. He will include a forecast of private business activity over the year and the effect on employment. He is planning to make some recommendations as to how the government can encourage industrial ventures in order to stimulate production and employment.

SOCIAL SECURITY: Carried over into 1946 will be a number of bills coming under the head of social security. The principal bill, which would extend social security coverage to state and municipal employees, to agricultural and maritime and domestic workers, and which has been widely opposed due to its socalled socialization of medicine, is the Murray-Wagner-Dingell bill. In the Senate it has been pigeonholed by the Finance Committee. In the House this bill has been split up into two parts; the original bill is with the Ways and Means Committee which has shown no indications of taking it up, while the features providing for federal control of health and medicine have been incorporated in a new bill referred to the Committee on Interstate and Foreign Commerce where an attempt will be made to bring it to hearings early in 1946.

NATIONAL HOUSING POLICY: Among important bills before Congress for action early next year is the Wagner - Ellender - Taft National (*Please turn to Page* 382)



As head of the expanding Department of Commerce, Henry Wallace still is a man to be reckoned with. Before Congress are proposals which would give the department greater power in international trade, research, statistical studies and special services to industry



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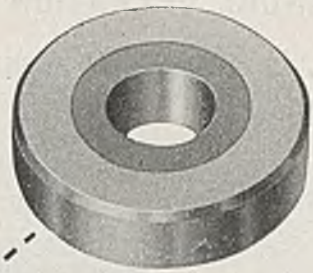

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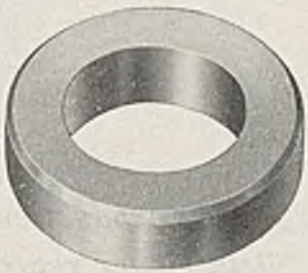

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High carbon-high chrome steels, cast to shape with close tolerance requiring a minimum of machine finishing.

ANOTHER Jessop FIRST—a complete die service which includes finished dies of the three types illustrated; also carbide and cast non-ferrous alloy inserts for reclaiming worn dies or for shops making their own dies. In addition, Jessop supplies bars and forgings of highest quality tool steels for die makers.

Each of the above materials have a separate field in which they are superior and Jessop maintains a staff of qualified engineers who, in consideration of the following factors, will suggest and recommend the best material for the job:

- Type of operation
- Original die cost
- Total production required
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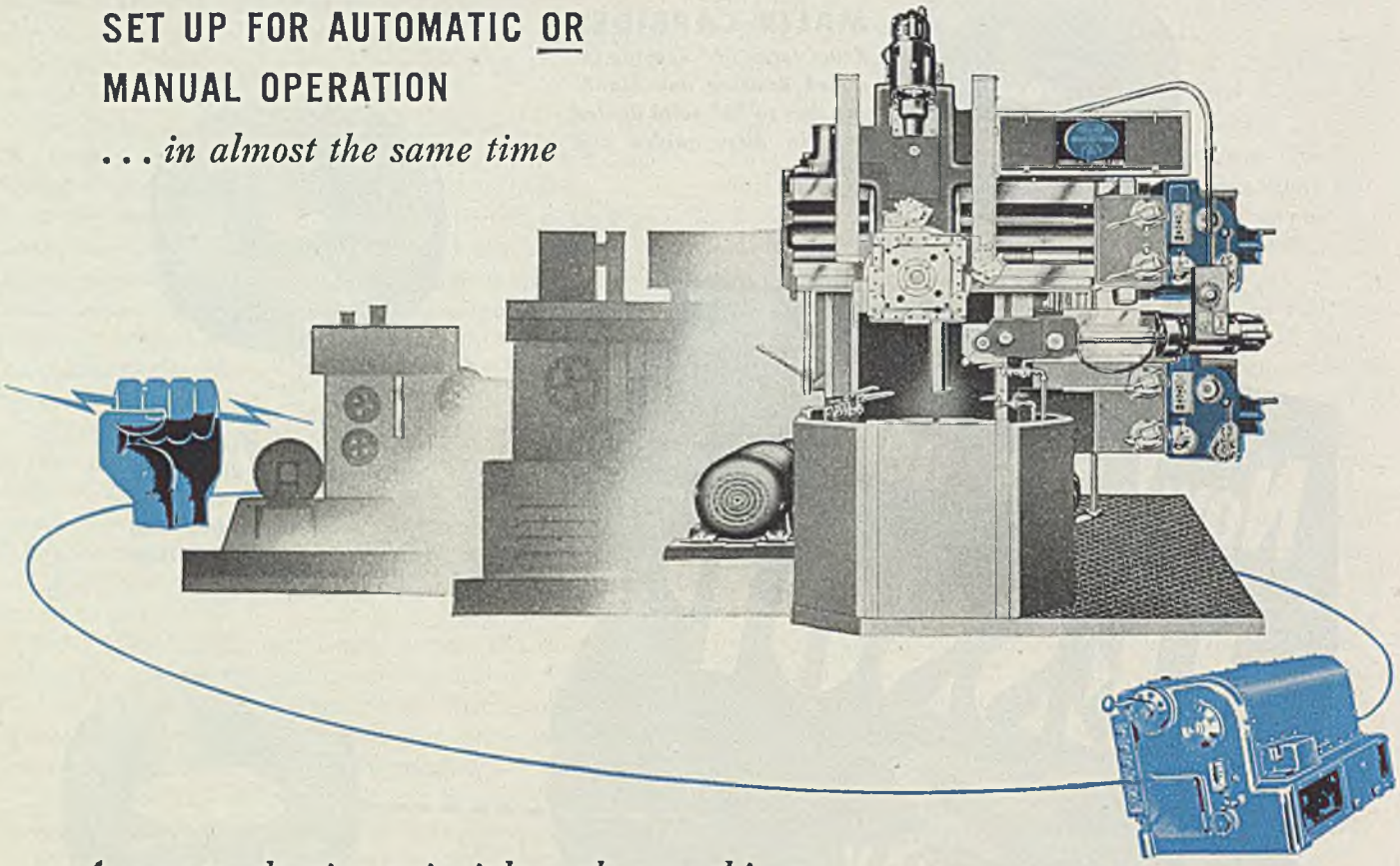
NOW... ONE MACHINE CAN BE SET UP FOR AUTOMATIC OR MANUAL OPERATION

... in almost the same time



A new production principle makes machines yield richer returns on investment

The Bullard MAN-AU-TROL principle of automaticity gives a machine the ability to be changed from manual operation on single pieces or small job lots . . . to automatic production runs . . . in only slightly more time than required for changing the setup of a manually-operated machine . . . To illustrate, picture the operation of a Bullard MAN-AU-TROL Vertical Turret Lathe. Suppose a sample is to be machined for approval before a long run is started. As the operator does the first piece with the machine under manual control, he makes a simple MAN-AU-TROL setting at the end of each function. The job is completed in only a slightly longer time than if no settings were made. When approval is obtained, the operator then moves a single lever and operation becomes 100% automatic. Now, in between schedules of production runs, he can cut out automatic operation and use the machine for hand operation on miscellaneous jobs . . . This revolutionary machine versatility which prevents a machine from ever being idle is due to the fact that MAN-AU-TROL merely takes over whenever the manual operator wills, without disturbing the machine's inherent versatility. MAN-AU-TROL is now being applied only to Bullard machines.

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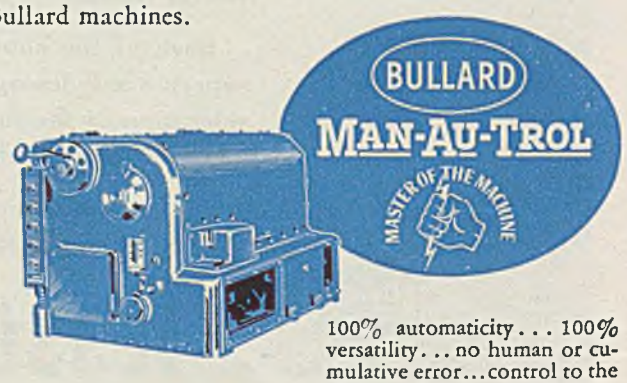
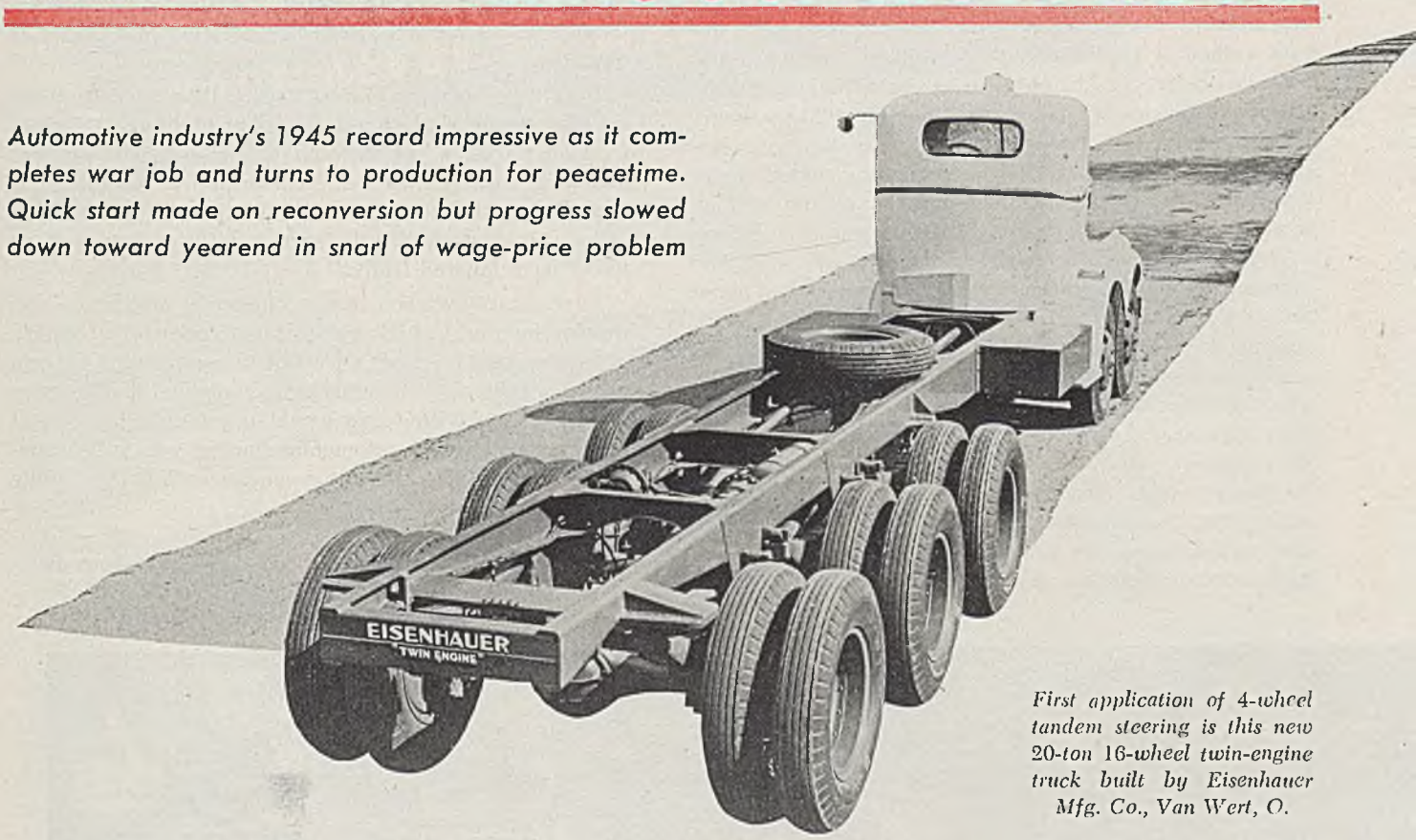


100% automaticity . . . 100% versatility . . . no human or cumulative error . . . control to the closest tolerances . . . a tremendous cost advantage in competitive markets.

mirrors of MOTORDOM

By A. H. ALLEN Detroit Editor, STEEL

Automotive industry's 1945 record impressive as it completes war job and turns to production for peacetime. Quick start made on reconversion but progress slowed down toward yearend in snarl of wage-price problem



First application of 4-wheel tandem steering is this new 20-ton 16-wheel twin-engine truck built by Eisenhauer Mfg. Co., Van Wert, O.

NOW receding into history, the year 1945 will come to be known by future generations as a major turning point in the near-half century record of the automobile industry. It marked the termination of a vast co-operative war production effort unsurpassed anywhere in the world. It marked an abrupt change in leadership of a political dynasty which had wrought complex changes in the entire United States industrial structure—for better or worse no one can say until it is possible to view them from a greater distance. It marked the reversion of automotive plants to their competitive peacetime pattern, to the *status quo ante bellum*, at least the incidence of such a return. Unhappily, however, it is beginning to appear there ain't no such animal, and the *status quo* may be nothing more than, to use a favorite phrase of General Bill Knudsen, "Latin for the fix we is in."

Writing finis to a successful war production activity, it may be apropos to summarize the figures, although these convey only weakly an appreciation of the task accomplished. For the record, here are the quarterly totals for 1944 and 1945, covering about 1000 companies in and allied with the automotive industry:

Quarter	1944	1945
1st	$2,338,836,072	$2,254,819,565
2nd	2,340,378,280	2,082,000,000
3rd	2,293,355,254	1,120,000,000
4th	2,216,400,944	N. A.*

*Not yet available. Small amounts of war production continued through fourth quarter; some may still be continuing.

These astronomical totals are not susceptible to any detailed analysis, for the reason that costs and prices of war products were continuously trending lower as manufacturing acumen sharpened. Thus, dollars and cents become no gage of physical volume. As to the total dollar volume of production delivered to the U. S. and its allies from the start of ordering of such items, best estimates show it to be something under $29 billion, divided roughly into $11¼ billion for aircraft, subassemblies and parts; $8½ billion for military vehicles and parts; $3 3/4 billion for tanks and parts; $2 billion for marine equipment; $1½ billion for guns, artillery and parts; $1 billion for ammunition and components, and $1 billion for all other munitions items.

If the reader is interested in comparisons, let him ponder the fact this enormous outpouring is roughly equivalent to the *wholesale* value of all passenger cars and trucks built in this country over a period of 13 years, or from 1929 through 1941.

As to actual figures on physical volume of war paraphernalia disgorged by automotive plants, they are dizzying. Thus: 3,386,570 carbines, 1,439,810 machine guns, 156,100 antiaircraft guns, 848,500 other type guns, 418,000 aircraft engines, 161,230 tank engines, 166,450 marine engines, 48,750 tanks, 5100 amphibian tanks, 23,750 self-propelled artillery, 113,560 gun carriages and armored cars, 1,950,000 military trucks, 659,931 jeeps, 578,000

military trailers, 16,035 bombers, 5800 fighter planes, 4290 gliders, 2000 torpedoes, 2000 buzz bombs, 5500 marine gyrocompasses, 12,777 amphibious jeeps.

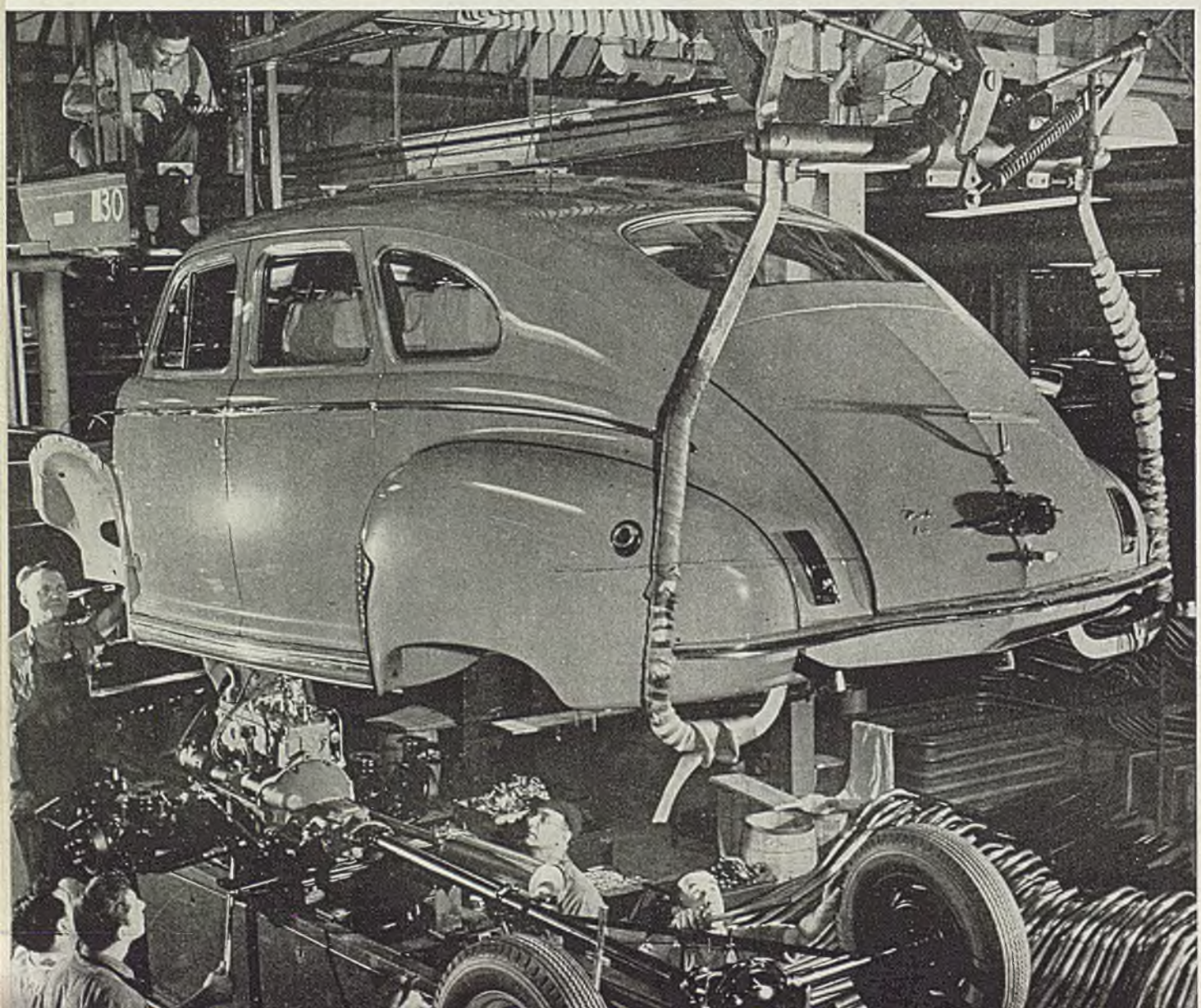
Preliminary estimates on the production record for the past year alone cite output of 275,000 civilian trucks, 355,000 military trucks, 16,500 buses and 75,000 passenger cars, valued at approximately $6.5 billion. While an impressive outlay, the last of these figures is puny alongside industry estimates last fall to the effect 500,000 passenger cars would be completed before the year was out. Explanation of course lies tangled up in the snarled wage-price problem which enmeshed virtually all industry almost the moment the Japs were atomized, and even before.

A year ago, when reconversion planning was being delineated, automotive officials were gravely concerned about the slowing effects of plant clearance, surplus disposal, contract terminations and other loose ends of winding up a war production assignment. As it actually worked out, their fears proved exaggerated, because most of these problems were cleared up more rapidly than the most optimistic had foreseen. Military and government personnel must be given a large measure of credit for their alacrity in anticipating and activating the details. This is not to infer that war surpluses are well on their way to disposal, for such is definitely not the case. What is meant is that plants themselves were cleared of materials and equipment used on war contracts and termination agreements preconceived and made operative with relatively little delay and red tape, to permit quick rehabilitation of plants for peacetime production. By December, the automotive industry considered its reconversion job completed and ahead of schedule.

But there was more to reconversion than its mere physical aspects. It involved a degree of mental reconversion of working forces, a reawakening of consciousness of costs and prices, along with their relationship to wages, and a rekindled alertness to the vital importance of productivity or individual effort. On this score industry and its working forces have faltered badly.

First monkey-wrench in the wage-price machinery was thrown by the United Automobile Workers-CIO which, promptly after V-J Day, set about to haggle a 30 per cent wage boost for all its members. It contended that the drop in wartime takehome pay would require the increase if purchasing power of automobile workers was to be maintained; further that the motor companies had the "ability

Striking action shot at the "body drop" on a Nash assembly line, showing a body being lowered onto the power unit traveling along the conveyor



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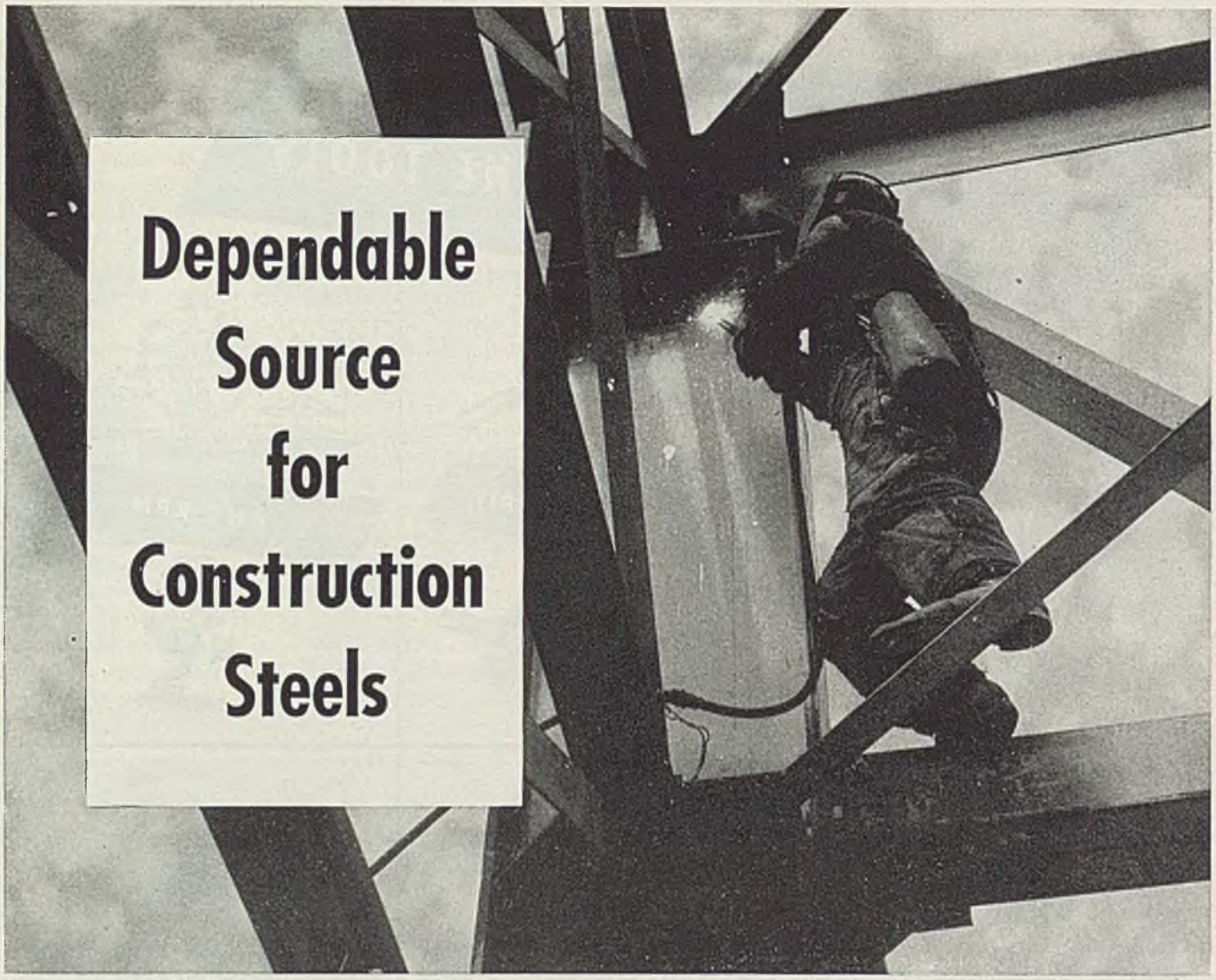

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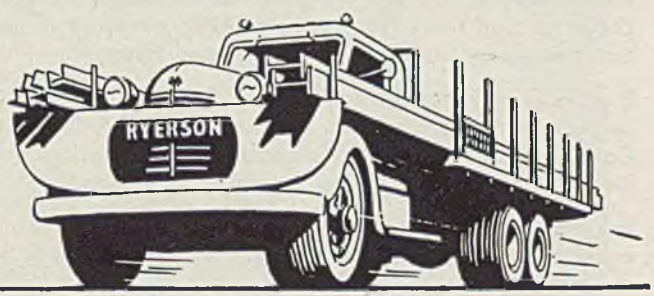


RYERSON STEEL

to pay" the higher rates —and without increasing prices— because they would be operating in 1946 at a production pace 50 per cent beyond anything yet achieved.

Union statisticians sharpened their pencils and opened up cans of invective to attempt to prove their case and to smear any calm analysis of the matter. They insisted managements should "open their books," they screamed managements were refusing to bargain collectively, they called for and received the friendly support of pseudo-scientific government economists in the Department of Commerce and the Office of War Mobilization & Reconversion.

It began to appear the UAW-CIO was not so much pleading the case for higher wages as it was attempting to muscle in on the prerogatives of management, to get a look at cost sheets and other data essentially confidential in a competitive system of production. Entirely forgotten were certain basic concepts of the American economic philosophy, namely:

In the free American economic system, an essential part of a free political system, obviously the most efficient producers will make the largest profits and the most competent individuals will earn the highest wages. A producer buys materials at market price and offers workmen wages sufficient to recruit a good working force. These represent the market values of materials and labor. The producer furnishes the tools for the workmen, and the better these tools, the more work can be done without extra effort. When the producer supplies good tools and properly organizes and directs the business, his profits will be good. He will then be able to give the public a better product for less money and get more customers. This will encourage him to expand his business and create more good jobs.

Only to the degree that increasing technological efficiency serves to reduce costs can there be any gain to the economy as a whole. The benefit to the greatest number, which must be the prime objective of industry and which means advancing living standards to the maximum, occurs when technological efficiency is reflected in lower selling prices so that all can buy more. Hence more can be produced.

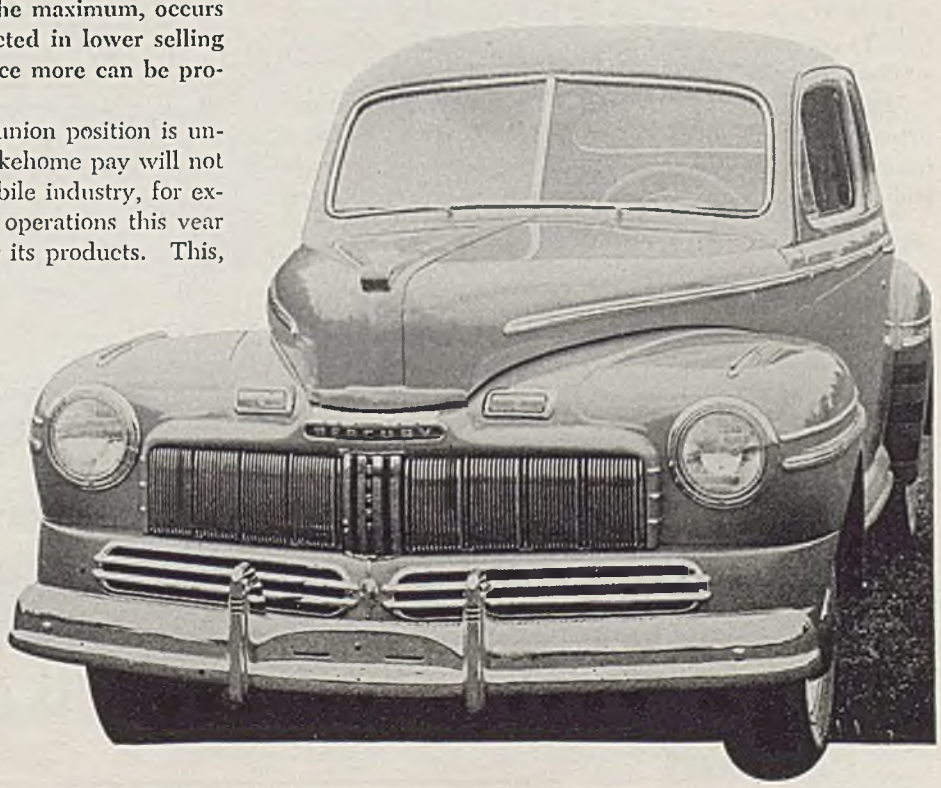
From many standpoints, the entire union position is untenable. In the first place, wartime takehome pay will not drop to the extent feared; the automobile industry, for example, planning to continue overtime operations this vear because of unprecedented demand for its products. This, plus the fact wartime operations never averaged much over 45 or 46 hours weekly at best, along with wage increases of 10 per cent already offered and refused, actually would mean an increase in takehome pay over wartime.

In the second place, despite optimistic forecasts of record production levels during 1946, there is not a management official in the industry who expects production this year to go much beyond the 1941 level; in fact, many think they will be lucky even to reach that point. One slightly dissenting voice may be that of Alvan Macauley, head of the Automobile Manufacturers Association, who says, for publication, that if planning can be realized, automobile production by June of this year will be three times the monthly average for 1939.

Focal point of the original union pressure was General Motors and in early negotiations the corporation made three distinct offers of wage increases. The first was to increase the work week to 45 hours instead of 40 and to raise rates 5-6 per cent. The second was a flat 10 per cent raise in rates. The third was a 13½ cent an hour increase, with 12 cent across-the-board, so to speak, and the other 1½ cents used on a fund basis in various plants to correct inequities. All three were rejected, almost without consideration, by the UAW which, for its part, confined collective bargaining efforts to "30 per cent or else."

Union strategists decided they would attempt to blockade GM plants by a strike and make every effort to keep the corporation's competitors operating. After GM plants were struck Nov. 21, it became apparent the scheme was a flop, for all other manufacturers either were closed or moving in fits and starts because of interferences to parts supply occasioned by strikes in vendors' plants. Furthermore, certain GM divisions supply parts to other manufacturers, and their closing meant constriction in the flow of such parts.

Despite a corps of expert statisticians, economists, industrial relations and public relations personnel, General



Displayed publicly for the first time Dec. 4, this is the 1946 *model Mercury. Redesigned front grille comprises sections of vertical louvers in die cast zinc*

Motors did not appear to be doing a too creditable job in getting its story across to the public, sound and logical though its arguing was. Many believed Ford took the play away from the corporation in negotiations with the UAW over the same wage demands. Ford exploded a bombshell in the union ranks by insisting the company would have to receive some sort of "security" from the union to put an end to hundreds of "wildcat" strikes and an appalling decline in productivity, before any discussion of wages could take place. Labor relations officials from the Rouge put the matter squarely up to the UAW which was reeling from the proposal that wildcat strikers be penalized to the extent of $5 per man per day, deductible from union dues collected under the checkoff system. In one year, incidentally, the company spent $2.8 million in the Dearborn area alone to collect dues and fees for the union and to pay more than 1000 union men in the company's plants who spent all or part of their time handling union business; against this the union's income for the year from such collections was a little over $2 million.

Look, said Ford, we figure we will lose $27 per car during 1946 under present OPA-frozen prices, even assuming full production and a 16 per cent improvement in productivity. That will mean a total loss of $35 million. And further, the company went on, we are now paying 7 per cent higher wages than nearest competitor, and we have raised wage rates 36.5 per cent since January, 1941, not counting vacation pay and other extras. Walter Reuther himself might understand that kind of cold turkey.

12-15 Per Cent Wage Increase Debated

Meantime, Chrysler Corp., with its union contract lapsed, stood by and watched the two large competitors battle it out, realizing whatever pattern finally was evolved probably would have to be accepted by Chrysler, too. Year-end speculation around Detroit centered on a figure of 12-15 per cent as the wage increase ultimately to be accepted by both companies and unions, but along with it would have to come firm guarantees of "company security" such as Ford took the lead in proposing.

Manufacturers are universally caught in the squeeze between OPA price ceilings and mounting costs, the latter resulting principally from labor's pressure for higher wages and its unwillingness to turn in a fair day's work. Once in the wringer, many manufacturers simply threw up their hands and quit; others will ultimately be forced to do so, making for less production, more unemployment and more inflation.

In its transition year, the automotive industry witnessed many changes, running from routine to the epochal. In the latter category was the wholesale reshuffling of administrative personnel at Ford, involving the departure of Harry Bennett, long a mighty and mysterious figure in the company's activity, and along with him hundreds of his friends and associates both in the producing and sales end of the business. Direction of the Ford empire now seems firmly in the hands of youthful Henry Ford II. In the background, supplying seasoned advice and counsel, is reported to be Ernest C. Kanzler, related to the Ford family, and long a highly capable executive in business.

Kaiser-Frazer Merger Enters Picture

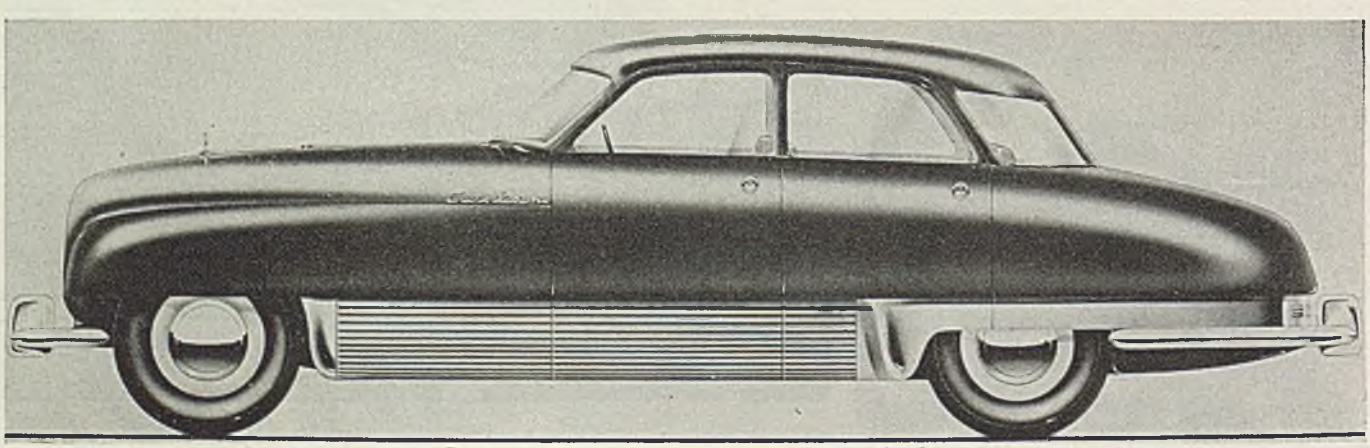
Newcomer to the automotive scene was the Kaiser-Frazer Corp., marking consolidation of the interests of J. W. Frazer in Graham-Paige Motors and Henry J. Kaiser. The two entrepreneurs arranged an attractive lease on the former Ford Willow Run bomber plant and by year-end had made a fair start on setting up lines there to build a new $1500 car to be called the Frazer. Later, a $1000 model, to be known as the Kaiser, will be unveiled, and along with the two cars a line of tractors, farm tilling machinery, implements and such. Somewhat dubious of the venture at the start, Detroit was ready to concede the operators a better chance of success following their hiring of E. J. Hunt, ex-Chrysler production wizard, in December.

As was expected, 1946 model passenger cars showed little change from the last of the 1942 models, except that in most cases new grilles were featured, along with redesigned bumpers and minor refurbishing. Mechanically, there were practically no innovations; there had been no time during the war to perfect them, and even less time to do any extensive tooling for their manufacture.

The 1947 models are expected to be on the assembly lines Sept. 1 of this year, and there will be the briefest possible changeover period, leading some observers to the conclusion no radical departures are planned for next year's series. There is definite trend in the direction of eliminating fenders and consolidating them with body panels, but whether such a major retooling program could be handled this summer seems problematical.

Increased application of au- (*Please turn to Page* 392)

Postwar automobile designers envision many innovations. Brooks Stevens, in the design shown below, suggests increased rear vision



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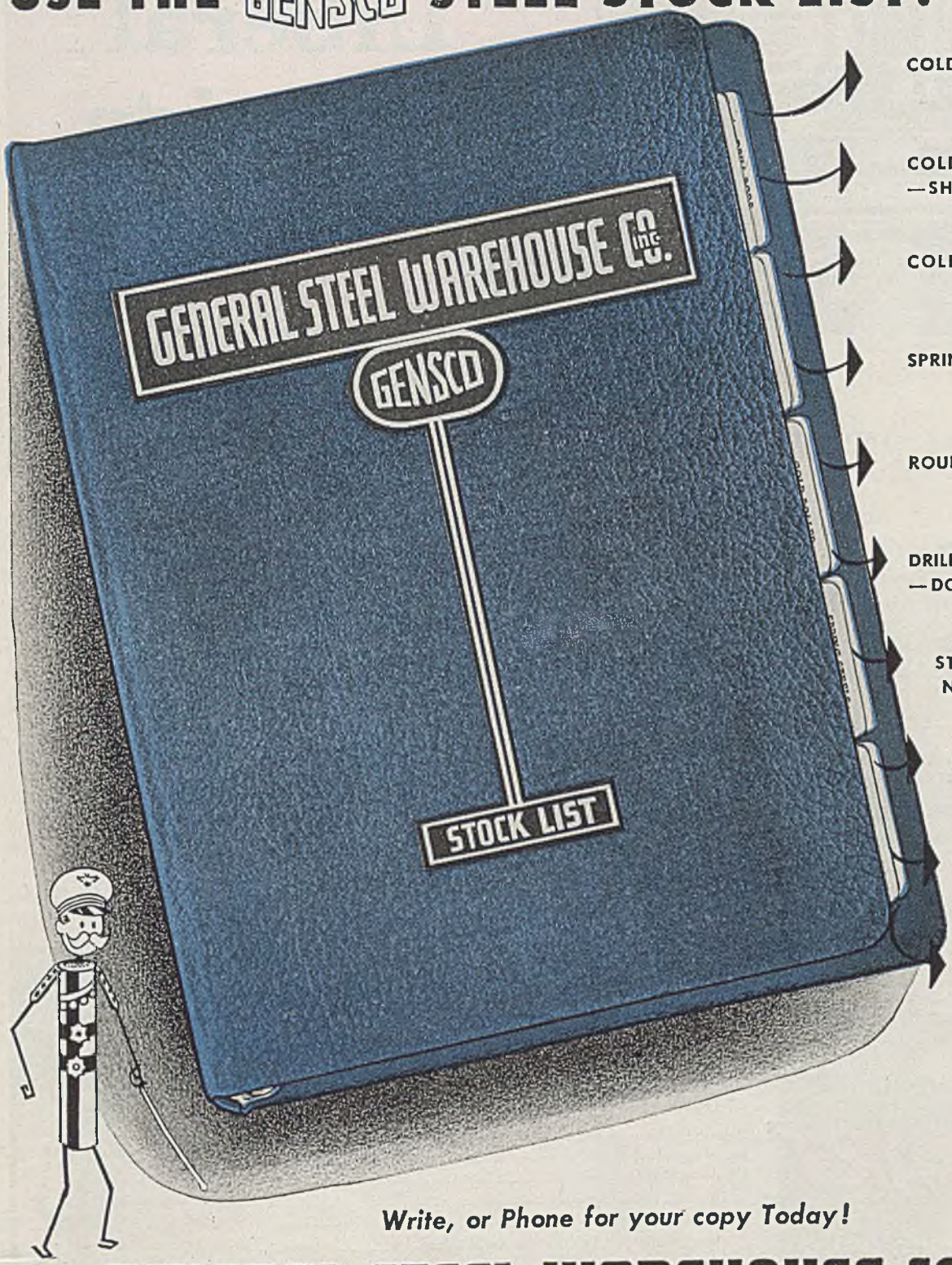

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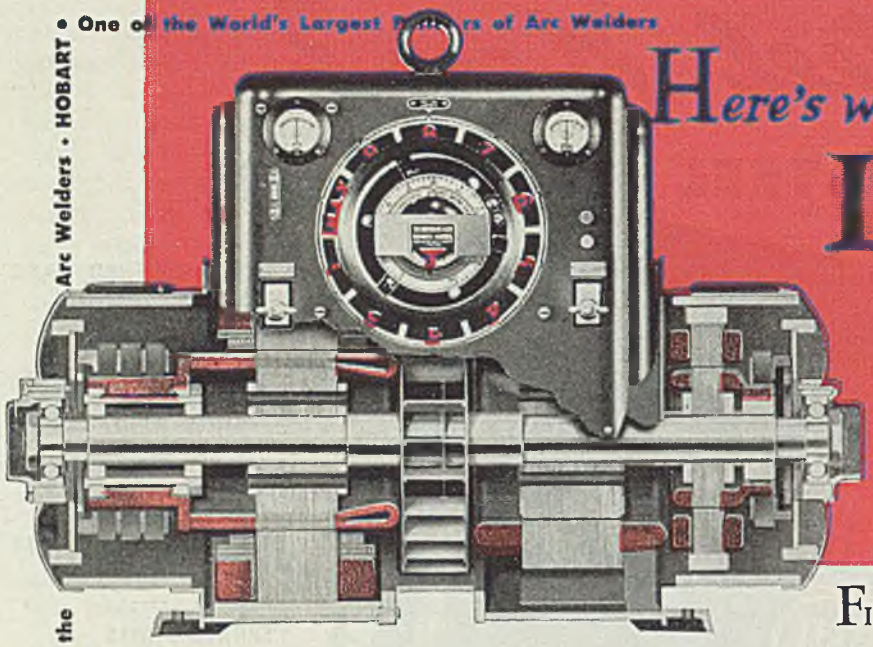

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1946 Will Test Leadership

Problems of transitional period present challenge and opportunity to executive personnel of industry. Many corporations need more junior managerial and professional personnel in training for top positions

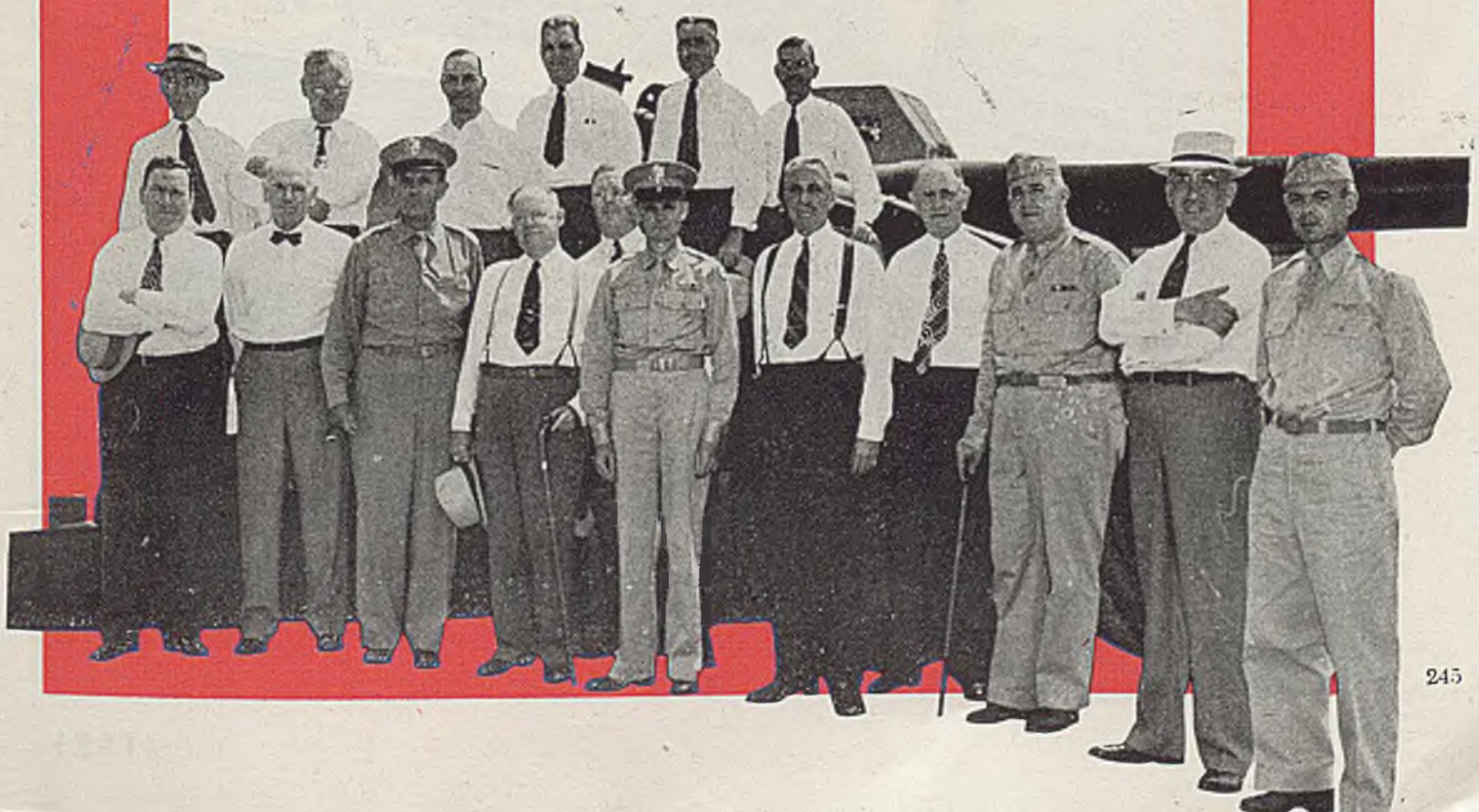
By WILLIAM M. ROONEY
News and Market Editor, Steel

LEADERSHIP of the highest order is demanded of executive personnel as the nation's industrial and business machine, figuratively speaking, rolls up its sleeves and digs into the task of readjusting to a peacetime basis.

In many respects, industrial management may face its severest test in 1946. It promises to be a year in which those at the helm in industry and business will be called upon to demonstrate, as never before, their capacity to steer the nation from the economic morass which threatens to mire us as a result of the muddled thinking of our times. By the sagacity they display and the initiative they exert will they meet the challenge.

By the same token, 1946 may prove to be a year of rare opportunity for management. To the entrepreneurs, the executives and managers we look hopefully for initiation and promotion of the new ideas that make for a progressive economy. In the past they have fathered the new processes which increased production, pulled down costs and improved quality of goods. They introduced new products, explored and opened up new markets. They created opportunities for employment (*Please turn to Page* 248)

Thousands of industrialists and business executives served throughout the war on Industry Advisory Committees set up to help the various government war agencies shape policies and programs. Below is shown members of the Steel Industry Advisory Committee to the War Production Board on an inspection tour of the Army proving ground at Aberdeen, Md.



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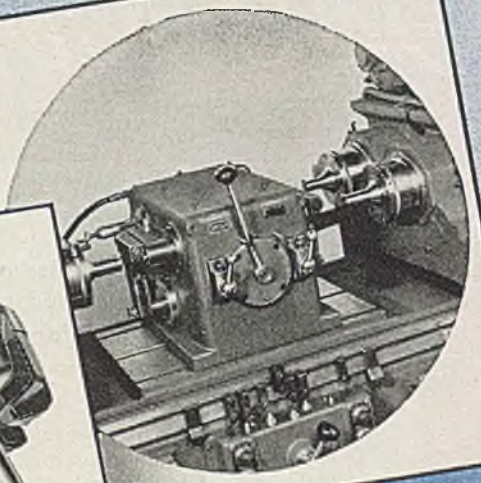
FIXTURES

To right: Typical set-up designed and made by Ex-Cell-O for standard boring machine. Used to semi-finish both ends of steel articulated rod at a high production rate with maximum efficiency and economy.



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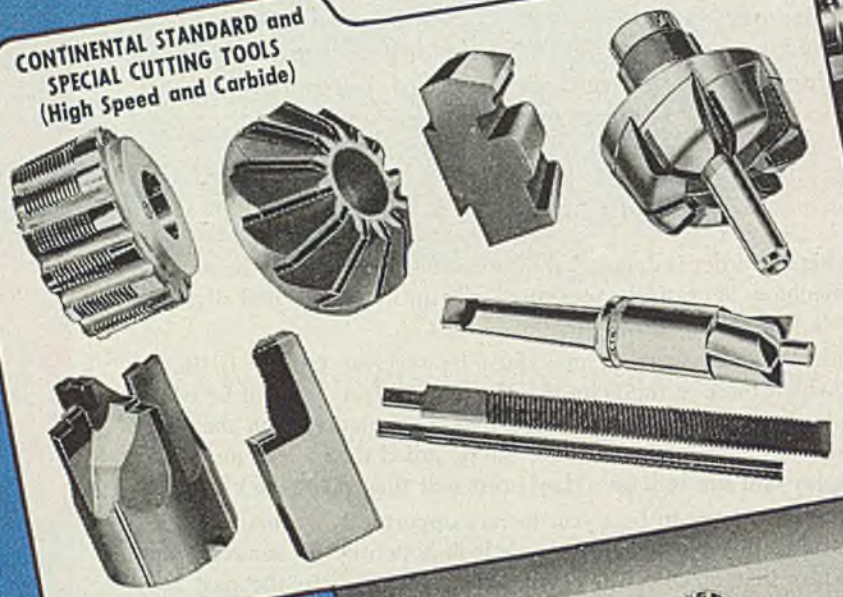

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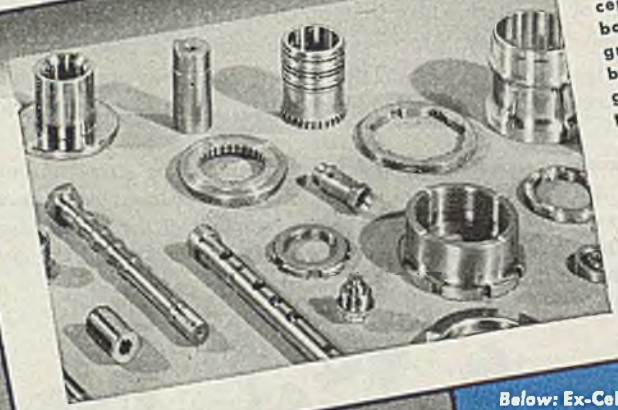

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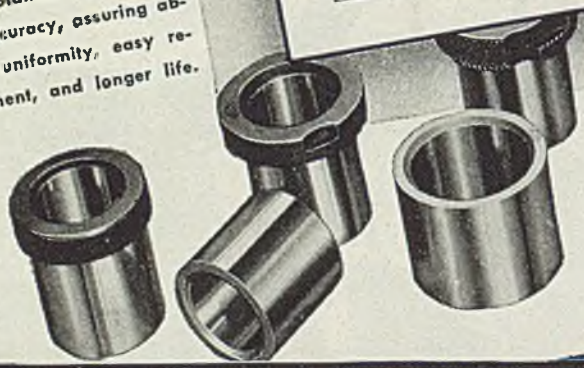

Below: **Ex-Cell-O's new catalog on precision machine tools, cutting tools, and other Ex-Cell-O precision products. Contains illustrations, descriptions, and specifications. A copy will be mailed free to any executive requesting it on his business letterhead. Ask for Ex-Cell-O Catalog No. 27121.**

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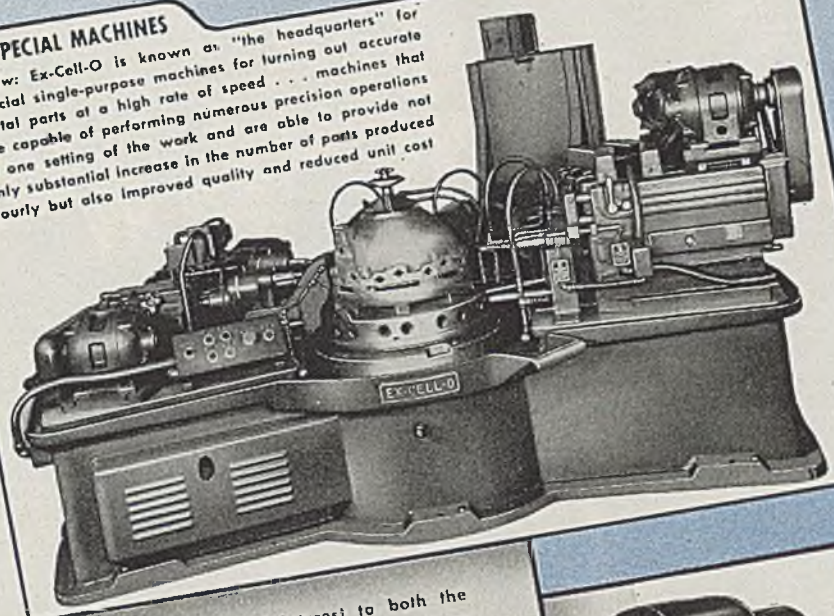

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Many of industry's topflight management personnel served in key government posts throughout the war, their positions in industry being filled for the duration by retired executives recalled to service. An outstanding example was that of Owen D. Young and Gerard Swope who returned to the chairmanship and presidency, respectively, of the General Electric Co. when Philip D. Reed and Charles E. Wilson left for government service. Above, left to right, are Messrs. Young, Reed, Swope and Wilson

(*Continued from Page* 245)

and blazed the path to better living for all. In the future the demand upon them in this regard will be greater than ever.

Throughout the war, executive personnel functioned under extreme difficulties. However, despite the heavy draft of top rank business managers into the armed forces and emergency governmental posts, the economic machine functioned remarkably well. This was possible because of the high caliber of management which continued on the job. Hundreds of executives, who in the ordinary course of events would have retired from active management, remained at their posts. In some instances, retired executives returned to their respective companies to resume their former posts for the duration. An outstanding example of this was the return of Owen D. Young and Gerard Swope to their old posts of chairman and president, respectively, of the General Electric Co. when Philip Reed and Charles E. Wilson took leave for government service. The holdover of older executives was general throughout industry, a fact which points to many likely changes in management as we move into the postwar era. Already this change is underway, with many of the top-flight executives who had been on leave to the government now returned to their companies.

Many Have Acquired New Skills

As the older executives move into their delayed retirement and younger members of executive staffs move upward, each level of management will experience supervisory changes. But that is not all. As the change in managerial authority extends down through organizations, new personalities will come onto the scene. Many executives on returning to their companies from government service may be fitted into entirely new positions. Valuable experience gained by industry representatives serving in goverment positions during the war will stand them in good stead in postwar days in handling industrial relations with government. Private industry is certain to be called upon by the various federal agencies to help in working out the economic problems of peacetime. As a matter of fact, many of the wartime industry advisory committees to the various government agencies are being continued indefinitely, and it seems logical to assume that a good many of these industry advisory posts will be filled by men acquainted with government routine and policy.

Recently, John D. Small, as administrator of the new Civilian Production Adminstration, successor to the War Production Board, upon taking up his new duties, listed 176 key industry advisory committees which would be consulted on reconversion problems. During the war there were 780 such committees. He stressed the value of consulting with industry groups, declaring that these committees would be consulted before any action is taken which will materially affect production or distribution in the respective industries.

"My own experience with the industry advisory committees during the past four years convinces me that round-table discussions with these groups have been a most important factor in the successful operation of the War Production Board," said Mr. Small. "And it is equally necessary that the Civilian Production Administration secures the advice of industry on the problems of reconversion."

In view of the many difficulties (*Please turn to Page* 251)

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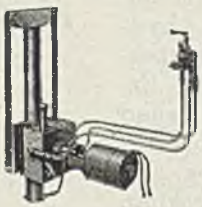
2. Mercury has pioneered and perfected many important industrial truck features. Those illustrated are standard on all Mercury fork trucks. While these features vary slightly on Mercury platform trucks, the basic principles are the same—

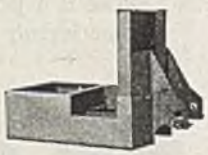


Hydraulic Hoist: No power required to lower load, no power wasted in lifting. Less than 50% of the usual moving parts.

Snap-action cam operated controller: Eliminates injurious arcing. Reduces maintenance to the minimum.

Unit constructed drive assembly: Motor and drive are one unit. Double reduction spiral bevel and spur gears transmit maximum power.

All welded frame: No rivets to weaken sections. Exterior is smooth and pleasing in appearance.



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(*Continued from Page 248*)

before industry can be completely reconverted to peacetime, it is likely industry officials who have served in government posts will be called upon to a large extent to help in co-ordinating industry objectives with those of government. Being acquainted with government policy they can contribute substantially and constructively in presenting industry's viewpoint.

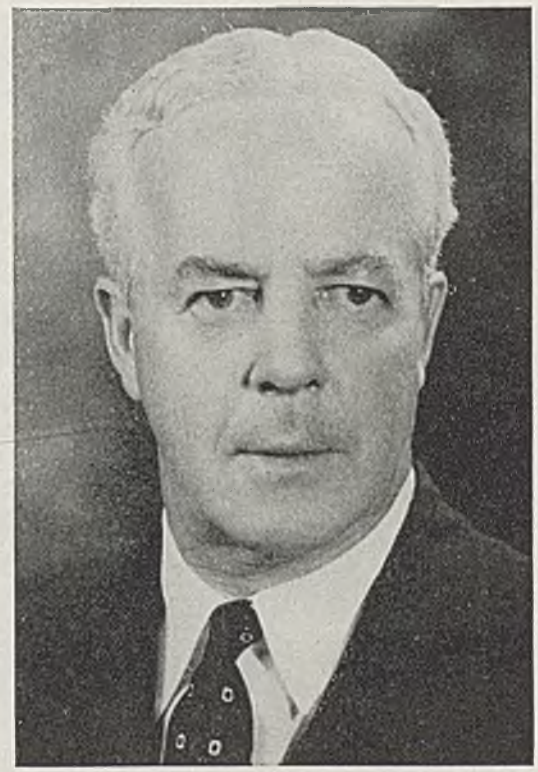
Former employees who achieved officer rank in the armed services are sure to be given the opportunity to obtain managerial authority wherever such is possible. The latent abilities of these men, developed in the crucible of war, are certain to be utilized to greatest possible advantage by every forward-looking business organization. Skills acquired in the Army and Navy will not be overlooked in adjusting the veteran, officer or private, into the peacetime economy.

Likely extension of managerial staffs has raised the question in the minds of many executives as to whether closer supervision of managerial personnel from the standpoint of development of the individual for larger responsibilities is not a desirable function of management. Business consultants, from time to time, have pointed out that of all the fields of industrial management, development of executive and supervisory personnel has been least controlled. This may be true, but it must be said that, as a general thing, executive authority in the past has been placed in an individual only after he has had years of practical training and he has demonstrated his ability to direct. There are possibilities in the suggestion of the consultants, however, and it would not be surprising if many large companies, in the future, gave serious thought to the advisability of establishing "Executive Personnel Offices" which would have the responsibility of conducting programs for manager training.

Faces New Social, Economic Problems

As with all things, the functions and policies of industry are subject to change. After four years of production for war, industry, facing the difficult job of reconverting to peace, is face to face with changing social and economic concepts. Some of these are evolutionary in nature, but others represent a radical departure from the old American political and economic pattern. Problems are presented which demand of industrial management careful analysis of its practices and objectives to the end industry may continue to serve in the best American tradition.

Probably no arm of management will receive more attention in the future than that concerned with labor relations. For more than a decade the relationship of management to the workers in the shops has been undergoing drastic change. Governmental policy has encouraged the strange philosophy that somehow the interests of management are not the interests of the workers. Unionism has gained at an unparalleled rate to the end the prerogatives of management in the matter of labor direction have been seriously threatened. No longer are questions of wages, hours of work and conditions of employment a matter of negotiation between individual worker and his supervisor. Rather, such matters now are the subject of negotiation between top management and union agents representing not just employees of a single factory, but often workers in an entire industry. And the matter does not end there since government acts as a third party in the determination of most labor agreements and settlements.



Emergency agencies set up by the government to direct the economy during the war were placed in charge of top industry executives called to government service. Above is shown Hiland G. Batcheller, president, Allegheny Ludlum Steel Corp., who for a time served as chief of the Steel Division of the War Production Board. Other prominent industry executives who at times held this post included J. T. Whiting, president, Alan Wood Steel Co.; Norman W. Foy, general manager of sales, Republic Steel Corp.; David F. Austin, vice president in charge of sales, United States Steel Corp.; W. B. Todd who held executive posts in a number of steel companies prior to taking up government work; C. E. Adams, chairman, Air Reduction Co.; and Arthur D. Whiteside, president, Dun & Bradstreet

The key role of the labor relations executive cannot be overemphasized. He must be of the highest caliber, equipped to handle the most confused and complex problems which arise in the administration of the duties of his office. His position calls for one not only thoroughly versed in labor law, but one also endowed with a broad consciousness of the social implications of the decisions he is called upon to make. He must have tact and imagination in handling the manifold duties of his post, approaching each problem in a spirit of broad tolerance. In short, he must be the type of person who knows how to give and take, and he must be blessed with the patience of a Job and the wisdom of a Solomon.

Aside from the management changes expected to come as a result of the return of younger executives on leave to government agencies and the armed services, a great area of opportunity for executive personnel is opening up in enlarged emphasis on certain business functions. For many years, production technique was emphasized. Technological developments will continue to receive major at-

Great things are expected of industry's engineers and scientists in sparking the nation's economic progress postwar. Above is shown C. F. Kettering, chief of General Motors Research Division, speaking at the dedication of a new research laboratory

tention postwar, but it is believed marketing and distribution will be concentrated on to a greater degree than has been the case for some time past. Huge productive capacity, coupled with intensive competition for markets, is likely to force the expenditure of intensified effort in the cultivation of larger consuming outlets in a drive for greater sales.

In marketing and distribution, top managerial opportunities unquestionably will be presented in a number of directions. For example, at one time the executive in charge of sales managed salesmen. Today, his functions are much more diverse, sometimes including duties only remotely related to selling or sales-management. On his staff he has sales promotion managers, market analysts, public relations counselors, customers' men and account executives. The multiplicity of functions which immediately come under the top sales executive necessarily demands delegation of management to numerous assistants, and it is quite possible that in the postwar business setup many of these departmental functions will evolve into separate divisions of major authority.

In every phase of business activity new responsibilities are bound to develop in the postwar era calling for managerial direction of the highest caliber. For example, increased emphasis on exports may possibly result in the creation of separate export divisions in many firms which prewar paid little, if any, attention to this area of marketing. Even in the case of large corporations which have always maintained export departments or divisions under top-flight management, likely extension of export activities may open new opportunities for managerial personnel not now apparent. In the case of smaller companies establishing export divisions, the success of their undertakings will hinge upon their ability to place in command of their foreign trade activities managers acquainted with the many problems peculiar to this function.

In the field of production, the role of the engineer in the management function, if anything, will increase in importance. In the past the engineer has exercised a dominant influence in business, the mass production technique of our times being only one of his many contributions to the forward progress of the nation's economy. He has brought into our factories new methods and processes which have out-moded the rule-of-thumb, resulting in greater production of improved quality products for an ever broader consuming market as prices tumbled in company with the reduction in production costs he engineered. Practically every phase of business feels the engineer's touch in one form or another, and in the postwar era the demand for his services will be increasingly pressing as industries strive to meet the challenge of low consumer prices for the broadest possible market under highly competitive conditions.

With respect to the engineer's influence in industry, it is pointed out by competent observers a serious scarcity of technically trained men is threatened. This scarcity results from the short-sighted Selective Service policy throughout the war of drafting engineering students into the armed services before they could complete their studies. According to Col. Blake R. Van Leer, president, Georgia School of Technology, despite the flood of students back to the engineering schools now that the war is over, there will be an estimated shortage of 40,000 technically trained men over the next seven years, during which time the shortage in engineering talent will be accentuated by the demand for the services of experienced engineers in restoring devastated areas of war-torn Europe and Asia.

Increased emphasis on scientific research and product development will bring enlarged responsibilities to those in charge of such programs. This greater emphasis it would seem, must create opportunity for positions in this area at a high executive level. The key role of those in charge of the research function is clear. Their's is the responsibility for developing new processes and products, methods and procedure in the adaptation of natural phenomena to the wants of modern society.

Mergers Resulting from Market Domination

Difficulties attending conduct of business in highly competitive markets dominated by large corporations with huge financial resources, are stimulating a tendency toward merger of small corporate units. Recently, numerous diverse manufacturing units have been brought under a single overall management. In these mergers not all companies involved lose their corporate identity. Many have become divisions of larger organizations, continuing to operate under their long established corporate titles.

Various reasons have been ascribed for this trend, among them being the increasing difficulties encountered by small companies in competing with larger and more integrated firms, better financing and larger resources afforded by consolidation, and the enlarged research and product development possibilities resulting from joint action. Prominently mentioned in recent months as exemplifying this type of management are such firms as Republic Industries Inc., New York, Woodall Industries Inc., Detroit, Maguire Industries Inc., New York, (*Please turn to Page* 395)

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The BUSINESS TREND

By VANCE BELL
Associate Editor, STEEL

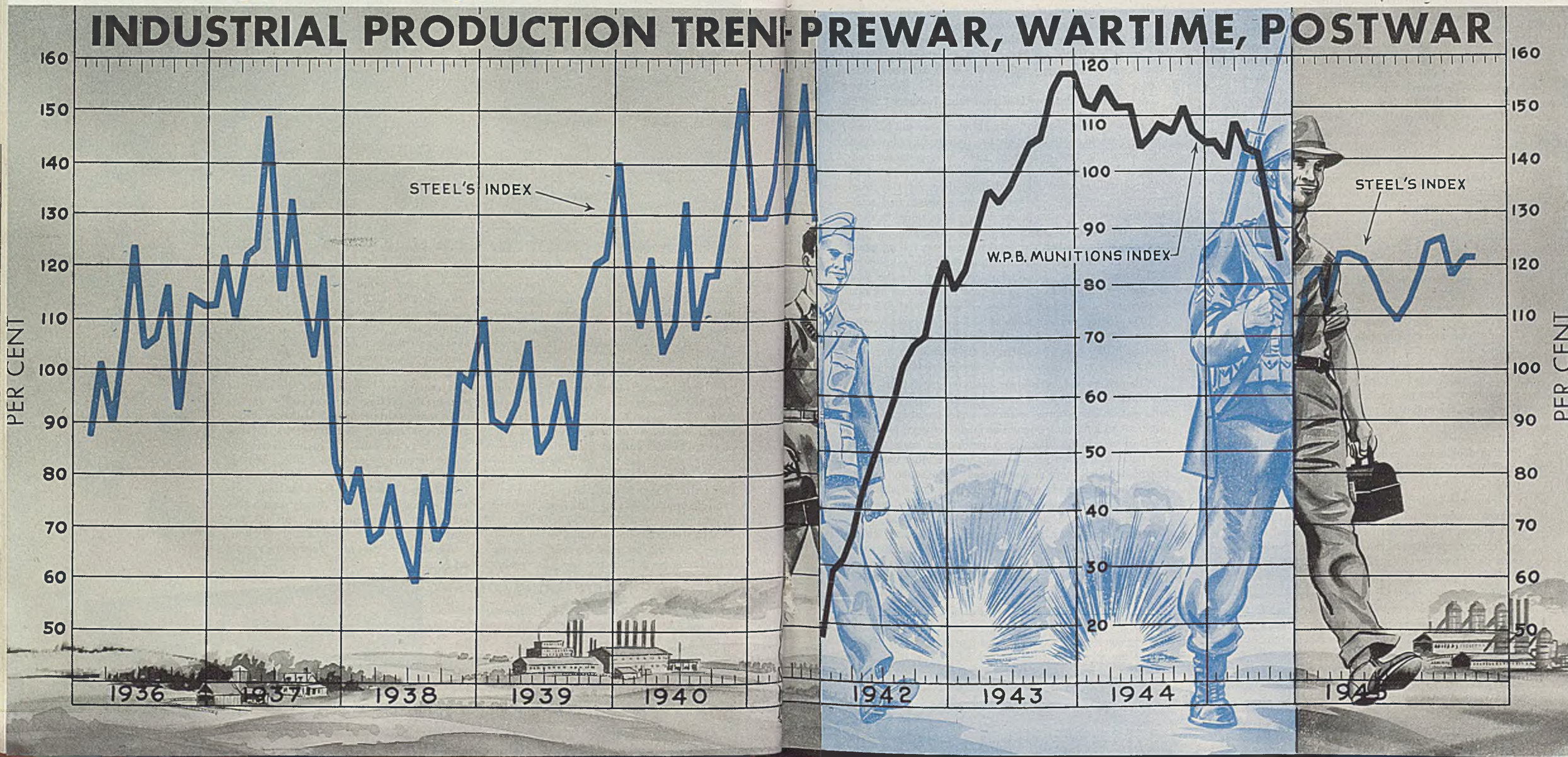
Industry Strives for Peacetime Footing

INDUSTRY enters 1946 with its first big postwar job—readjustment to peacetime conditions—unfinished and largely unsolved. Strikes and labor unrest are holding production down and make the near-term trend of industrial activity uncertain. Over the long term, however, it is expected that activity will be at high levels because of the huge pent-up demand for goods.

Sorely needed to put industrial activity into high gear is national unity of purpose. When the United States entered the war four years ago victory was the common aim of industry, labor, and government, and through a high degree of national unity generated by the emergency that goal was attained. Today the goal is a sustained and healthy level of prosperity, which can be achieved only if unity among all the forces in the economy can be rekindled.

While much of the technological adjustments necessary to convert industry from war to peacetime production was accomplished within three months after V-J Day, economic adjustments have a long way to go.

Speedy changeover of physical plant to peacetime production is not surprising con-



sidering the experience gained during the war in fitting facilities to munitions production. For five years emphasis has been on the mechanics of production rather than on costs. Throughout this period the economic system was disrupted by emergency regulations.

Reflecting the confusion in the economy as the new year begins, four and one-half months after the end of war, is the debate as to which is the greater immediate danger, inflation or deflation. Labor's demand for maintenance of high take-home pay plus the huge pent-up demand for products of all kinds make it appear pressure for inflationary price rises is stronger than that for deflation.

Industry as a whole had not expected peace to come as soon as it did, and the government agencies had been discouraging extensive reconversion up until May when the war in Europe ended. Much of the speed in reconversion since V-J Day, however, was due to industry's plannning for the peace before the Jap collapse.

Even though the war did not end until August, 1945, surprisingly the industrial production index of the Federal Reserve Board started declining in March because supplies had been built up beyond war demands. In January, the index stood at 234 per cent of the 1935-1939 average, and the year's high mark was reached at 236 per cent in February. After that the index declined steadily. At the end of October it had dived to 164 per cent, approximately the level existing shortly before the United States officially entered the war in December, 1941. The index reached its wartime high at 247 per cent in late 1943.

A chart prepared by STEEL (see pages 254-255) shows the nation re-entered peacetime at the same level of industrial production that prevailed in April, 1940, when this country started defense preparation in earnest. Considering the weekly average of 1936-1939, inclusive, as 100 per cent, industrial production when peace returned, week ended Aug. 18, 1945, was 102 per cent, the same as the monthly production index for April, 1940.

Recent Industrial Output Near That of 1940

Industrial output since surrender of Japan has averaged slightly under that of 1940 and a bit higher than in 1937.

By 1942, emphasis in industrial production was on munitions. Considering the 1943 monthly average of munitions production as 100 per cent, reported by the War Production Board, the output of munitions was 29 per cent at the beginning of 1942. After reaching a high mark of 117 per cent in November and December, 1943, munitions production declined gradually in 1944 and when V-J Day arrived Aug. 15, 1945, the index had receded to 84 per cent.

Although the war is over, expenditures for war activities will continue to dominate the federal budget through the current fiscal year which ends June 30, 1946. More than $50 billion, or three-fourths of total federal outlays, will go for war activities in the current fiscal year, compared with peak war spending of more than $90 billion in the 1945 fiscal year ended June 30, 1945.

While expenditures for munitions have been reduced drastically, federal spending has not declined in the same proportion because many nonmunitions items have continued large and will be large for many months.

The year 1945 was one of many contrasts. In early months, production of many munitions items such as airplanes was pushed vigorously. Toward the year-end many nearly-completed planes were scrapped. Early in 1945, rigid manpower controls prevented men from shifting to work that appeared to have a postwar future. In the last half of 1945, many of those very men where thrown out of work, more than 2½ million workers being released from war jobs during the first month following the Japanese surrender. Unemployment was aggravated by refusal of many war workers to accept peacetime jobs offering take-home pay lower than that to which they had been accustomed. As a result the roll of unemployed was up even though there were severe labor shortages in various areas.

Soon after V-J Day, strikes and widespread labor unrest began to hamper reconversion as labor sought to maintain take-home pay at wartime levels in the face of a reduction in the number of hours worked, and also to compensate for wage increases previously denied because of wartime controls. At the same time, manufacturers, faced with a continuation of government price controls were caught in the squeeze between rising costs and frozen ceiling prices. The automobile industry was an outstanding example of this. There existed a postwar paradox—men were out of work yet there was work for them to do.

Labor Shortage Handicaps Steel Industry

Similarly, in the steel industry although demand has continued close to wartime levels the industry has been unable since the first quarter of 1945 to operate near capacity, chiefly because of a shortage of labor. Readjustment of mill schedules immediately after V-J Day from production for war to production for peace caused steelworks operations to drop to the lowest level since the early days of the defense program. Shortly after a measurable recovery in September, steelworks operations fell off again because of a fuel shortage resulting from the bituminous coal miners' strike. Steel ingot production for the year is estimated at 79,728,256 gross tons at an operating rate of 83 per cent of capacity, compared with 89,641,575 tons in 1944 when operations were at 95.5 per cent of capacity. Continuing shortage of labor also held bituminous coal production in the first 11 months of 1945 almost 9 per cent under that for the corresponding period of 1944.

Although most government wartime regulations were modified or discontinued more quickly than had been anticipated, many price controls were maintained as a deterrent to inflation. Numerous manufacturers, including steelworkers, found that rising production costs on the one hand and frozen price ceilings on the other narrowed or eliminated all profit on some items. Consequently, little or no effort was made to produce certain items, although there was a ready market for them. This tended to hold down operating rates and employment in some industries.

Return of peace revived the construction industry which for some years to come is expected to enjoy a heavy demand. Construction volume in the 37 states east of the Rocky mountains for the first ten months of 1945 totaled $2,598,531,000, a 58 per cent gain over like 1944 period.

Since June, railroad freight carloadings have been running below last year. According to Interstate Commerce Commission estimates, revenue loadings of carload freight during the second half of 1945 will be down 8 per cent from the corresponding period of last year. Loadings of less-than-carload freight were not forecast, but the de-

cline in this category is likely to be less than in carload traffic. Net income of Class 1 lines in the first nine months of 1945 totaled $452 million, compared with $502,930,968 in the corresponding period of 1944. After hitting a high mark in 1942, net income has declined each year.

High level war production until Japan surrendered kept sales of electricity in each of the first seven months of 1945 above those of the corresponding months of 1944. August was the first month in 1945 in which electricity sales were less than those of the corresponding month of the previous year.

In changing from war to peace, the trend of industrial production will, broadly speaking, go through three successive stages: 1. Reconversion; 2. "catching-up" period, characterized by intensive industrial activity based upon accumulated demand for consumer goods and the urgent need to replace worn-out and obsolete capital equipment; and 3. sustained production after the pent-up demand has been satisfied to maintain high standards of living.

The first phase, reconversion of physical plant, is pretty well completed, but the second phase is being delayed by strikes and labor unrest. The third, sustained production, may possibly be the most difficult to accomplish. The nation's success in the latter phase well may be determined by the economic pattern set in 1946.

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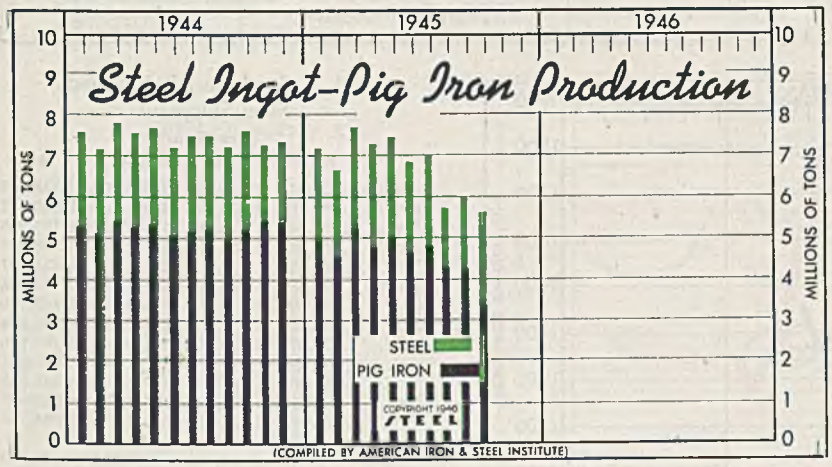


Iron, Steel Production

(Net Tons—000 omitted)

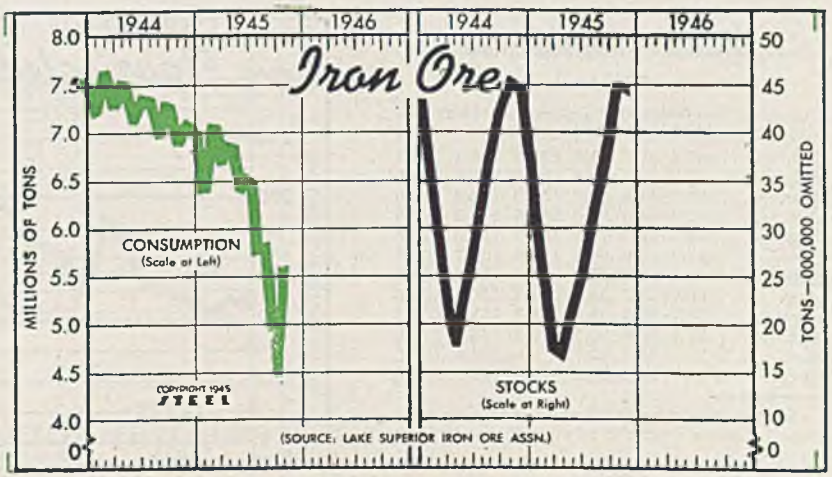
	Steel Ingots			Pig Iron	
	1945	1944	1943	1945	1944
Jan.	7,206	7,593	7,424	4,945	5,281
Feb.	6,655	7,194	6,824	4,563	5,088
Mar.	7,708	7,826	7,673	5,228	5,439
April	7,292	7,594	7,375	4,786	5,248
May	7,452	7,703	7,550	5,016	5,348
June	6,842	7,234	7,041	4,605	5,062
July	6,987	7,498	7,416	4,812	5,162
Aug.	5,736	7,499	7,592	4,249	5,215
Sept.	5,983	7,235	7,519	4,227	4,993
Oct.	5,620	7,621	7,819	3,343	5,200
Nov.	....	7,279	7,374	....	5,426
Dec.	....	7,366	7,266	....	5,404
Total	....	89,642	88,873	....	62,866

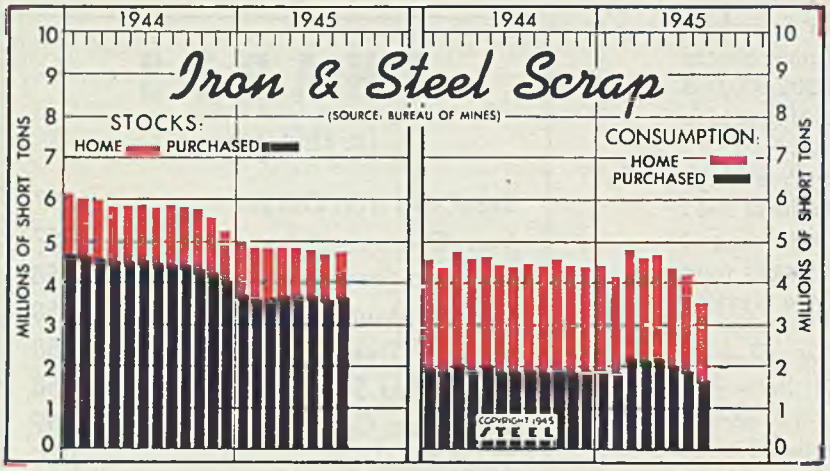
Iron Ore

(Lake Superior Iron Ore Assn.)

Gross Tons—000 omitted

	Consumption		Stocks at Lake Erie docks, and furnaces	
	1945	1944	1945	1944
Jan.	6,983	7,482	30,889	36,059
Feb.	6,371	7,207	24,577	28,910
Mar.	7,082	7,659	17,304	21,333
Apr.	6,642	7,273	16,429	17,892
May	6,872	7,558	20,715	21,474
June	6,397	7,112	24,847	26,655
July	6,532	7,372	29,485	32,069
Aug.	5,658	7,342	34,781	37,243
Sept.	5,837	6,950	39,549	41,943
Oct.	4,491	7,320	45,090	45,343
Nov.	5,612	6,883	44,706	44,722
Dec.	....	7,090	....	37,824





Iron and Steel Scrap

Bureau of Mines

(Gross Tons—000 omitted)

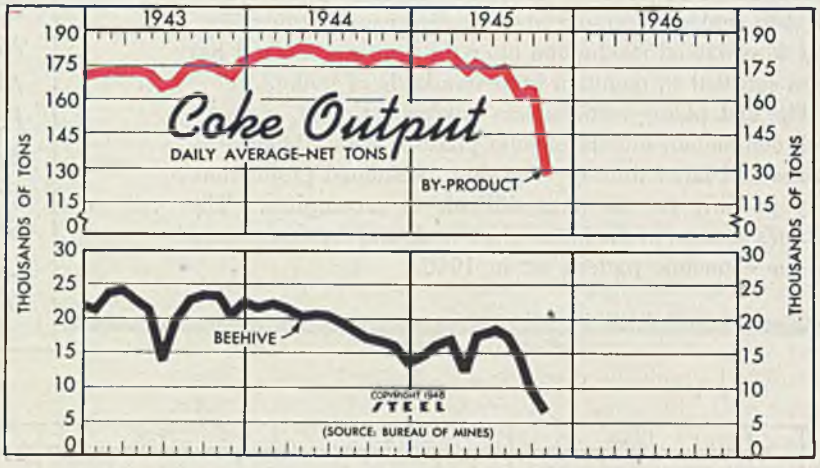
	Consumers' Stocks			Total Consumption		
	1945	1944	1943	1945	1944	1943
Jan.	5,023	6,214	6,877	4,507	4,616	4,492
Feb.	4,901	6,134	6,871	4,209	4,414	4,178
Mar.	4,873	6,027	6,850	4,889	4,827	4,787
Apr.	4,907	5,932	6,918	4,668	4,629	4,642
May	4,902	5,966	6,905	4,774	4,683	4,723
June	4,847	5,991	6,916	4,414	4,460	4,493
July	4,762	5,909	6,860	4,184	4,423	4,670
Aug.	4,848	5,975	6,778	3,562	4,533	4,686
Sept.	....	5,953	6,613	....	4,471	4,657
Oct.	....	5,832	6,456	....	4,684	4,830
Nov.	....	5,624	6,391	....	4,527	4,581
Dec.	....	5,335	6,448	....	4,487	4,449
Mo. Ave.	....	5,908	6,740	....	4,563	4,599

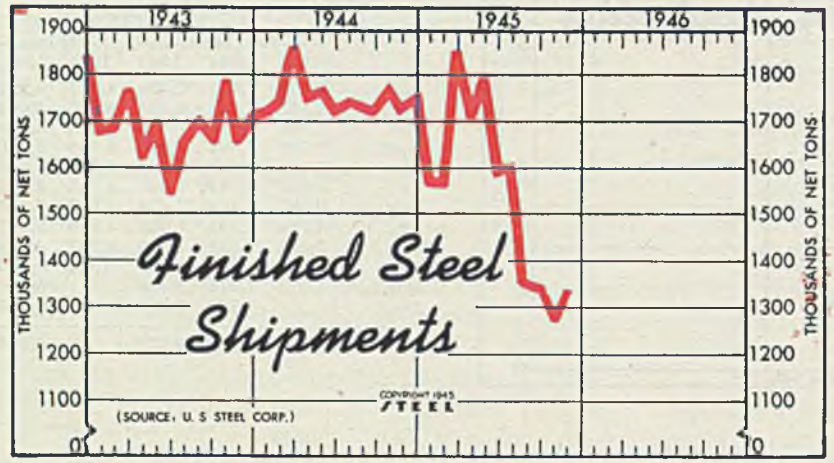
Coke Output

Bureau of Mines

(Daily Average—Net Tons)

	By-Product		Beehive	
	1945	1944	1945	1944
Jan.	179,879	182,226	14,745	21,933
Feb.	180,727	184,384	16,210	22,248
Mar.	182,120	183,123	17,115	21,529
Apr.	174,239	185,259	12,554	20,457
May	178,338	184,071	17,963	20,783
June	172,201	181,891	18,616	20,472
July	175,163	181,506	17,682	19,531
Aug.	163,567	181,718	14,669	18.572
Sept.	166,559	179,234	9,924	17,305
Oct.	127,173	181,772	6,383	16,994
Nov.	.....	182,383	.....	16,199
Dec.	.....	180,746	.....	13,507
Ave.	.....	182,359	.....	19,128





U. S. Steel Corp.'s Finished Steel Shipments

(Net Tons)

	1945	1944	1943	1942
Jan.	1,569,115	1,730,787	1,685,993	1,738,893
Feb.	1,562,488	1,755,772	1,691,592	1,616,587
Mar.	1,869,642	1,874,795	1,772,397	1,780,938
April	1,722,845	1,756,797	1,630,828	1,758,894
May	1,797,987	1,776,934	1,706,543	1,834,127
June	1,602,882	1,737,769	1,552,663	1,774,068
July	1,608,994	1,754,525	1,660,762	1,765,749
Aug.	1,332,180	1,743,485	1,704,289	1,788,650
Sept.	1,321,576	1,733,602	1,664,577	1,703,570
Oct.	1,290,358	1,774,969	1,794,968	1,787,501
Nov.	1,346,407	1,743,753	1,660,594	1,665,545
Dec.	.....	1,767,600	1,719,624	1,849,635
Total	.....	21,150,788	20,244,830	21,064,157
Adjustment	.....	*98,609	*97,214	*449,020
Total	.....	21,052,179	20,147,616	20,615,137

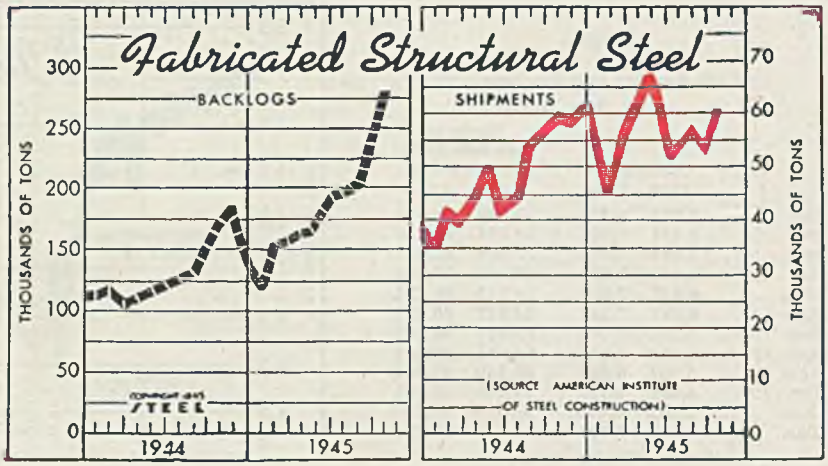
*Decrease.

Fabricated Structural Steel

(1000 tons)

	Shipments			Backlogs		
	1945	1944	1943	1945	1944	1943
Jan.	55.4	35.2	91.9	124.4	113.1	339.1
Feb.	47.9	42.9	90.8	151.6	117.6	321.0
Mar.	58.8	41.4	94.0	153.3	106.3	299.8
Apr.	62.2	44.5	86.6	162.5	111.2	272.5
May	71.5	50.7	78.9	165.7	116.3	220.6
June	68.4	43.0	68.4	195.2	122.7	207.1
July	68.1	45.3	56.8	194.0	125.4	201.8
Aug.	68.7	55.2	50.2	201.1	130.4	195.6
Sept.	60.7	57.5	51.8	248.5	151.1	208.1
Oct.	62.1	61.6	80.1	282.8	174.4	274.0
Nov.	....	59.4	42.7	.....	184.2	134.6
Dec.	....	61.3	39.6	.....	142.5	113.0

Source: American Institute of Steel Construction. Figures represent members' reports only.

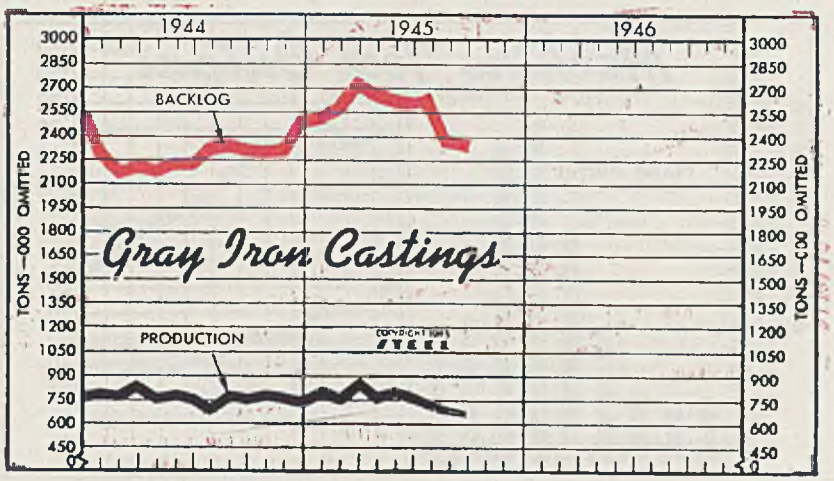


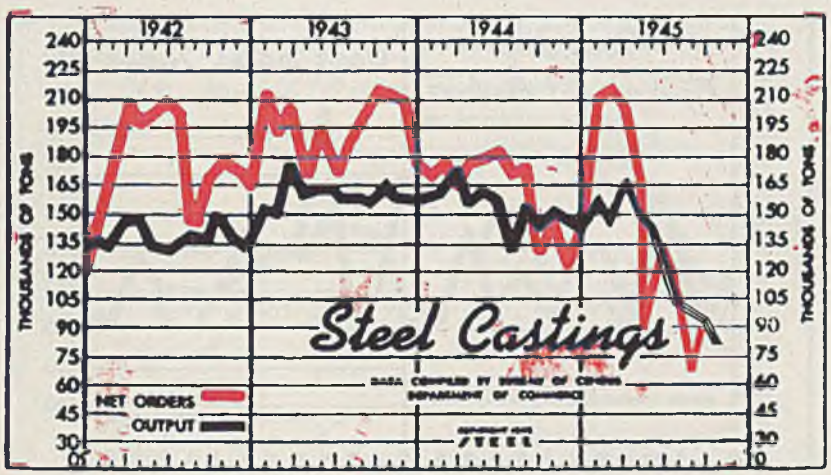
Gray Iron Castings

(U. S. Bureau of Census)

Tons—000 omitted

	Production		Backlog	
	1945	1944	1945	1944
Jan.	807	794	2,497	2,259
Feb.	753	773	2,562	2,145
March	851	841	2,714	2,184
April	769	766	2,641	2,159
May	806	789	2,603	2,205
June	773	766	2,596	2,213
July	693	698	2,565	2,314
Aug.	675	778	2,375	2,335
Sept.	666	769	2,325	2,304
Oct.	...	788	....	2,297
Nov.	...	770	....	2,300
Dec.	...	744	....	2,475
Mo. Ave.	...	773	....	2,266





Commercial Steel Castings†

(Net tons in thousands)

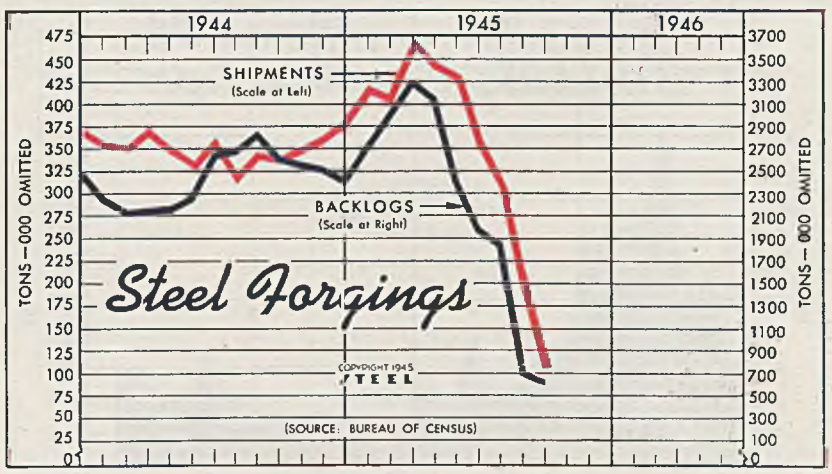
	New Orders		Production	
	1945	1944	1945	1944
Jan.	210.2	167.7	157.2	159.8
Feb.	214.4	173.6	146.2	161.4
Mar.	203.2	162.6	166.9	174.6
Apr.	177.7	175.1	150.3	155.8
May	89.8	177.0	145.1	161.8
June	130.2	181.8	125.1	157.4
July	110.7	169.9	99 6	131.9
Aug.	68.3	171.3	96.2	154.9
Sept.	89.7	129.8	82.4	144.5
Oct.	....	146.1	....	150.7
Nov.	....	120.7	....	146.4
Dec.	....	138.7	....	144.2
Ave.	....	159.5	....	153.6

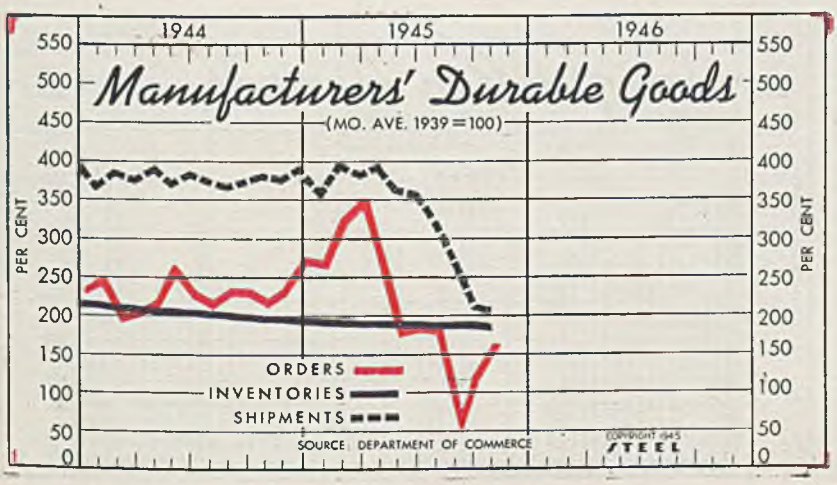
†For sale.

Steel Forgings

Tons—000 omitted

	Shipments		Backlog		Consumption of steel	
	1945	1944	1945	1944	1945	1944
Jan.	417	355	2,723	2,256	556	521
Feb.	406	350	3,018	2,132	544	509
Mar.	469	370	3,304	2,142	632	521
Apr.	442	347	3,147	2,166	576	494
May	430	330	2,428	2,252	567	453
June	357	359	1,947	2,637	467	487
July	306	315	1,855	2,670	393	441
Aug.	195	341	696	2,821	257	483
Sept.	110	336	623	2,602	152	463
Oct.	...	348	....	2,564	...	488
Nov.	...	360	....	2,510	...	488
Dec.	...	377	....	2,408	...	506

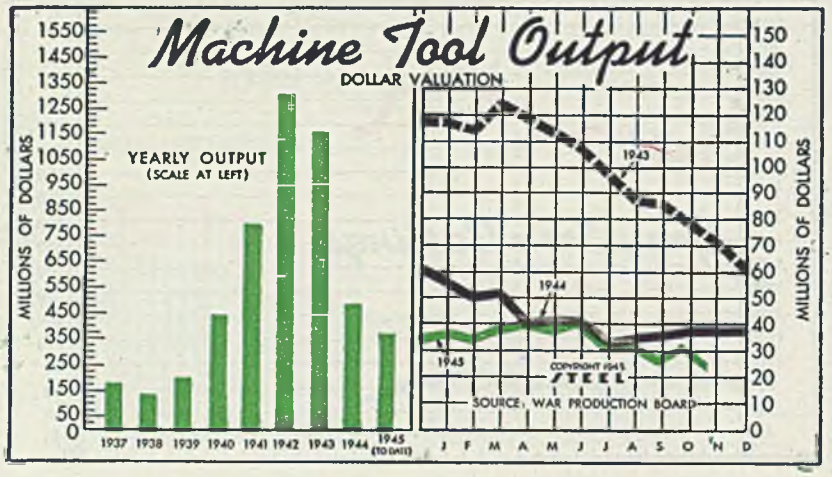




Index of Manufacturers' Durable Goods

(Mo. Ave. 1939 = 100)

	Orders		Shipments		Inventories	
	1945	1944	1945	1944	1945	1944
January	267	248	354	364	190	212
February	326	195	394	384	189	209
March	351	202	382	377	189	207
April	267	215	389	389	189	205
May	177	265	361	371	189	204
June	182	227	356	383	189	204
July	180	213	320	373	187	202
August	54	231	262	366	185	201
September	122	230	216	372	185	199
October	165	214	205	380	182	197
November	....	232	....	374	....	195
December	....	276	....	390	....	192
Average	....	229	....	377	....	202



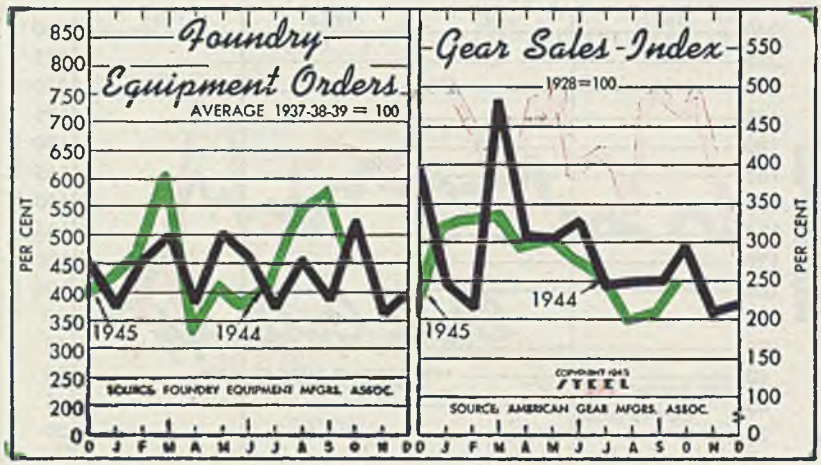
Machine Tool Shipments

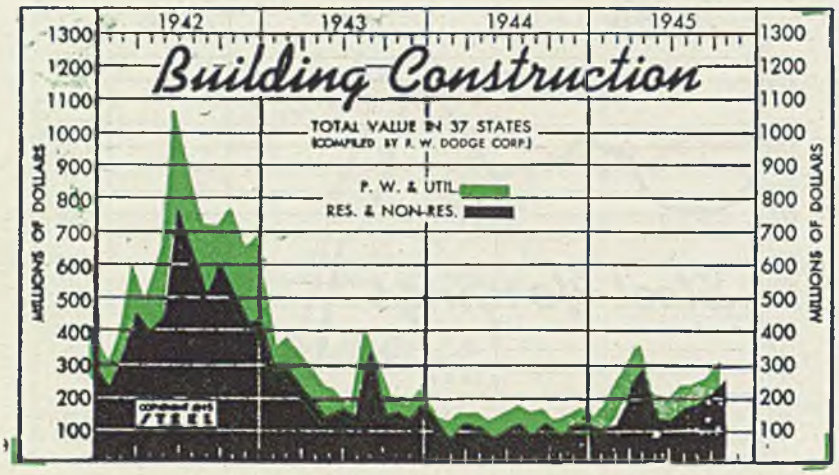
(000 omitted)

	1945	1944	1943	1942
Jan.	$37,353	$56,363	$117,384	$83,547
Feb.	36,018	50,127	114,594	84,432
Mar.	39,977	51,907	125,445	98,358
Apr.	40,170	41,370	118,024	103,364
May	39,825	41,819	113,859	107,297
June	41,040	41,471	108,736	111,090
July	32,504	32,753	97,428	113,596
Aug.	32,500	35,177	87,405	117,342
Sept.	27,300	35,876	85,842	119,883
Oct.	31,200	37,516	78,300	130,008
Nov.	25,923	36,277	71,811	120,871
Dec.	.....	36,782	60,861	131,960
	.....	$497,438	$1,179,689	$1,321,748

Foundry Equipment Orders — Gear Sales

	Foundry Equipment Orders Index (1937-38-39=100)			Gear Sales Index (1928=100)		
	1945	1944	1943	1945	1944	1943
Jan.	422.4	378.3	429.8	323	246	268
Feb.	465.3	456.8	399.5	331	214	303
Mar.	604.7	498.4	562.7	339	485	334
Apr.	325.0	385.7	362.7	296	308	240
May	404.7	503.9	348.9	309	305	342
June	375.4	466.1	413.6	271	328	401
July	411.7	375.8	379.4	264	242	374
Aug.	532.2	450.5	390.4	205	247	312
Sept.	577.2	388.0	346.6	213	248	320
Oct.	457.8	526.5	436.6	251	293	368
Nov.	....	369.5	388.0	...	209	387
Dec.	....	397.4	442.8	...	219	387
Ave.	....	433.1	408.4	...	279	336





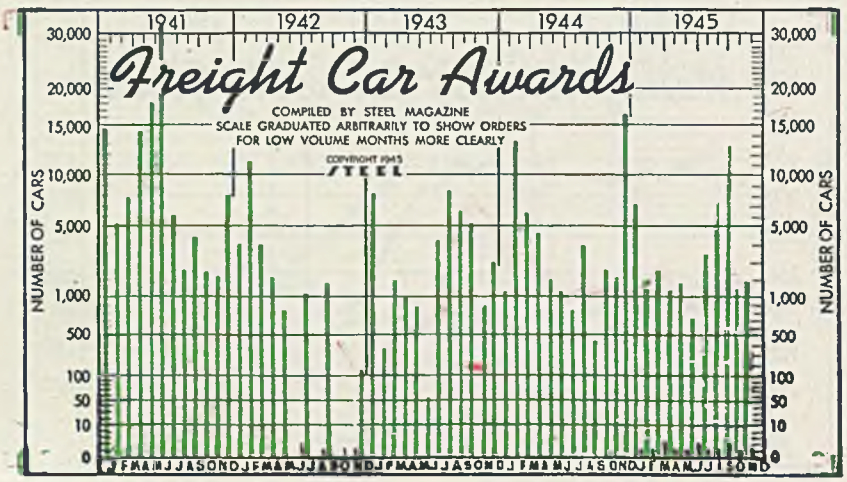
Construction Valuation In 37 States

(Unit—$1,000,000)

	Total	Public Works-Utilities		Residential and Non-Residential	
	1945	1945	1944	1945	1944
Jan.	140.9	39.8	50.3	101.2	108.9
Feb.	147.0	32.0	55.1	115.0	82.1
Mar.	328.9	90.6	61.3	238.3	115.1
Apr.	395.8	111.9	72.0	283.9	107.3
May	242.5	107.9	53.8	134.6	88.4
June	227.3	95.0	70.7	132.3	93.1
July	257.7	89.9	80.5	167.8	110.0
Aug.	263.6	77.5	69.4	186.1	99.9
Sept.	278.3	54.6	64.1	223.6	111.6
Oct.	316.6	61.1	52.2	255.5	92.6
Nov.	.....	....	48.0	.....	116.9
Dec.	.....	....	66.6	.....	121.8
Total	.....	....	746.0	.....	1,247.7

Freight Car Awards

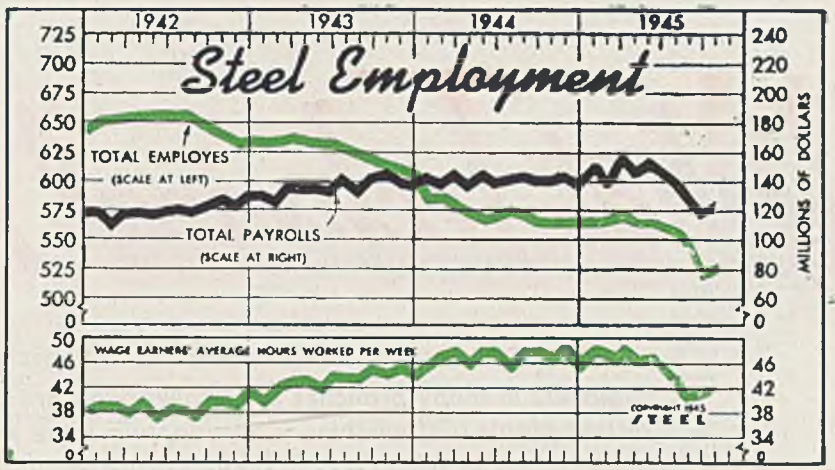
	1945	1944	1943	1942
Jan.	7,200	1,020	8,365	4,253
Feb.	1,750	13,240	350	11,725
March	2,500	6,510	1,935	4,080
April	1,120	4,519	1,000	2,125
May	1,526	1,952	870	822
June	670	1,150	50	0
July	3,500	795	4,190	1,025
Aug.	7,240	3,900	8,747	0
Sept.	12,840	400	6,820	1,863
Oct.	1,320	2,425	5,258	0
Nov.	1,650	1,065	870	0
Dec.	.....	16,245	2,919	135
Total	.....	53,221	41,374	26,028

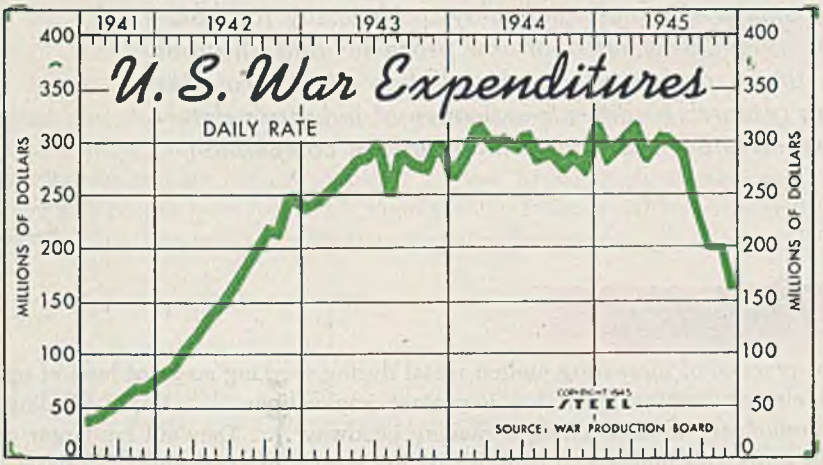


Steel Employment

	—Employees— (000 omitted)			——Total Payrolls—— (Unit—$1,000,000)		
	1945	1944†	1943	1945	1944	1943
Jan.	564	583	637	$150.3	$141.8	$129.7
Feb.	566	583	635	138.4	137.6	122.8
March	570	578	637	155.0	145.3	136.8
April	567	573	634	147.0	138.9	133.3
May	565	569	632	154.0	145.4	137.4
June	562	570	631	144.1	140.5	136.2
July	557	571	627	141.0	141.8	142.8
Aug.	543	569	625	128.1	143.9	139.9
Sept.	521	565	620	119.1	142.2	143.8
Oct.	522	564	615	121.3	141.7	144.9
Nov.	...	564	611	.....	143.1	141.5
Dec.	...	564	605	.....	139.9	140.2

† Monthly average; previous reports showed total number regardless of whether they worked one day or full month.





War Expenditures

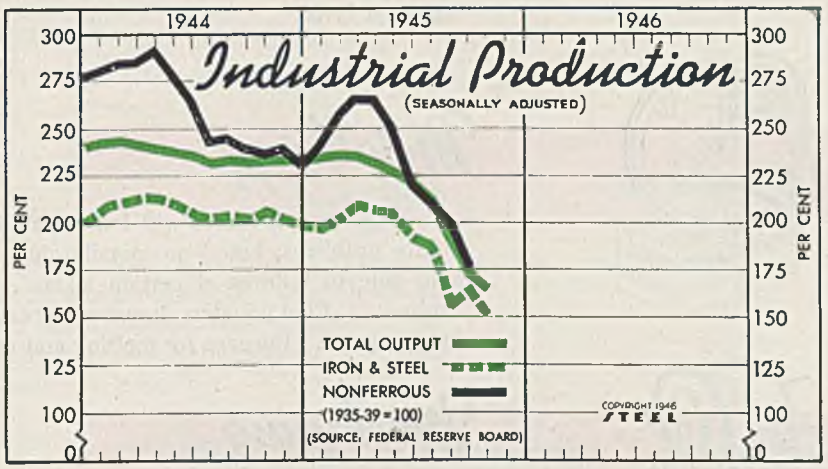
(millions)

	——1945——		——1944——	
	Monthly Expenditures	Daily Rate	Monthly Expenditures	Daily Rate
Jan.	$7,519	$278.4	$7,416	$285.2
Feb.	6,965	290.2	7,808	312.3
March	8,318	308.1	7,948	294.4
April	7,045	281.8	7,493	299.7
May	8,166	302.5	7,918	293.3
June	7,885	303.4	7,957	306.0
July	7,324	281.7	7,355	282.9
Aug.	6,398	246.1	7,798	288.8
Sept.	5,365	206.3	7,104	273.2
Oct.	5,124	197.1	7,447	286.4
Nov.	4,224	162.5	7,095	272.9
Dec.	.....	.....	7,835	313.4
Total	...	....	....	91,174 Ave. 292.4

Federal Reserve Board's Production Indexes

(1935-39 = 100)

	Total Production		Iron, Steel		Nonferrous	
	1945	1944	1945	1944	1945	1944
Jan.	234	243	197	208	240	281
Feb.	236	244	202	212	257	285
Mar.	235	241	210	214	265	286
Apr.	231	239	206	213	264	292
May	226	236	204	210	251	279
June	220	235	192	204	219	264
July	211	230	187	202	210	243
Aug.	187	232	155	203	198	245
Sept.	171	230	163	202	176	239
Oct.	164	232	150	206	...	236
Nov.	...	232	...	201	...	239
Dec.	...	232	...	198	...	229
Avge.	...	235	...	206	...	260



Federal Reserve Board's Industrial Production Index

(1935-39 average = 100)

	1945	1944	1943	1942	1941	1940	1939	1938	1937	1936	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926
Jan.	234	243	227	181	140	122	101	85	116	94	83	72	58	65	78	100	108	95	97	93
Feb.	236	244	232	183	144	116	101	84	118	92	85	75	57	63	79	100	108	95	97	94
Mar.	235	241	235	186	147	113	101	84	120	93	84	79	54	62	81	98	109	96	99	95
Apr.	231	239	237	189	144	112	98	82	120	98	82	80	58	58	80	98	110	96	96	94
May	226	236	239	191	154	116	98	81	121	100	83	80	68	56	80	96	112	97	97	94
June	220	235	236	193	159	122	103	81	119	103	84	79	78	54	78	93	114	98	97	95
July	211	230	240	197	160	122	105	86	120	104	84	73	86	53	76	89	114	99	95	95
Aug.	187	232	242	204	160	124	105	90	119	106	87	72	82	54	74	87	114	101	95	97
Sept.	171	230	244	208	161	127	114	93	115	108	89	70	77	58	70	85	113	102	94	98
Oct.	164	232	247	215	163	130	121	96	107	110	92	71	73	60	68	83	110	104	92	98
Nov.	...	232	247	220	166	134	124	100	96	113	94	72	69	60	67	81	105	106	92	97
Dec.	...	232	241	223	167	139	125	101	87	116	95	77	70	58	66	79	100	107	93	97
Av.	...	235	239	199	155	123	108	89	113	103	87	75	69	58	75	91	110	99	95	96

What Technical Men Expect in 1946

Engineers in many branches of metalworking are busily engaged in reconverting plants and machinery, in adapting some war-developed techniques to peacetime practice, and in finding processes that will utilize to the fullest characteristics of new or improved metals and alloys. Necessity for holding down costs will foster wider use of efficient new processes and all types of automatic machines, timers and controls. Installation of laboratories and expansion of existing research facilities is indicative of industry's determination to hold its own in either national or international competition

Iron and Steel Production

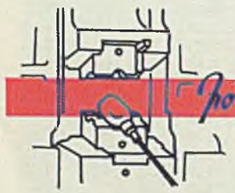
Present practice of measuring molten metal during working stage of heat at open-hearth and electric furnace shops has important implications . . . Rapid pickling of steel strip preliminary to cold rolling is making headway . . . Demand for larger coils for tin plate spurs mill builders to consider rolling speeds of 6000 fpm . . . Basic linings gain favor.

Metallurgy

Engineers in future will look to statistical mechanics for solution of strength and failure problems, based on metallurgical observation . . . Sigma phase structure may hold clue to failures of certain alloys . . . Effect of quench on physical properties studied . . . Fine powders, improved presses to put larger powder metal parts into mass production . . . Furnace for melting and casting metal in vacuum watched with interest.

Machining

With labor costs rising, machine tool builders are looked to for equipment which will keep overall costs down through improved efficiency . . . Hope for new business in face of huge surpluses overhanging the market lies in economic pressure for more special machinery and for machinery capable of full utilization of cemented carbide tooling; and in possibility that Government may hold large numbers of standard machines as military reserve equipment, and for export . . . Strong trends toward features which will increase production by relieving operators of mental and physical drudgery are apparent.



Forging, Drawing and Stamping

Advances in presses and hammers, part designs and forge heating methods, plus new alloys and new uses for old alloys, will combine to make the 1946 forging a finer product than prewar counterpart . . . General use of modern inspection instruments to uphold quality . . . Trend is toward larger presses of all types, with power or speed, or both, emphasized.

Lubrication

Cost-reducing possibilities of war-improved lubricants to be underscored . . . Feeling grows that time to install centralized lubrication on machinery is during design stage . . . Long-lived lubricants will be better able to meet stringent requirements of anti-friction bearings . . . A more sensible approach to entire problem of selection and application of lubricants necessary.

Heat Treating

Heat treaters anticipate: Increased mechanization and conveyorizing of furnaces for heat treating on straight-line, continuous basis . . . Extension of continuous gas carburizing for precise control of case . . . Use of salt baths for heating as well as quenching to permit handling larger tonnages . . . Pronounced bulge in field for induction heating . . . Gas heating, reheating, flame hardening, etc. of steel at mill speeds.

Surface Treatment

Electroforming holds interest . . . Composite coatings of nickel and zinc subsequently heat treated, expected to compete with hot galvanized coatings . . . Efforts toward placement of adequate cleaning facilities in line ahead of final finishing may be intensified . . . Tumbling, new bright dips and vapor blasting to command wider attention as fine finishing mediums . . . Hot air drying boon to hot dip galvanizers . . . Thin overplate of lead or lead-tin alloy on bearing surfaces seen as holdover from war practice . . .

Casting

Future steel castings to stand up under most severe conditions . . . Trend toward mechanization and improved working conditions to continue . . . Cast iron stresses and directional solidification in nonferrous alloys slated for additional study . . . Ultimate strengths exceeding 100,000 psi on 1-in. diam gray iron sections to set new standards . . . More cold chamber machines spell variety in die casting.

Materials Handling

Sizable demand for trucks and special handling equipment expected to keep suppliers working overtime . . . Improvements in overhead traveling cranes in next few years will outdate older slow-speed units . . . Trained materials handling engineers to be at premium . . . War record of transfer bridge cranes good enough to warrant incorporation in new factory buildings . . . Palletizing here to stay.

Joining and Welding

Welding and joining engineers expect: Automatically controlled pressures to eliminate warping in cold riveting . . . Special fasteners to appear in many new sizes and shapes . . . Furnace silver brazing of cast iron cylinder sections . . . Automatic metallic shielded arc welding to establish new concepts of speed and efficiency . . . Higher manual welding speeds . . . Industrialization of continuous arc-time welding fixtures . . . More spot welding of aluminum, magnesium and hardenable steels.

Fuller Utilization of Steels' Potentialities Anticipated

John T. Jarman, general superintendent, Allis-Chalmers Mfg. Co., Milwaukee: "Current and prospective developments for the coming year can be classified as follows:

"1. Considerable progress in fully utilizing potential properties of steels will result from better understanding of quenching equipment and quenching media. Facilities for more rapid and uniform quenching definitely will pay dividends.

"2. In the past, we have had a flurry of interest and development in induction hardening. Added to this field of heating, will be development of induction heating for forging. This type of heating has had many fine applications during the war, and the understanding of its application should carry over well to commercial fields.

"3. In order to keep engineering gray iron cheap, the foundry industry must develop more on problems of mechanization, control and salvage. There are many benefits to be gained from a better understanding of sand control and sand reclamation. Sand reclamation covering the reclaiming of all waste sand, so that even the smaller foundries can benefit from the potential savings, will have intensive study".

Strain Gage Measurements Balance Costs and Safety

R. B. Lincoln, director, National Weld Testing Bureau, Division of Pittsburgh Testing Laboratory, Pittsburgh: "Strain gage measurements as a means of stress analysis are not new but they are coming into more general use, partially at least, due to the improved electrical strain gages that permit the use of very short gage length, as well as measurement of rapidly varying stresses. There are many cases where it is not possible to accurately calculate stresses. In the past we have erred, in such cases, on the side of safety. That usually meant too much material with unnecessarily high cost. Substantial cost reductions can be obtained with an increase in safety and service by redesigning weldments and castings on the basis of information secured by electrical strain gage measurements, taken with improved equipment.

"There is, I believe, a further improvement in this technique just around the corner. It will consist in the more general use of x-ray diffraction in measuring strain. In theory, it is possible to measure absolute strain by this method while the mechanical and electric instruments so far developed measure only change in strain.

This will simplify study of locked up stresses. Further, it will probably be possible to use a gage length in the order of 1/100-in, facilitating the study of stress concentration. I have not, as yet, seen equipment suitable for general laboratory and field use but it will likely be developed shortly".

Statistical Mechanics May Help Solve Strength Problems

Clayton O. Dohrenwend, Department of Mechanics, Illinois Institute of Technology, Chicago: "It is certain that all industry will continue to pay more attention to the application of mechanics, the science of matter and motion, not only in the design of equipment but also in its production lines.

"Many significant developments in the measurement of displacement velocities and accelerations, as well as strain measurements, are making it possible to study dynamic problems in all phases of industry. Application of physics principles in the field of electronics has made possible measurements in problems requiring experimental techniques for solution because of their complexity. In the fields of mechanics and metallurgy, new basic understandings are bringing the two fields much closer together, especially in matters of strength and failure of the metals. Therefore, in the future much more attention will be placed on the correlation of mechanics strength problems with metallurgy.

"Many mechanics research people are turning their attention to the behavior of material from a microscopic viewpoint. It may be of minor significance that European research in mechanics has already taken on this activity.

"Engineers in the future may look to the application of statistical mechanics for the solution of their strength and failure problems, based on metallurgical observations, rather than on general modifications of classical mechanics theories."

End-Quench Hardenability Test Still Holds Much Authority

W. B. Coleman, president, W. B. Coleman & Co., Philadelphia: "In our particular field, testing and inspection, the most outstanding development, both current and prospective, is the specifying and manufacturing of alloy steels to within end-quench hardenability limits.

"Controlling the hardenability of steel or its response to heat treating has been attempted for a long period of time with a varying amount of success. Most of the methods used involved restricting chemical composition to very narrow limits, but this did not always give the quality control that is necessary in most of the war and postwar applications where strength and uniformity of materials are a prime requisite.

"It has been found that the relative ability of a steel to harden under heat treatment becomes apparent in the degree to which the material hardens when quenched at different cooling rates. By use of the adopted standard method for end-quench hardenability, numerous steels that were outside the accepted chemical specifications definitely fell within the accepted hardenability limits. It is also true that some steels, while within the specified chemical range, were not acceptable by hardenability limits. Residuals, as well as open hearth procedure, and deoxidation, all enter into the hardenability test.

Some of these phases at times are not under control and thus even after basic chemical analysis is correct, hardenability still would not be within required limits.

"More general adoption of this test by both manufacturers and consumer would result not only in better co-operation

between the two, but the product attained would be superior in quality and obviously it would be more economically produced."

Next 50 Years To Be Known as "Era of Scientific Research"

Carl A. Zapffe, consulting metallurgist Baltimore: "There is but little question that the next 50 years will go down in history as the Era of Scientific Research. World War II began as a result of anti-Christian leaders who recognized the real possibility of attaining world power through the products of scientific research; and World War II ended probably as the result of our own government's remarkable faith in Anglo-American scientists to produce the atomic bomb.

"Political isolation has now vanished, which means that India, China, Brazil, and all the underdeveloped countries of the World will not only be exposed to western science, but will be sought out and cultivated with early and full utilization of their natural resources, both material and human. This already occurs in South America; and attitude of the Indian delegates to the recent International Civil Aviation Conference amply displayed the rapidly growing efforts of that country to enter the international race for knowledge and material power,

"Starting from virtual chaos, the progress of the Soviet colossus to a world position in science in less than one generation should cause us quickly and soberly to re-evaluate the geopolitical significance of countries, for example, which comprise the wealthy land mass of Asia and contain one billion orientals whose basic mental acuity is not to be doubted —and whose marked anti-Christian philosophy creates a terrible parallel with the philosophic background of World War II.

"On the Soviet postwar program, Item No. 1 is the prosecution of scientific research. Russia's position thereby forces other countries, specifically the United States, to nationalize research in some form at least equivalent in intensity and extent. While such a move appears to many as a threat to American individuality, the fact remains demonstrated by the fearful potential of prewar socialistic Germany and the astonishing progress of quasi-socialistic wartime America that a collected national effort is the efficient effort. Our peacetime policy of each company for itself leads to endless and unknown duplication of scientific facts separately found and separately buried in each company's files. Total research program of the nation then is measured more or less by the nation's largest single laboratory, which is insufficient for the international stature demanded in the coming period.

"Just as no nation can afford to neglect this challenge, neither can any single industry within that nation. Virtually every productive business must have a research staff or a connection with one because of the pace set by those which do. Number of newly announced laboratories increases each month.

"Research began as a philosopher's plaything, grew through magnanimity of industries who cared for it as a luxury, and attained manhood in World War II".

Modified Austenitic 18-8 Steel Under Development

L. W. Townsend, manager, Composite Steel Division, Jessop Steel Co., Washington, Pa.: "Steel mill thinking had to gyrate during the past year between total war, reconversion, and peacetime problems. Electric furnace steel mills had to change plans overnight to apply material and facilities going full blast on war production, to peacetime items. The only developments which are of paramount interest at the present time are those which affect our peace economy.

"We are working diligently on an austenitic stainless steel, with a modified 18-8 analysis which will lend itself particularly well to cold drawing and cold rolling. This stainless steel will eliminate one or two intermediate anneals in the production of deep drawn sections. It has characteristics of a stabilized alloy, and will take a high luster finish, superior to the standard 18-8 analysis. This patented metal, it is planned, will be available in composite as well as solid form.

"Early this year, a high speed composite hacksaw will be available, and this product, no doubt, will have a very marked effect on the hacksaw industry. We also are putting a composite R-type tool steel for the production of chipper knives, hog knives and other wood-cutting tools, into a standard production setup. These tools possess the edge holding and wear resistant qualities of high speed, combined with the shock resistance and economy of a low alloy steel.

"In the near future, there will be marketed stainless clad material down to 0.025-in. in gage, with a bright cold rolled finish on the backing side as well as the stainless side".

Sigma Phase Study May Yield Clue to Failure of Some Alloys

Oscar E. Harder, assistant director, Battelle Memorial Institute, Columbus, O.: "There have been certain developments on heat-resistant alloys reported during 1945 which should be mentioned in any review of metallurgical progress. Four of these are: (1) Sigma phase; (2) liquidus-solidus temperatures of commercial heat-resistant alloys; (3) emissivities of commercial heat-resistant alloys; and (4) high-temperature corrosion of nickel-chromium-iron alloys.

"First constituent has been noted by investigators, and its advantages and disadvantages, mostly the latter, have been described in numerous researches. However, there continued to remain considerable confusion regarding this constituent; Francis B. Foley, in a comprehensive survey of the information on the sigma phase published in the Alloy Casting Bulletin (July, 1945), gives adequate proof of the existence of the phase, shows how it may be detected, and also gives indication of its importance in commercial alloys. Key to some of the problems, including failures of commercial alloys, might be found in a study of this article.

"Little in the way of specific information has been available on the liquidus-solidus temperatures of commercial heat-resistant alloys, such as those containing about 36 per cent nickel and 16 per cent chromium and 26 per cent chromium and 12 per cent nickel, which are now designated as HT and HH alloys by the Alloy Casting Institute. Addition of carbon to the ternary alloys lowers both the liquidus and solidus temperatures, effect on solidus temperature being somewhat greater than on liquidus temperature. For H. H. alloys, the liquidus temperature is lowered some 70°F by 0.35 per cent carbon and about 105°F by 0.53 per cent carbon when the silicon content is about 1.75 per cent and the manganese about 1 per cent.

"Approximately same reduction in the

liquidus temperature is found in H. T. alloys when carbon content is increased from 0.15 to 0.46 per cent. Solidus temperatures of these alloys were reduced about 275°F and 190°F by about 0.50 per cent of carbon in HH and HT alloys, respectively. Increasing silicon content from 0.5 to 3.5 per cent lowered liquidus. and solidus temperatures about 80°F.

"For alloys of carbon, silicon, and manganese contents of about 0.45, 1.20, and 0.80 per cent, respectively, there was little change in liquidus-solidus temperatures when chromium was varied from 14 to 20 per cent or when nickel was varied from about 34 to 40 per cent.

"Emissivity of molten metal has been recognized as of importance, and in careful metallurgical work either the true temperature is determined by an immersion thermocouple or an attempt is made to correct for emissivity. It is shown that emissivities of the HH and HT types heat-resistant alloys vary with temperature of the bath and also with the surface condition of bath. Especially, it is important to note whether the bath is covered with surface film or whether it is an open bath.

"Research has been in progress at Battelle on corrosion resistance of nickel-chromium-iron alloys with quite a wide range in variation in nickel and chromium contents; with nickel varying from about 20 per cent up to over 60 per cent in some of the alloys and chromium ranging from about 10 per cent to as high as 35 per cent. Air oxidation has been studied at 1600°F, 1800°F and 2000°F, both for interrupted heating and continuous heating. Corrosion tests have been made in flue gases containing about 5, 50, and 100 grains sulphur per cu ft at 1800°F, with composition of the gas adjusted to represent both 'oxidizing' and 'reducing' conditions. This work is not complete, but the material which has been released gives a general picture of the effect of nickel and chromium variations on the corrosion resistance."

High-Cost Alloys Worth Their Price

E. V. Ivanso, Steel Sales Corp., Detroit: "Postwar period is finding widespread uses for high-alloy steels and various nonferrous alloys, such as the high nickel types. New alloys, or modifications thereof, presenting special mechanical and physical properties, under corrosive and high temperature conditions, which were used in such projects as jet propulsion, atomic bomb production, aircraft, etc., are being widely considered in spite of the apparent high cost per pound.

"Such materials justify themselves either by performance unrivaled by other materials, or by eventual lower costs because of longer life. In fact, lower costs per item can often be brought about by economies made possible in manufacturing operations by the intrinsic properties of the material. An example would be a part made of a cheaper material which had to be heat-treated, plated, etc., to obtain the desired combination of physical properties and corrosion or abrasion-resistant surface properties.

"By changes in design to accommodate the properties of one of the special materials, a saving in weight can often be effected, while a reduction or elimination of several operations would result in a saving in labor costs. Often a part as good or better than the original, thus can result in a cost comparable or lower than originally.

"Utilization of the precision casting or 'lost wax' method of producing castings to exact dimensions, will also result in a more widespread use of special alloys where difficulty in machining, etc., was originally a drawback."

Success of Combined Research Makes Continuation Imperative

C. E. Sims, supervisor, metallurgist, Battelle Memorial Institute, Columbus, O.: "During the recent world conflict, engineering and scientific talents were organized in a concerted effort for the solution of technical problems in production and the development of the new engines of war. These efforts were freely financed with the result that products were developed in such rapid succession as to simulate assembly-line production. The highly successful outcome of these efforts has placed great emphasis on research and has resulted in a much wider recognition of its potentialities. There is every evidence that this emphasis will carry over into the succeeding years of peace.

"It has been widely claimed that wartime developments resulted from the application of fundamental knowledge already known and not from the acquisition of new information. From the broad viewpoint, this is obviously true, and yet many of studies were carried out in a manner so fundamental that much basic information was discovered. There is still the inevitable gap between the discovery of basic information and its engineering application to products or processes. It is predicted, however, that in the next few years, many of these data may be expected to find applications in steel metallurgy.

"A realization of this and a belief that research will play an extremely important part in postwar developments seems prevalent throughout industry. Plans are now under way for a marked expansion of research facilities both as regards new laboratories and increased personnel."

Inspection Instruments Not Always Infallible

T. L. Counihan, chief metallurgist, Hyatt Bearings Div., General Motors Corp., Harrison, N. J.: "Increased use of the magnetic particle test during war years resulted in concentrated studies by both steelmakers and users in efforts to reduce losses encountered because of this type of inspection. While progress has been made, there remains much to be accomplished along these lines.

"Unfortunately, as far as inclusions which generate hairline seams are concerned, there is no inspection method known which can be applied to billet steel samples which will evaluate or predict what percentage of rejections may be expected in finished parts. Microscopic cleanliness ratings, deep etching of billet samples, or magnetic inspection of turned bars from the billets are not too accurate criterions of rejections to be expected. Heats of steel rated relatively clean by these methods may, when fabricated into finished parts, produce abnormally high rejections.

"Fine hairline seams are more prevalent in the outer two-thirds' volume of metal, between the outer surface and center of a bar of rolled steel than the other third section, from the center of the bar outward. Possibly this is due to the fact that since the center of an ingot freezes last, small inclusion particles responsible for hairline seams have a longer time to traverse upward through

molten metal during casting, so that more of them reach the ingot top and are cropped or removed.

"Losses on parts which have surfaces paralleling the flow lines of the material can be very serious. Such is the case in cylindrical shaped sections. Greatest relief can be accomplished by changing the directional properties of materials by mechanical working, such as by proper forging. Forging concerns have made specialized studies in this respect and it is not unusual to reduce losses by 90 per cent or more through study of directional properties."

Refinement of Techniques Held Scientific Interest in '45

R. H. Harrington, Research Laboratory, General Electric Co., Schenectady, N. Y.: "Now, and for time to come, one individual can no longer assess adequately a year's significant developments in metallurgy. The year 1945 did not witness the advent of any new alloys of startling worth. Rather, it seemed to further emphasize refinement of techniques, improvement in composition control, more efficient development of processes, and more accurate application evaluation of specific alloys.

"Some of the items of interest include the following:

"1. Further development of centrifugal casting. Contrary to past belief, it has been demonstrated that high strength, heat-treated aluminum alloys can be successfully centrifugally cast, particularly the new alloys of aluminum and copper, containing small additions of beryllium with or without cobalt.

"2. Further development of investment casting, also inclusive of the aluminum-alloys of copper-beryllium-cobalt.

"3. Improvements in forming and finishing methods for magnesium and its alloys.

"4. Better understanding and use of the role of quenching and cold work strain, especially when combined with subsequent aging treatments.

"5. New and growing interest in the relationship of 'true-stress' vs. 'true-strain' diagrams to engineering applications and behavior of alloys.

"6. More detailed evaluation of the effect on properties of very small additions of second elements (less than 0.5 per cent) to 'pure' metals. While copper-base alloys have been well studied in the past few years, present research on aluminum indicates that very small percentages of some alloying elements increase markedly the rupture strength and vary the conditions for recrystallization and age-softening."

Modern Wire-Drawing Equipment Produces 10 Times More Wire

H. C. Boynton, metallurgist, John Roebling's Son's Co., Trenton, N. J.: "Now that the war is over, some of the pressure to 'deliver the goods' has been relaxed, but the wherewithals to turn out more wire and wire products are here to stay. New, faster, smoother running wire drawing machines with all accessories and labor-saving devices, with air and water cooled blocks and water cooled die holders, can easily turn out at least 10 times as much and better wire than the old heavy slow-moving wire benches of yesterday. Quality also has been enhanced.

"Carbide dies have definitely proved their value, and except for diamonds for very fine wire, 0.010-in. and smaller, have practically replaced all cast iron and steel dies and plates except for very special jobs like shaped wire. They are now being reconditioned by the user, who is learning how to do a better job with correct 'die angles', better polish, closer tolerances, etc. to suit the product desired.

"However, diamond dies for fine wire and ultra fine wire are still supreme, particularly for stainless and other alloy wire. Dies made from diamonds can now be purchased in the open market from 0.0004 to 0.010-in in. sizes varying by only 0.00005-in. National Bureau of Standards has developed a faster method of piercing diamond dies for fine wire. An electric spark is shot from the end of a platinum needle at the diamond while both are immersed in a chemical solution. The process looks promising.

"Lime as an adjunct to wire manufacture is slowly but surely being replaced by other cleaner and less wasteful mediums.

"Drawing compounds, both dry and wet, are carefully compounded, often under chemical control. Many coatings, somewhat rust inhibiting, are being tried and in some cases are giving desirable results, but some proposed, like the black iron oxide process, are too expensive to be used except for very special high grade wire products.

"Molten salts, although not new, are fighting hard to compete with molten lead for patenting and other heat treatments. Some mixtures are claimed by their manufacturers to both heat and clean (remove hot mill scale) in one operation. Controlled atmospheres for modern furnaces are gaining in use and presage a good future. Savings produced by the elimination of scale and cleaning often are startling.

"Stainless Steel, 18-8 and other grades in the stainless family are on the 'up.' For example, an alloy wire with a high coefficient of expansion, almost as high as aluminum, has been developed and fabricated into cord which, when used in a duralumin plane will expand at about the same rate as the plane itself, which is particularly useful for planes designed for 'stratosphere' flying with temperatures at minus 60°F and lower.

"Ultra fine wire, 0.010 to 0.0001-in. in diam and finer, made during the war, still is being manufactured for many special jobs. In gold, silver, and platinum and other alloys, it is used for gold braid, all kinds of electrical jobs, radio, radar, electronic tube grids and filaments, jewelry, x-ray work, etc. Tolerances are 0.0002 in. or less. Platinum fuse wire, for example, has been reduced to 0.000017-in., about 1/1000 of the diameter of a fine hair. Sound recording wire about 0.004-in. is being manufactured in music wire and in alloy grades.

Tremendous Demand for Fine Wire

"Regular fine wire, 0.010 to 0.030-in. in diam, although before the war never reckoned in tons, when figured as miles, needs astronomical figures. For example, the official of one company reports the 0.013-in. diam high strength steel (280,000 psi) reinforcing wire used for Signal Corps Field wire was supplied in this size alone at the rate of 1600 tons, or 1,300,000 miles per month. When reconversion gets into full swing demand for regular fine wire will increase.

"Silicones, when used in resinous forms for insulating copper wire, hold forth great possibilities. One grade of this insulating compound is capable of resisting continuous temperatures of 200°C (392°F) and high humidity. Experiments have proved that motors insulated with this compound need be only about one-half the size and weight of the old fashioned 50°C motor.

"High strength steel wire cord is being employed for reinforcing long rubber conveyor belts. Cord sizes of about 1/16 to 5/32-in. of suitable construction, are woven into the fabric and

strengthen and greatly prolong belt life. This also makes possible much longer conveyor belts."

Aluminum Bronze Available in Wide Variety of Forms

J. D. Zaiser, executive vice president, Ampco Metal Inc., Milwaukee: "Originally, and until comparatively recent years, aluminum bronze has been known only as a casting material. Today, through industrial wants and military necessity, these alloys are available in a wide variety of forms.

"A few producers, sensing the potential field for this versatile alloy, have led in its development. Thus forgings, welding rod, sheet, thin and heavy-walled tubes, shapes, clad stock, and full fabrications of aluminum bronze are now readily available.

"In addition to being one of the few bronzes amenable to heat treatment, aluminum bronze can be spun, drawn, stamped, formed, fusion or resistance welded, clad to steel, and otherwise worked. These manufacturing developments, coupled with closer control on the part of the producers, and wider application by users, have made aluminum bronzes one of the most versatile of copper-base alloys.

"Most of the developments have taken place within the past 3 years. Many of them will find their industrial niche in the reconversion program because today, for the first time, they are freely available to industry as a whole."

Versatility of Aluminum Proved by New Developments

Junius D. Edwards, assistant director of research, Aluminum Research Laboratories, Aluminum Co. of America, New Kesington, Pa.: Postwar industry is looking to new applications of aluminum to help consume available production of this metal. Developments of research during the war years should be very helpful in this direction. For example, the new strong aluminum alloy, No. 75S, of substantially increased strength, will be used in the construction of new aircraft with increased carrying power for both military and civilian applications. Other time-tested alloys will find application in the transportation field—in bus, truck and railway car. Groundwork has been laid for increased use of aluminum in shipbuilding, particularly in the superstructure of ships carrying both passengers and freight.

"Not only are aluminum alloys of increased strength available, but alloys adapted for special applications such as bearings, a strong, free-cutting alloy for screw machine work, and a new alloy for architectural work which will take a clear, bright Alumilite coating.

"Fundamental work on stress analysis of structures will help make new applications of aluminum secure and shorten the period of experimental development. New methods of joining by welding, brazing and resin-bonding will be helpful in fabrication. Electroplating of aluminum has now been placed on a sound technical basis. This finish, along with oxide coatings applied by anodic and chemical treatment procedures, as well as the many other time-tested methods of finishing aluminum, will be employed for both decoration and protection of the metal.

"Aluminum equipment and structures have now demonstrated their serviceability under trying service conditions and in all parts of the world".

New Techniques Responsible for Improved Brass Production

D. K. Crampton, director of research, Chase Brass & Copper Co., Waterbury, Conn.: "Certain definite trends have been interesting and significant during 1945. In melting brasses, the low frequency induction furnace is still used almost to the exclusion of other melting equipment, but the tendency is continuously towards larger units. Double-channel furnaces are coming to be the rule and some use has even been made of triple-channel ones. Energy input continues to increase, some furnaces having been operated with inputs of above 400 kw. Results of these trends is greater productive capacity, improved uniformity of composition and a slight lowering of cost.

"In rolling strip, the trend toward modern large production mill equipment continues. Both hot and cold rolling breakdown units are used. In general, the hot mill has a slight advantage where there is very large production of relatively few and of lead-free alloys. The cold breakdown mill has the advantage when there are more frequent changes of alloy or where leaded materials as well as nonleaded ones must be handled. In any event, there is increased use of 4-high cold mills of considerable capacity for running down and even some finishing operations.

"There is a strong trend toward atmosphere controlled annealing furnaces both in batch and conveyor types. With these furnaces, some alloys need not be pickled at all and most can be handled with relatively few and relatively light pickling operations, as compared to that required with former practice.

"An adjunct to the much improved furnaces is the newer type of continuous pickling machine with push-pull feed mechanisms, circulated pickle and vigorous and efficient brush-scrubbing action.

"In both rod and tube mill practice, the most significant trend is toward use of multiple unit benches whereby two or more pieces can be drawn simultaneously on one bench with marked increase in production per machine hour and per man-hour."

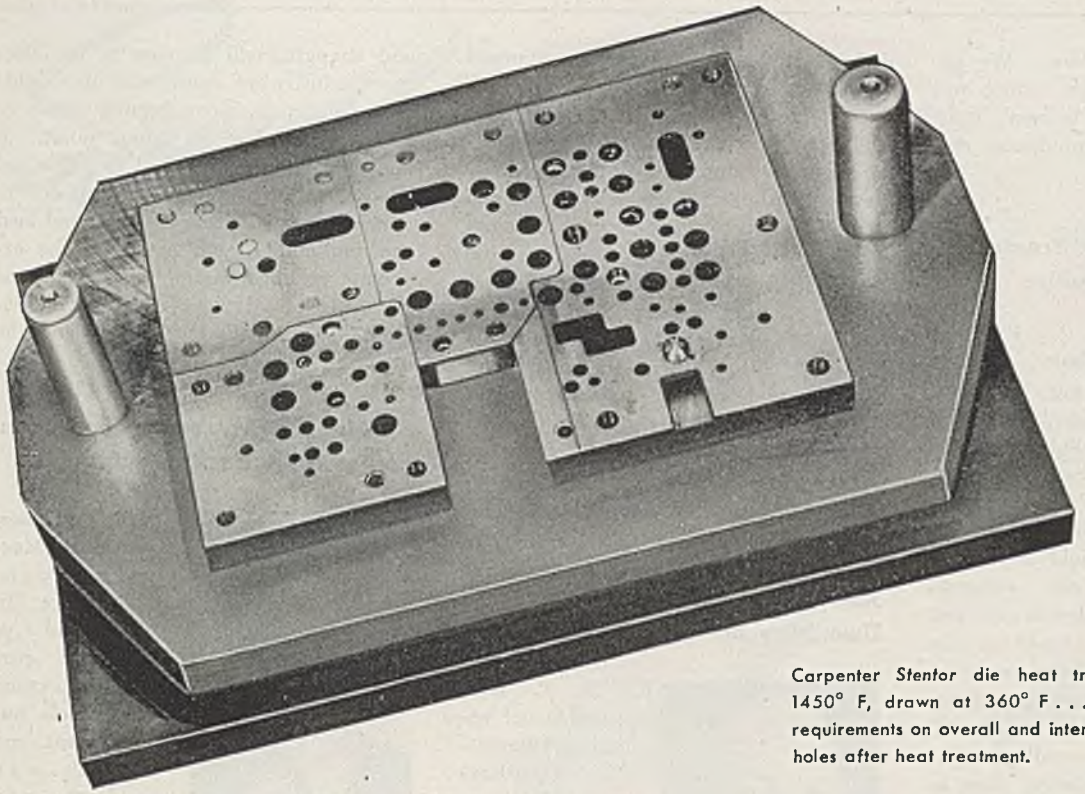
Demand for Inspection-Testing Equipment Expected To Be Heavy

Harold H. Morgan, vice president and chief engineer, Robert W. Hunt Co., New York: "Production of war material has resulted in many improvements in testing and in new methods of testing. In production line manufacture many new control or inspection procedures have proven valuable.

"However, during this war period, the production of peacetime material has suffered not only in quantity but in quality. This quality drop has been caused by shortages of material available, the enforced use of less satisfactory material, and substitute material, plus transfer of skilled and competent workmen to the Armed Forces or to war products made by plants which were demanding the best skilled and most competent workers.

"Transition to peacetime production with the natural change from a 'sellers' market to a 'buyers market' should demand very careful attention to material used and to the workmanship performed.

"Buyers of engineering materials, products and equipment will require in-



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spection and testing for them. We anticipate heavy demands for testing and inspection services and unusual difficulties may arise unless producers recognize the situation."

Metallurgist and Heat Treater Together Solve Difficulties

A. P. Seasholtz, consulting engineer, Seasholtz Metallurgical Service, Lancaster, Pa.: "We are entering a new field of production, competitive in cost and quality. To meet this competition we have the benefits of many new developments and experiences gained during World War II. One of the branches of metallurgy that has progressed to a prominent place in production is heat treating, which includes selection of steel to obtain maximum properties.

"Hardenability, rather than chemical analysis, was established as a method of selecting a suitable grade of steel, one with characteristics which will respond to the best method of heat treating. Tension tests are made more frequently than any other tests of metal. The statement has been made that alloy steels, regardless of composition, have similar tension qualities when fully hardened. This is true for tension tests at the usual atmospheric temperatures, but for special high or low temperature properties, special composition is required.

"To obtain optimum properties, it is necessary to fully harden the steel with a minimum of residual strains. The forming of free ferrite and quenching strains are generally the cause for lowering the yield point and poor fatigue and impact properties. Unfortunately there is no universal quench to accomplish a full quench. Some parts may require a violent agitation either in oil or water, while other parts of complicated sections require some form of interrupted quench such as time quenching, austempering or martempering.

"Too often the designing engineer has authority to specify physical properties, select grade or chemical analysis of the steel, and then leaves it up to the heat treater to get the properties the best way he can. A better procedure would be to determine physical properties needed, then consult the metallurgist or heat treater for best method of heat treating, and finally select the steel with characteristics best suited to give the required properties by the method of heat treating adopted.

"Today, the metallurgist or heat treater has more extensive information, many new methods and better equipment and control. There are S-curves for most standard steels which predict time and temperature that transformation takes place and what the resulting properties will be. Curves are employed to establish some of the newer methods of heat treating, such as cycle annealing, austempering, martempering and others. These advancements have played an important part in producing consistent quality during the war and should take their rightful place in reconversion planning."

Adaptation of Springs To New Uses May Bring Marked Changes

F. P. Zimmerli, chief engineer, Barnes-Gibson-Raymond Division, Associated Spring Corp., Detroit: "The spring industry's problem in reconverting its machinery to produce peacetime products is not difficult and the changes are few. It is in the adaptation of the springs themselves to new uses that we will see the greatest changes.

"To resist temperatures as high as 750 to 800°F, the use of highspeed steel will become more common. Both the 18-4-1 type and the 6-6-2 molybdenum steels can be employed.

"Chrome-silicon steel gave a good account of itself in gun recoil springs under extreme conditions. Its use in peacetime will be in places where stresses are extremely high and a few thousand spring cycles are all that is needed, or in parts which get heated over the range of carbon steel and where the use of stainless steels is not demanded. Since this steel has a fatigue range no greater than carbon valve spring wire at twice the cost, it will not be used extensively for engine valve springs. The use of chrome vanadium steel, SAE 6150, will decrease in the larger sizes and be replaced by SAE 9262 and some SAE 9260. Further inroads will be made by the so-called "needled" war steels of the 8600 series.

"Nickel alloys of K-Monel, Z-nickel and Inconel will increase in use, as many new developments present both corrosive and heat conditions. Use of beryllium copper, due to its excellent conductivity and strength, will increase in the electrical industry and decrease in other fields where cheaper silicon bronzes are very satisfactory. Use of fused quartz or glass springs will be found in a few isolated instances. Plastic springs, due to present materials' lack of continued load carrying ability, will not greet the expectant public for some time. It is expected the aviation industry will increase its use of ring springs and the Bellville type."

Specialized Automatic Inspection Shows Merit on Production Line

F. B. Doane, president, Magnaflux Corp., Chicago: "In the field of magnetic particle inspection, for which our equipment and materials are used, the most worthwhile recent accomplishments have probably been developments in engineering of specialized and automatic equipment. Without use of automatic, conveyor equipment, designed and built especially for the production job involved, labor cost may be almost prohibitive. Use of automatic, specialized equipment has permitted reduction of personnel requirements to a minimum in many problems such as inspection of automotive parts, resistance welded pipe, and projectiles. Many problems earlier experienced in designing such equipment have been solved and equipment permitting low cost, production inspection of practically any type of part can now be readily engineered and built.

"In the past, parts undergoing magnetic particle inspection have usually been magnetized with regular direct current supplied by storage batteries and full-wave, 3 phase rectifying systems, or ordinary alternating current properly transformed and regulated. Equipment furnishing half-wave, single-phase rectified current for magnetization has recently been developed and is now finding wide use for inspection of welds and castings and other similar applications. This type equipment can be more economically constructed and offers the advantages of greater mobility of the inspection medium with easier formation of indications, and easy location of deeper sub-surface defects.

"Equipment delivering very high output is frequently needed for inspection of large forgings and castings. Equipment delivering up to 15,000 amp, low-voltage

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direct current has now been designed and built, and is in use. Considerable work is still being done on the problem of locating deep sub-surface discontinuities in castings and forgings. One method that now seems to hold considerable promise is superimposing a varying and periodically reversing magnetic field upon a steady field induced in the part by direct current.

"During 1945, use of magnetic particle inspection to locate fatigue cracks and similar defects in oil well drill pipe has greatly increased and developed into an outstanding application. Special complete inspection units mounted on automotive truck bodies have been built and greatly facilitate inspection in the field.

"Another recent accomplishment in the field of magnetic particle inspection has been development of a new formula for Magnaflux pastes. The new pastes have been submitted to the Army Air Forces and Navy Bureau of Aeronautics for tests and will soon be available. They provide a much better suspension and do not age during storage.

Stouter Coatings in Prospect

"In the field of the brittle coating method of stress analysis, we are carrying on a research program which holds considerable promise. Coatings used now are affected by changes in temperature and humidity. Consequently they must be used under almost constant conditions. We hope soon to be able to make available coatings much less sensitive to changes in temperature and humidity. Use of Stresscoat is proving helpful in engineering design work and the availability of such new coatings would greatly simplify and increase the scope of application. A recent development in this field has been use of latex to cover coated parts for protection against oil and permit testing under actual service conditions. It is usually necessary to test parts in the laboratory where actual service conditions must be simulated.

"During 1945 use of fluorescent penetrant inspection has greatly increased. One product is now being used in about 250 plants to locate surface discontinuities in all solids, including nonferrous metals, plastics, ceramics, and glass. Considerable advance has also been made in engineering of specialized, automatic equipment for use of this method. Problems solved include low-cost inspection on a production basis of automotive, aircraft, and ceramic parts.

"A considerable number of different types of penetrants have now been developed for various applications of fluorescent penetrant inspection. Most problems for which special penetrants are required have been experienced in testing of nonmetallic materials."

Special Property Alloys To Find Many New Applications

George Sachs, professor of metallurgy, Case School of Applied Science, Cleveland,: "Metals and alloys with special properties will be used to a rapidly increasing extent. This applies (a) to metals which require reduced attention during fabrication and service, such as fully killed low carbon deep drawing steel, and stainless steels and (b) to alloys with improved strength properties, such as high temperature, high strength alloys, and high strength aluminum alloys (75S).

"Processing of metal products will more and more be controlled automatically, utilizing electronic devices particularly. This applies to melting, rolling, drawing, heat treating, etc. Fabrication of metal structures and parts will be performed increasingly by the more accurate methods, working to close tolerances without subsequent machining. Such processes are precision casting, permanent mold casting, progressive forging and sheet forming methods, and powder metallurgy.

"Fundamental data relating to properties, processing, and the fabricating of metals are needed badly, and it is hoped that the efforts of the government to promote basic research also will cover this field. Failures encountered in welded ships, aircraft propellers etc., have demonstrated importance of a more advanced understanding of metals."

Investigate Furnace for Melting and Casting in Vacuum

John G. Thompson, acting chief metallurgist, Division of Metallurgy, National Bureau of Standards, Washington: "An interesting development in the Division of Metallurgy has been a furnace for melting and casting metal in vacuum. The furnace, which was developed in co-operation with Ajax Electrothermic Corp. for use in a war project, consists of a high frequency coil, melting crucible, and mold, all surrounded by a vacuum tight shell of nonmagnetic steel. Entire furnace is tilted to pour the charge; the mold is held in a cradle which is hung from the trunions on which the furnace tilts. Mold therefore remains in a vertical position as crucible is tipped to pour the charge.

"Pressure within the furnace is about 200 microns at beginning of a run and rises to about 1 or 2 mm of mercury at the time melt is poured at about 1400°C. It is possible to maintain a controlled atmosphere at any desired pressure up to atmospheric, if this condition is desired instead of operation in a high vacuum.

"Furnace has been in use for about 3 years, vacuum melting 50 to 75 lb heats of special metals in connection with a war project. As a result of this successful use of the furnace, a research project has been planned to investigate vacuum and controlled atmosphere melting and casting of ordinary metals, with particular attention to merits and limitations of this type of furnace."

New Instruments Finding Rightful Places in Industry

W. C. Hutchins, Special Products Div., General Electric Co., Schenectady: "During 1945 General Electric, through its Special Products Division, made commercially available several new instruments which proved readily applicable in the steel industry. Among these instruments is a magnetic comparator which accurately compares the magnetic properties of any given piece of ferrous metal with those of a standard. This instrument also quickly and directly compares physical properties of metal, since hardness, composition, etc., all play a part in determining magnetic properties of ferrous metals.

"The dewpoint recorder continuously records dewpoint of any non-corrosive gas in the range of plus 80 to minus 80°F. Dewpoint temperature may then be interpreted as per cent moisture by volume. The thermal gas analyzer is valuable in annealing work for recording gas composition and controlling fuel-air ratio in order to avoid changes in the

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degree of the reducing atmosphere, which would affect the characteristics of steel. The current-force recorder simultaneously records a timing wave, the rapidly changing electrode force, and the electrode current of a resistance welding machine while the weld is being made. Consequently, it is very desirable not only for checking resistance welding equipment and its control for correct operation, but for use in research for developing new welding techniques.

"Also made available was a pressure detector which supplies a signal to an instrument for the purpose of indicating and recording pressure, and a gage designed for the protection of bending rolls."

Induction Hardening of Cold Finished Bars Wins Approval

M. N. Landis, manager, Metallurgical and Research Division, La Salle Steel Co., Chicago: "Of major interest to the cold finished bar industry has been the introduction of, and rapidly increasing application of induction hardening as a replacement for carburizing and the conventional quench and tempering treatment. High hardnesses developed, the freedom from warpage, scale, quench cracking and decarburized surfaces together with the facility for effecting localized hardening has made induction hardening a 'natural' for innumerable applications.

"It generally has been found necessary to employ a steel of about 0.50 per cent carbon in induction hardening to produce surface hardnesses of 60 rockwell "C" or higher. This has resulted in a considerable shift, not only from low carbon carburizing grades, but also a shift from the traditional 0.40 to 0.45 carbon heat treating steels. The fact any decarburized surface must be removed to obtain the full surface hardness, either by the fabricator of bar stock or parts manufacturer, has resulted in a considerable over-load on the turning and grinding facilities of the cold finished steel producers. Therefore, research is being conducted to develop methods whereby cold finished bars can be more economically rolled or treated to eliminate decarburization.

"Probably the outstanding development in cold finished bar industry of recent years has been production of cold finished bars to definite physical property specifications. Average physical properties tables had been used for years, but with the war specified minimum properties came more and more into use and apparently will be carried over into post-war production very extensively. Chief advantage in the production of these in-the-bar physical properties over heat treatment of parts themselves is, of course, decreased cost. It is far more economical to produce physical properties by special drafting with or without strain annealing than it is by quenching and tempering in the part".

Steel for Pressure and Process Vessels Meets Rigid Standards

Fred L. Plummer, chief research engineer, Hammond Iron Works, Warren, Pa.: "Fabricators and erectors of steel plate construction, and especially those who build large field-erected welded storage and process vessels, are constructing a greater number of such vessels of unprecedented size and subject to more severe service requirements. Many such vessels are now designed to operate at low temperatures. Steels having suitable properties at low temperatures must be used. The method of finishing the steel—rimmed, killed or semi-killed—has great influence on these properties. Nickel alloy steels are much used for such service.

"Many types of 'clad' steels are now being used for various corrosion or contamination prevention services. The use of wide plates, those 100 to 192 in. wide, has been found economical for many pressure vessels. Various alloy steels are being used for high temperature service. Stress relieving by heat treatment, by over-stressing and by mechanical means such as 'peening' are all used and are all being studied to determine their relative efficiency and cost.

"Inspection methods include hydrostatic and pneumatic pressure testing, Magnafluxing, radiographing, electromagnetic testing and supersonic testing, as well as trepanning and sectioning. Design engineers are concerned with such problems as: the effect of cold working of plates during fabrication on the properties of the steel; the possible effect on steel properties of the use of scrap, including low alloy steels; the effect of cyclic loading of relatively low frequency on the life of pressure vessels having discontinuities; the effect of plastic yielding in modifying vessel shapes and relieving high stress concentrations; and proper means of supporting heavy vessels without introducing critical stresses in the vessel at or near such supports".

Make One Locomotive Per Hour During Past Century

Paul L. Irwin, engineer of tests, Baldwin Locomotive Works, Eddystone, Pa.: "It is probably obvious to state that Baldwin Locomotive Works depends almost exclusively upon steel for its existence. Over a period of more than 100 years, we have been manufacturing locomotives at an average rate of one every 14 hours—including nights and Sundays. End to end, or side by side, these locomotives constitute a considerable quantity of steel—ranging from wrought iron staybolts to complex alloy steel parts. During the past few years, development of these locomotives has been quite phenomenal.

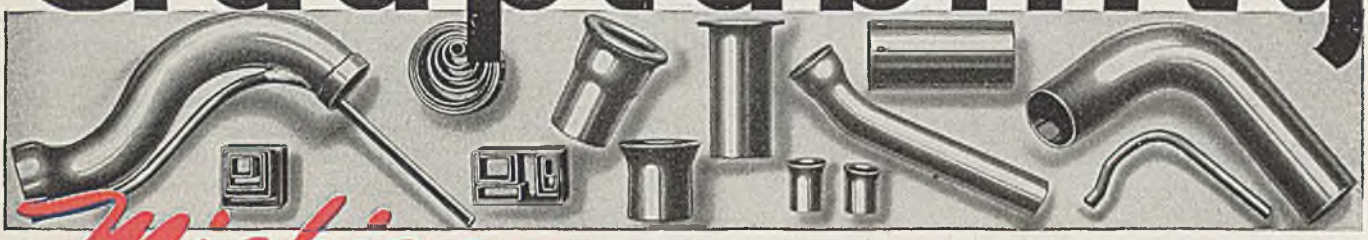
"The huge Pennsylvania railroad locomotive exhibited at the New York World's Fair was a reciprocating steam locomotive of 6500 hp having a 6-4-4-6 wheel arrangement. Baldwin subsequently built similar locomotives (somewhat smaller) of 6500 hp equipped with poppet valves rather than the standard piston valves. These 4-4-4-4 locomotives have been operating for the past 2 years pulling 16-car trains and, if permissible, they could pull such trains at 100 mph.

"To eliminate unavoidable unbalance associated with reciprocating pistons, we recently built a *geared-turbine* locomotive for the Pennsylvania railroad, having a 6-8-6 wheel arrangement and developing 6500 hp. This locomotive is exceptionally efficient at speeds above 30 mph and, based upon fine performance of this locomotive, we are now building three locomotives for Chesapeake & Ohio Railway Co. that embody an additional step forward. These locomotives will be *turbine-electric* with a 4-8-0—4-8-4 wheel arrangement. A unique feature is that coal is carried in the front end of the locomotive (instead of in the tender) in order to better distribute weight.

"Although the true locomotive lover is loathe to cover the mechanism with sleek sheet-metal streamlining, evolution continually changes features and 'personality' of the steam locomotive.

(*Please turn to Page* 404)

Adaptability



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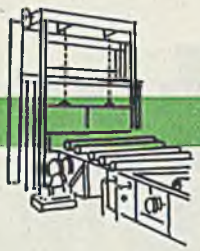
Heat Treating



Procedures Developed for Treatment of Forgings

H. J. Fischbeck, supervisor of metallurgical and chemical processing, Pratt & Whitney Aircraft Division, United Aircraft Corp., East Hartford, Conn.: "We procure as many forgings as possible heat treated to meet the physical requirements of processing. This is especially applicable to the procurement of forgings for carburized engine parts and for such other parts as require heat treatment after rough machining.

"Design Engineering is interested in the finished condition of the part and, with us, recognizes that machining requirements for forgings come properly under the jurisdiction of Production Engineering. Therefore, Production Engineering, in order to obtain uniformity of procurement to the desired condition from all its vendor sources, consulted with forging vendors concerning appropriate heat treatments to apply for the production of definite microstructure and hardnesses. Finally, the results of such conferences and suggestions were incorporated in process operation procedures which set up standard controls for the heat treatment of forgings. The required process operation procedure is specified by number on the purchase order".

Continuous-Flow Installations Require Minimum of Handling

A. C. Kramer, combustion engineer, Drever Co., Philadelphia: "The industrial furnace field is no longer one of merely heat application within the confinement of brickwork, but it covers engineering analysis of handling materials from one process to the next process, with heat applied during its travel. Modern industrial furnace applications show the trend toward straight-line continuous flow, with the minimum degree of handling during time of operation.

"The large number of battery installations of batch heating equipment is giving way to continuous conveyor production lines. The benefits of such installations have been proven during the past 3 to 4 years on many wartime materials and the 'push' is on to adapt these findings to peacetime materials. Consequently, the furnace engineer has found that his job is more an application engineer, of how to transport materials through heating chambers, rather than how to apply the Btu's required to heat the product in question.

"Advancement of high temperature alloys has been an aid to the furnace engineer in this conveying problem at elevated temperatures. Specially designed alloy belts, rolls, rails and etc., have been perfected to withstand loading and temperature applied.

"Educational period of continuous process heating has been completed as far as industry is concerned, and it is now a direct challenge to the furnace designer to maintain the pace".

High-Speed Gas Heat Treating To Alter Previous Practices

Frederic O. Hess, president, Selas Corp. of America, Philadelphia: "During 1945, rapid heating of materials with gas fuel had made further substantial advances, particularly in the metals heat treating field. In commercial production installations the continuous annealing of stainless steel bar stock and tubing, in a matter of seconds and minutes instead of hours, have proven beyond doubt the practical advantage of production line heat treatment in terms of uniformity, distortion, surface condition and even cost of operation.

"The applications have also been extended to heat treatment of carbon steel bar stock involving continuous hardening followed immediately by draw, in straight line production. The proven fact that, for example, 1-in. bar stock can be heated to hardening temperature in approximately 1¾ min, instantly quenched and then drawn in approximately 2 min time, has important implications upon processing of steels as well as quality of the end product. Such heat treating times and speeds are insufficient to allow decarburization or oxidation of any consequence. As a result, installations for heating or reheating at mill speeds are practical and are going into production.

"The same principles of heat transfer have also been applied to extension of flame hardening or surface hardening of parts, such as gears, saws, hammers or other parts which require localized heating for wearing or fabricating qualities.

"These basic gas heat applications, which have largely been developed during the war, have been applied during 1945 for peacetime production, and it can safely be predicted that during forthcoming years, high-speed heat treatment will alter many past heating practices in the steel as in the nonferrous industry."

Eight Modern Processes for Attaining Physicals Listed

R. B. Schenck, chief metallurgical engineer, Buick Motor Division, General Motors Corp., Flint, Mich.: "While none of the following processes (not listed in order of importance) is strictly new, commercial application of all of them has been considerably extended during the war period, and it seems certain they will play an important part in the future.

"*Gas carburizing* has made notable strides. With a better understanding of the principles and improved equipment, diffusion cycles are now practicable by means of which carbon concentration can be controlled at most any desired level. Carbon replacement to correct decarburization will doubtless be used extensively.

"*Clean hardening and annealing* with their obvious advantages, have come into wider use for a great variety of parts.

"*Carbo-nitriding*, with either quenching or slow cooling, has made progress and, for numerous applications, has replaced the oil cyanide process.

"*Electrically heated salt baths* of the immersed electrode type for both batch and continuous operation have under-

gone the most intensive development.

"*Induction and flame heating* for hardening, annealing and tempering (also forging and brazing) have made notable progress and give promise of much wider application in the future.

"*Isothermal annealing,* thanks to "TTT" curves and improved furnace equipment has made possible much better control of annealing in volume production.

"*Hot quenching,* in its various forms, such as Austempering and Martempering, has steadily extended its field, and offers promise of much wider application.

"*Cold treatment* for completing austenic transformation has created much controversy, but doubtless, after the smoke has all cleared away, will be found to have a definite place in the treatment of steel."

Improved Quality, Reduced Costs Given Machined Parts

E. G. de Coriolis, director of research, Surface Combustion Corp., Toledo: "Future emphasis undoubtedly will be upon methods of more extensively applying controlled atmospheres to production operations. Some of these applications, specifically developed for war purposes, will undoubtedly find utilization in the commercial field. For instance, methods of normalizing forgings where scaling has been minimized or completely eliminated have been successfully used during the war and soon will be available for peacetime production applications. Pickling no longer will be necessary in such cases.

"Utilization of prepared nitrogen atmospheres to prevent decarburization during long-time annealing cycles, especially of medium carbon steels such as those used for many machined parts, will find more extensive use.

"Controlled gas carburizing as applied to gears, splines and the like, to secure a definite type of case will call for greater refinements in furnace design than was heretofore thought necessary. Gas furnaces for rapid and localized heating of parts of many kinds will be available in the near future.

"Importance of obtaining and maintaining dry atmospheres, namely, those of low controlled dew point, will become more generally recognized. Means are not only now available to accomplish this, but also of continuously recording dew points over an unusually wide range.

"Further refinements in atmosphere generators and in the design and construction of furnaces using atmospheres will give further impetus to the use of gases for skin recovery (carbon restoration), dry cyaniding and gas quenching."

Automatic Conveyor Permits Heat Treating in Volume

Haig Solakian, vice president, A. F. Holden Co., New Haven, Conn.: "There have been, undoubtedly, improvements in heat treating materials and equipment, especially in design, construction and operational technique. However, the most significant progress during the past year, in the writer's opinion, has been in the development and application of the automatic conveyor for handling parts, large or small, during heat treating operations. Such an application, utilizing salt baths for heating as well as for quenching, may be carried out for the purpose of either neutral hardening or for carburizing. Thus heating, quenching and tempering operations are completed in one continuous process.

"This development is significant because, in the first place, it enables the handling of large tonnage automatically without sacrificing quality and, at the same time matching the mass production obtained in the other phases of manufacturing. In an ordnance plant, for example, 10,000 lb of critical parts were heat treated every hour by this method, thus speeding production with assured uniformity.

"In the second place, parts heat treated by this method come out free from scale, with a clean metallic surface and minimum distortion. Consequently, parts of any size or shape often may be machined to size prior to heat treating, thus eliminating a great deal of labor and expense usually required for final machining or grinding."

Salt Baths Gain New Importance in Heat Treating

C. R. Foreman, metallurgist, Park Chemical Co., Detroit: "End of war and return of industry to production for civilian use inevitably will bring about a closer examination of costs as competition once again assumes its place. Some new processes and materials, which flourished under pressure of the war emergency, will fall by the wayside in the face of postwar cost accounting. Others will prove themselves more efficient and economical than prewar methods and materials, and will be retained.

"In the heat treating field, we look for a return of lower alloy steels plus a fuller employment of new heat treating processes based on closer control over the isothermal decomposition of austenite. Automobiles, trucks, washing machines, etc., do not require the exacting processes and quality materials of ordnance. Nevertheless, they must be made uniformly, cheaply, and quickly to keep in step with our modern system of mass production.

"Because almost all types of steels can be heat treated rapidly, uniformly, and economically in molten salt baths, and as most of the new isothermal heat treating processes require one or more of these baths for their practical operation, the place of molten salt baths in postwar heat treating seems assured."

Cycle Annealing Popular for Large-Scale Production

T. A. Frischman, chief metallurgist, Axle Division, Eaton Mfg. Co., Cleveland: "Installations of specially designed modern heat treating furnaces embodying controlled atmospheres and mechanical handling features are on the increase, particularly where large production warrants the original cost. Besides economy, uniformity in the heat treatment from piece to piece is also obtained. Where possible, selective hardening is being employed to parts, especially where such a treatment is adapted to in-line production methods.

"These heat treatments can be accomplished with induction hardening equipment, flame hardening, radiant gas burners and other compact equipment, and thus extra transporting and handling of stock is substantially reduced and more often than not, entirely eliminated.

"Another factor influencing such installations is availability of hardenability tested steel which eliminates the cut and try method of 'hitting' the correct physical properties. By using such pre-tested steel, the heat treating in the machine

shop on specialized hardening equipment can be attempted with more confidence, in view of the fact the heat treating process is not being done by seasoned heat treaters but rather by machine operators.

"Cycle annealing continues to gain in popularity, particularly where large scale production involving precise microstructures for optimum machinability is necessary. A good many furnace builders today have the necessary experience to design furnaces which save many hours in annealing time by arranging equipment to hold the steel at specific points in the cooling curve where transformation is effected with the least time delay.

"Surface treatments, such as phosphate coatings on finished parts which operate against one another, are having their life extended many times by permitting gradual contact to take place during the all important wear-in period. There are many applications where this practice is the solution to combating abrasion, scuffing and pick-up. Use of such coatings is becoming more and more widespread for such applications, even though their original use was intended primarily for rust-proofing."

Induction Heating Provides Answer to Delicate Problem

A. S. Jameson, works metallurgist, International Harvester Co., Chicago: "The most productive development of the future is to be found in induction heating of steel for forging and hardening. It has always been the rule with heat treaters working in conduction heating to preface recommended heating practices with this sentence: 'Heat slowly and uniformly to such and such a temperature'.

"There seems to be in the induction heating method—which may be expressed as inducing steel to heat itself—an obsolescence of this warning. To quote a concrete example, we have taken a steel which has hitherto been regarded as a delicate problem in heating (1.00 per cent carbon, 1.50 per cent chromium bearing steel-52101) and heated for hardening 3 in. diameter, ⅜-in. thick, ball bearing race rings of this steel in 30 secs. Accelerated life tests of assemblied bearings containing these rings showed higher life values than bearings assembled with rings hardened according to conventional practice.

"This is only one example of numerous applications which may mean, eventually, a steel heat treating plant where all heating operations are accomplished by the induction method and perhaps the elimination of a heat treating department as such by the incorporation of steel treating in the machine line."

Close Control of Carbon Content Feature of Process

W. A. Darrah, president, Intercontinental Engineers, Inc., Chicago: "During the past year, development work has been completed on a method of gas carburizing known as the 'Hypercarb' process. It has been in use for a considerable number of years in the carburizing of gears for transmissions, differentials, and various machine parts.

"Recently, new specifications have made it desirable to control the rate of diffusion of the high carbon case into the supporting metal. The process consists in first developing to a predetermined depth a high carbon case or layer on the surface of the steel being carburized. Following this, metal is subjected to continued heating at accurately controlled temperatures in an atmosphere lower in carburizing content than the normal carburizing atmosphere.

"Under these conditions, carbon penetrates into the steel beneath the case, depth of penetration and carbon content of the steel being controlled by such factors as time of heating, temperature of the steel, and composition of surrounding atmosphere. By this process it is possible to produce a carburized part having an accurately controlled carbon content on the surface and with a controlled penetration into the supporting steel.

"Such a structure gives added toughness and strength and permits using a lighter section in the part. Lighter weights result in lower first cost and, in the case of automotive equipment, mean reduced weight in the finished car and therefore less load on tires, and less gasoline consumption for the engine.

"A line of complete plants and also special high temperature equipment which is designed to operate at temperatures close to 4000° F are available. Furnaces are quite large, some of them having capacity of 5 or 6 tons of metal at a charge. They are electrically fired, using special high temperature resistance elements which permit accurate temperature control and give a long life.

"This equipment has numerous fields, one of which is in connection with the distillation of various metals. With such equipment, it is possible to subject such metals as nickel silver, brass, zinc, aluminum alloys, etc., to a distillation process in which the more volatile metals are separated from the less volatile metals. As an example, it is possible to distill battle scrap (70-30 brass), recovering the zinc in the form of solid pigs and the copper in the form of a commercially pure ingot. Process also may be applied to purification of any alloys. Zinc can be separated and recovered from German silver or nickel silver. Aluminum alloys may be separated, recovering pure aluminum, by a very direct process which eliminates the older method of converting the metal to oxide and reducing the oxide. Various lead, zinc, and other alloys can be treated with equal facility. The process has interesting possibilities in the manufacture of sintered carbides and similar materials which require temperatures between 3000 and 4000° F. Capacity of one plant now in operation is about 30 tons of brass per day."

Mechanization and Protective Atmospheres Aid Heat Treating

C. L. Ipsen, Industrial Heating Division, General Electric Co., Schenectady, N. Y.: "In the industrial heating field during 1945, mechanization and protective atmospheres materially contributed to improved quality and reduced costs in the heat treating of high-quality machine parts. An example of this is an electric plate conveyor furnace, with a deep quench tank, for the continuous heat-treatment of large, irregular-shaped parts such as gears with splined shaft attached weighing up to 37 lb.

"Complete heat-treating equipment includes a conveyorized quench tank and washing machine and a mesh-belt electric draw furnace, thus providing complete handling equipment for all operations. A carbon-dioxide free dry gas protects the high carbon parts in the furnace from scaling and decarburization. Synthetic rubber-covered baffles prevent marking and nicking of the parts in their descent through the deep quench tank. Parts are delivered from the fur-

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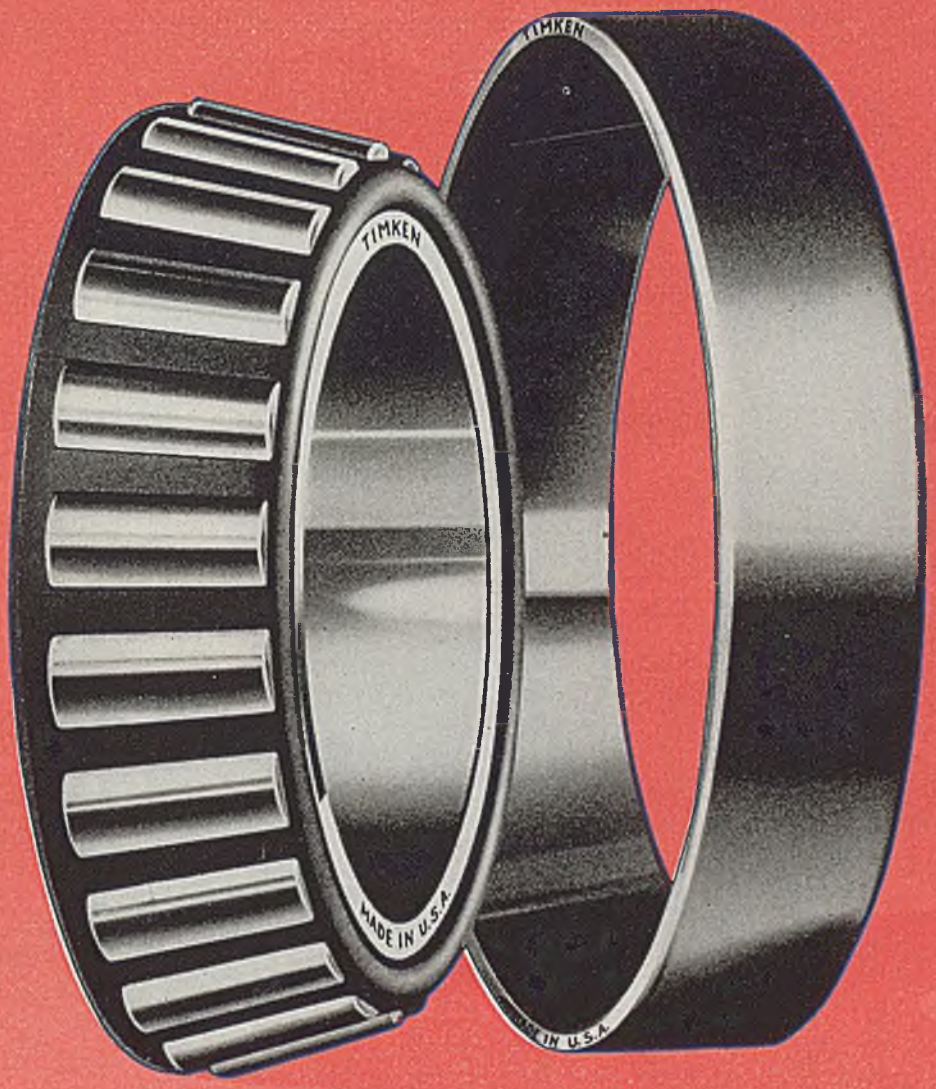

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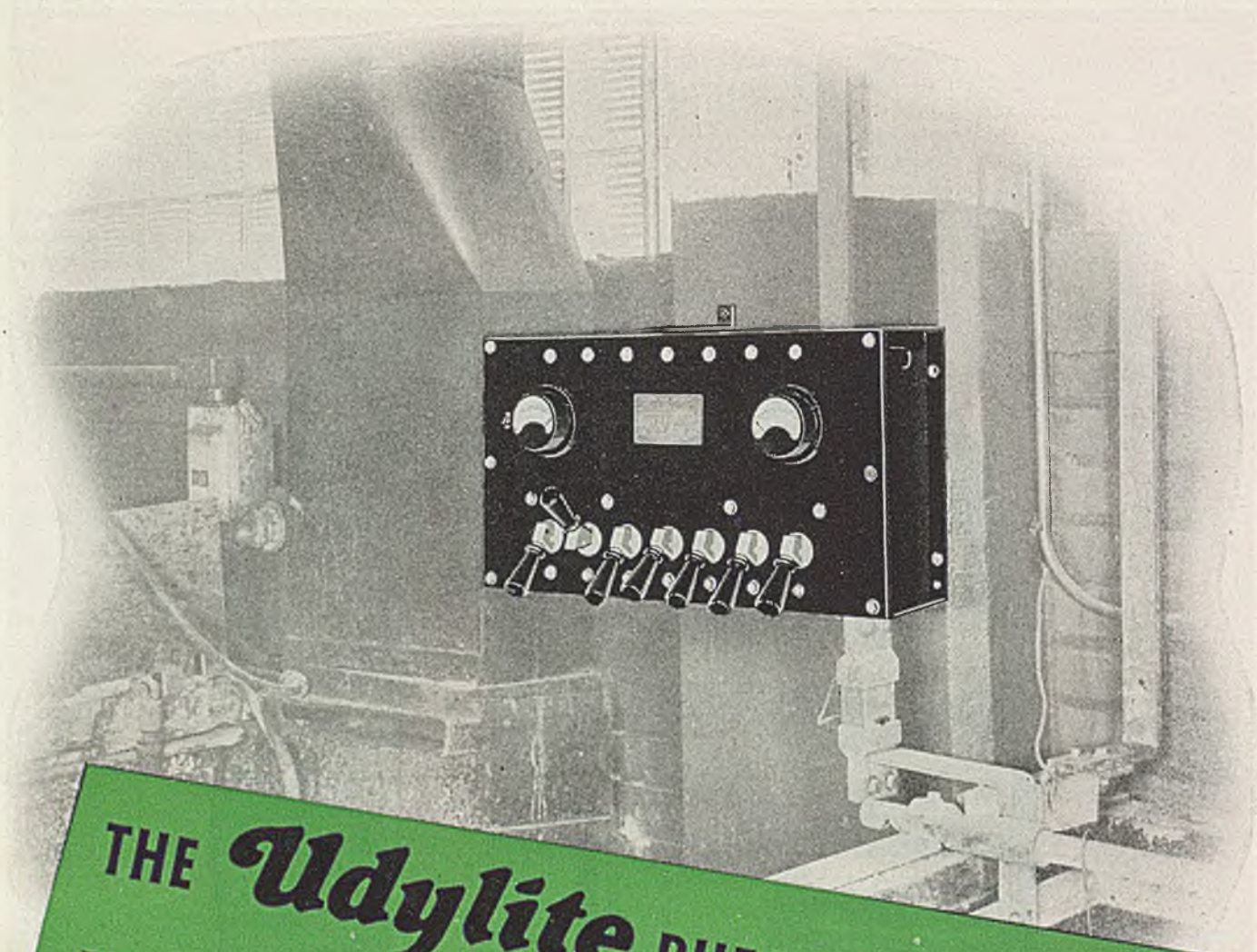

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Centralized Lubrication Wins Approval of Management Men

E. J. Ehret, Chicago district manager, Farval Corp., Chicago: "STEEL recently conducted a survey to find out what features plant management wanted on their machinery. Of all the features 'Centralized Lubrication' scored the highest rate of preference, 85.6 per cent. In plants having over 500 employes the percentage was 94 per cent. This is a far cry from 1926.

"There are still a great many people who say they haven't any lubricating troubles. What they mean is, they haven't any new troubles. They have been living with the old ones so long they have become accustomed to them. It is true you can get along without a centralized system, but not as well, or as long, without lost time, lost production and costly maintenance. We take out insurance against just about everything else—why not insure ourselves against lack of lubrication by installing centralized lubricating systems?"

Improved Lubricating Materials Lead to Reduction in Costs

R. S. Shoemaker, lubricating engineer, American Rolling Mill Co., Middletown, O.: "Those responsible for the purchase and application of petroleum products for the lubrication of industrial machinery are waiting to take advantage of some of the improved products which have been developed during the past war years.

"About the only evidence discernible that we ever will have more efficient lubricants is the fact that we can now drive up to our favorite filling station and with a clear conscience say "fillerup", and what we get in our tanks is a decided improvement over what has been available and without doubt has a greater knockless punch than any pre-war gas.

"During this reconversion period the emphasis must be more than ever before placed on costs. The days of cost plus are over. While improved lubricating materials may cost slightly more they may lead to reduced costs per ton.

"Properly installed and maintained centralized systems will from every angle reduce costs. The best time to plan centralized lubrication is when the machinery is being designed and installed. A far better job of selling must be done if these systems are to attain their proper place in the steel plant."

Lubrication Problems Can Be Solved by Following a Plan

James G. O'Neill Jr., staff engineer, Sinclair Refining Co., New York: "Plant operators often are confused by qualities of lubricants and their application. This results in use of too many lubricants, wasted storage, and errors in application. Correction of this condition has obvious value.

"Solution has been worked out. It entails first elimination of unfounded personal opinions, indifference and supervision of lubrication by inexperienced personnel. Second step involves placing supervision under an experienced practical engineer. Third step is for this practical engineer to consult with a reliable, experienced representative of the lubricant supplier. Fourth step involves a system for selecting a minimum number of lubricants.

"Selection of a minimum number of lubricants is readily made. Oils and greases should be chosen for the most critical units. Then an investigation should be made to determine what other machinery could economically use these same oils or greases. It will be noted that as a result groupings of machinery can be made in line with the oils or greases used on the more critical units. Such a selection will also segregate notorious oil wasting machinery which can be lubricated with inexpensive general purpose oils. End result of this procedure will be a reduction in the number of lubricants, clean and active storage, less errors in application, etc. The article 'Simplified Lubrication,' in STEEL, Oct. 1, p. 118, will be helpful in setting up a modern lubrication program."

Requirements of Anti-Friction Bearings Met by Lubricant

Maurice Reswick, lubrication engineer, Standard Oil Co. of New Jersey, New York: "The multiplicity of anti-friction bearing applications in machinery operated under various conditions of speed and temperature imposes special requirements as to their efficient lubrication. For example, the ball bearings of a flame-proof motor in a mine locomotive operate much hotter than normal and require a grease, which will withstand heat and oxidation, and yet this grease must not become too stiff when the same locomotive is left outdoors during cold weather.

"Machine designers choose anti-friction bearings for parts which are not readily accessible for periodic lubrication, and frequently specify for such applications 'lubricated for life' ball bearings. The grease used in such bearings is expected to resist disintegration and assure long time operation. There must not be any separation of the ingredients, and it must be free from the development of acidity, thickening due to oxidation, and it must not melt out at high operating temperatures.

"To meet these strict requirements, Standard Oil of New Jersey and its affiliates developed Andok lubricant C. It is a grease of smooth texture, medium stiff consistency having an ASTM dropping point of over 500°F while its running torque at sub-zero temperatures is low".

High-Speed Presses Increase Output, Lower Forging Costs

R. H. Jones, National Machinery Co., Tiffin, O.: "Probably the most significant development in the field of forging during the past year has been the trend toward heavier, more powerful and higher speed mechanical forging presses.

"At the start of the war, the largest machines of this type were comparable to 5000 lb steam hammers. Performance of these machines, as well as the smaller sizes, certainly entitled them to be classified as 'secret weapons'; and the demand for them was far beyond the capacity of the industry to produce them.

"At the close of the war, high-speed forging Maxipresses, comparable in capacity to 8000-lb steam hammers, were turning out heavy forgings for our Armed Forces in ever increasing quantities. And now the world's largest Maxipres is underway. It will weigh 1,300,000 lb and will be comparable in capacity to a 12,000 lb steam hammer.

"Bigger output, longer die life, greater accuracy, low scrap loss and lower upkeep expense are factors which have established this press in the position which it occupies today. Addition of bigger and more powerful sizes will make these advantages available on even the heaviest mass production job."

Improved Forge Heating Methods Benefit Structure and Surface

Waldemar Naujoks, chief engineer, Steel Improvement & Forge Co., Cleveland: "The present period of beating the sword into the plowshare again affords the production forging industry an opportunity to apply the many new techniques and methods, developed by war necessity, to the peacetime uses. There appears to be a broad field of application.

"The 1946 model forging will be a much improved product over its prewar counterpart. Improved forge heating methods, ranging from clean and scale-free gas or oil furnaces to induction heating will offer a better metal structure, a cleaner metal surface, and a better appearance. Newly developed inspection methods insure more rigid adherence to specified dimensional and physical tolerances. Advances in forging design offer a wider application of forged parts to a greater variety of equipment and permit the making of shapes considered difficult or impossible not so many years ago. New alloys and new uses for old alloys offer better selection of compositions for strength and economy.

"War demonstrated the continued reliability of the forging under known and unpredictable service stresses; this unequaled toughness offers the designer less weight with more strength, and economy with quality. The reliability that was forged into the sword will surely be converted into a more useful service as a plowshare."

Modern Hydraulic Press Designed for Utmost Economy

R. E. Dillon, president, Lake Erie Engineering Corp., Buffalo: "Demands for faster and better hydraulic presses during the war brought many improvements in standard types and also opened new fields for the use of hydraulic presses.

"Our metal forming presses today are usually of the housing type, combining great rigidity with accurate guiding of the moving members. Large pumps giving greater speeds, together with flexible controls, place these units in a class similar to specialized machine tools. Standard designs include single, double and triple action, with adjustable controls of not only the pressure but also of the strokes, controlling the points of slowdown, return and down reversal. These various controls have been enclosed, giving a more pleasing appearance.

"One type of press for forging and extrusion and especially metal powder forming is completely automatic, and has a dual action with rams top and bottom to insure uniform density throughout the work. Operator merely keeps the hopper full of powder and the press automatically turns out the finished product.

"Plastic molding presses have also been further developed, combining either straight compression molding or duplex molding in the same press. These units have self-contained pumps and are arranged with timers and controls for aumatic cycle operation.

"All of these new designs have been evolved to reduce the cost and improve the quality of the finished product."

Automotive Forgings Could Keep Industry Busy 5 Years

R. E. W. Harrison, vice president, Chambersburg Engineering Co., Chambersburg, Pa.: "Attention of the drop forging industry now is in the process of being diverted from production of forgings for war to production of forgings for peacetime products. This industry played a tremendously important role during the war years. Its role now will be no less important to peacetime economy.

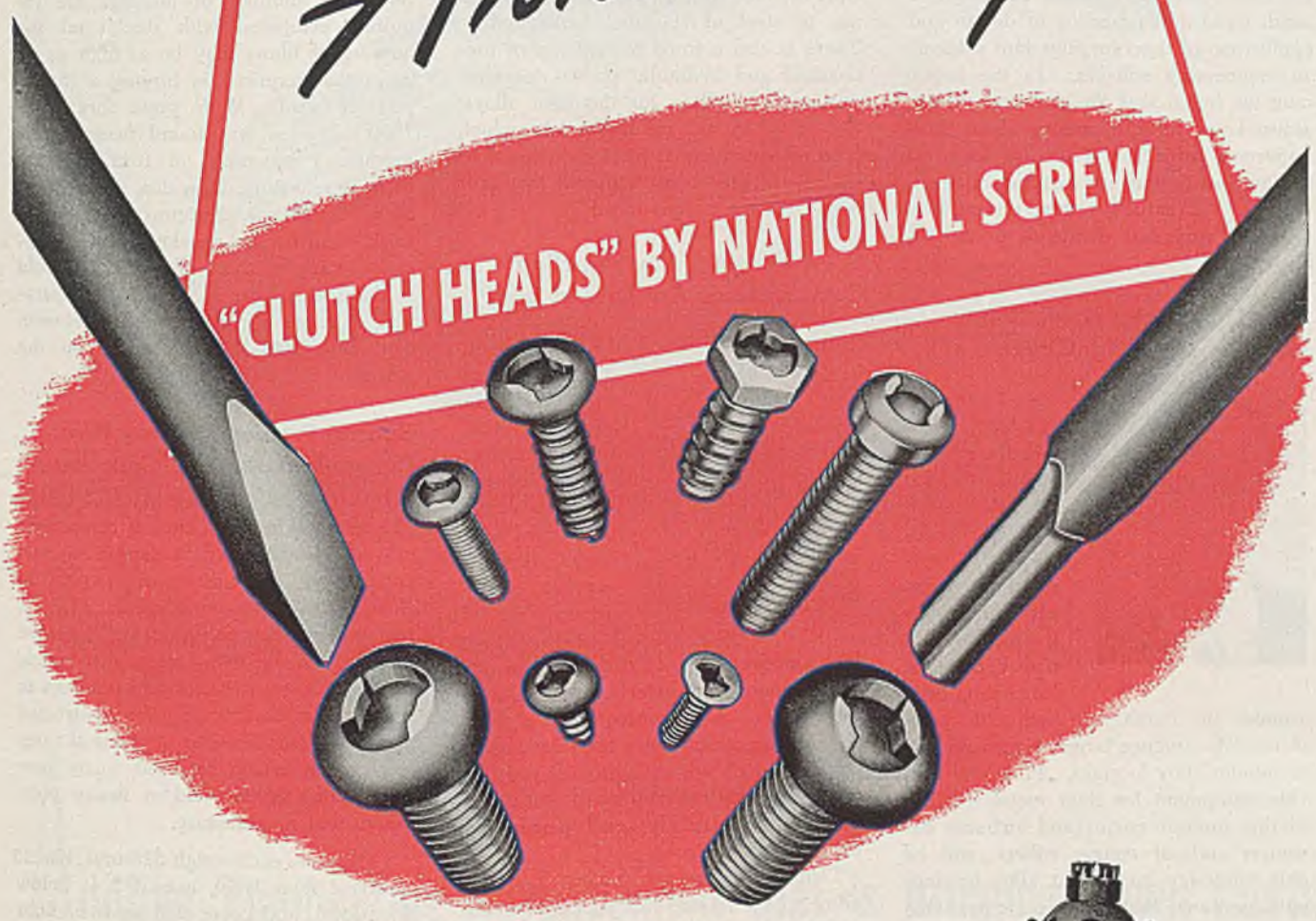
"The first of many things expected of this basic industry is a huge volume of top quality forgings to satisfy the long pent up demands of the automobile, bus and truck manufacturers—including several important new companies. It looks as though this business alone would be enough to keep the industry more than normally busy for 5 years or so. On top of all that will be piled a lot of other business, no small amount of it from those who during the war have used other types of components and who now are anxious to get back again to the use of drop forgings.

"Now, as never before, there can be no substitute for good die practice; accurate, hard-hitting hammers capable of reliable and continuous service; plus trimming presses and furnaces which will keep pace with the other equipment. It will be no time for guess-work or the cut-and-try methods which in the past all too frequently resulted in die sets which literally would wreck a hammer, and in purchase of hammers entirely inadequate for even the normal run of work.

"Today there is no reason why mistakes of that sort should be made. They

Announcing

"CLUTCH HEADS" BY NATIONAL SCREW



To serve industry still better with the most complete line of fasteners made by one manufacturer, we now offer the new and modern CLUTCH HEAD SCREWS.

More speed, added safety and longer tool life combine to reduce costs when Clutch Heads are used. Can be driven with a conventional screw driver or a special type driver. "Lock-On" feature permits easy one-handed reaching, driving and withdrawing.

In addition to the most complete line of staple fasteners made, we produce the following patented fasteners:

Phillips Recessed Screws	Lok-Thred Studs
Laminar Flow Screws	Rosán Fasteners
Marsden Lock Nuts	Scrivets
Huglock Nuts	Hi-Shear Rivets
Dynamic Lock Nuts	Lock Washer Assemblies
Drake Lock Nuts	Clutch Head Screws

Consult with us for information or advice on any fastener question.

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can be avoided by proper engineering. Our own carefully kept and analysed records and our experience are available as foundation material for this correct engineering.

"Since 1940 our company has been carrying on an educational campaign to instill basic understanding of design and application of drop forgings into students in engineering colleges. In the beginning we found that the professors themselves knew little or nothing about these important subjects. Today at least 20 leading institutions are carrying on these courses. Eventually this undertaking will pay very real dividends to our industry."

New Light Metal Forge Shop Includes 18,000-Ton Press

A. L. Rustay, assistant chief metallurgist, Wyman-Gordon Co., Worcester, Mass.: "Probably the outstanding project under way is erection of a new light metal forge shop built around an 18,000-ton hydraulic press planned to produce large magnesium and aluminum alloy forgings. Press will provide equipment for light metal forgings so that aircraft engine and airframe designers and, of course, others, will be able to design large light alloy forgings with assurance that facilities are available for producing the forgings.

"Heretofore, with regard to magnesium in particular, it was not possible to utilize the metal to best advantage because magnesium is best forged on presses, and presses of sufficient capacity were not available to produce the large forgings that frequently are desirable if magnesium is to be properly utilized for structural members. Newer high strength aluminum alloys such as 75S and R303 may be forged advantageously on presses, which means that larger forgings may be made of these alloys. This press will be available for making die forgings of light alloys of a size heretofore outside the scope of available equipment and it is expected that this press will enable us to compete technologically with some of the European countries which have utilized large magnesium press forgings made on hydraulic presses of about the same capacity as this one.

"Some of the applications that come to mind are crankcases, propeller blades, structural members of general I-beam section and large disk-like forgings of considerable projected area. The press will be available for general use in the spring of 1946.

"With regard to the forging of steel, general trend is toward closer dimensional tolerances and more careful control of mechanical properties through use of steel of specified hardenability. There is also a trend toward use of mechanical and hydraulic presses for steel forgings as well as for the light alloys, but it is by no means certain which type of equipment is most economical to operate where many different types of forgings must be produced."

Alloy Forgings Meeting High Temperatures Are Low in Iron

A. P. Spooner, metallurgical engineer, Bethlehem Steel Co., Bethlehem, Pa.: "Jet propulsion has developed the need for wheel forgings capable of retaining much of their strength at high temperatures. Extreme uniformity and freedom from defects are further requirements. As a consequence, a number of compositions have been developed, most of which are so highly alloyed that they are really not true steels, but rather alloys with relatively small percentages of the element iron.

"Unfortunately, we cannot have an alloy which is soft and which will flow readily when hot-formed, but which possesses the opposite characteristics in service. Service requirements are so drastic that Zyglo and Supersonic testing requirements are now included in the survey of each forging, in addition to methods of inspection.

"As a result, during the past year great strides have been made to meet this new requirement. Many forgings were of necessity consumed in the development of various process controls and through destructive testing. In final processing of parts, as severity of inspection became increasingly drastic, many forgings were rejected.

"Forgings were produced by one of two principal methods: 1—(a) Cast ingot to produce multiple forging lengths, (b) Hammer or press forge to billets, (c) cut to individual lengths, and (d) finish to size under hammer; or 2—(a) cast ingots for individual forgings, and (b) Press forge to size.

"It was found that during hot working these alloys could withstand little tension and that the work therefore must be done in such a manner that metal is primarily in compression. This, combined with nondeforming properties of the alloy, led to what might be termed innovations in forging practice.

"In hammer forging, three to four times the number of heatings are required, compared with steel; and the number of blows may be as high as 10 times that required in forging a similar part of steel. With press forging, a 7500-ton press was found necessary to produce a movement of 1 in. in diam without reheating, on a disk about 16 to 20 in. in diam and approximately 6 in. thick. Further, to develop desired properties, many of these alloys require cold working as a final operation. Temperature of these operations varies between 1200 and 1600 F., depending on the alloy."

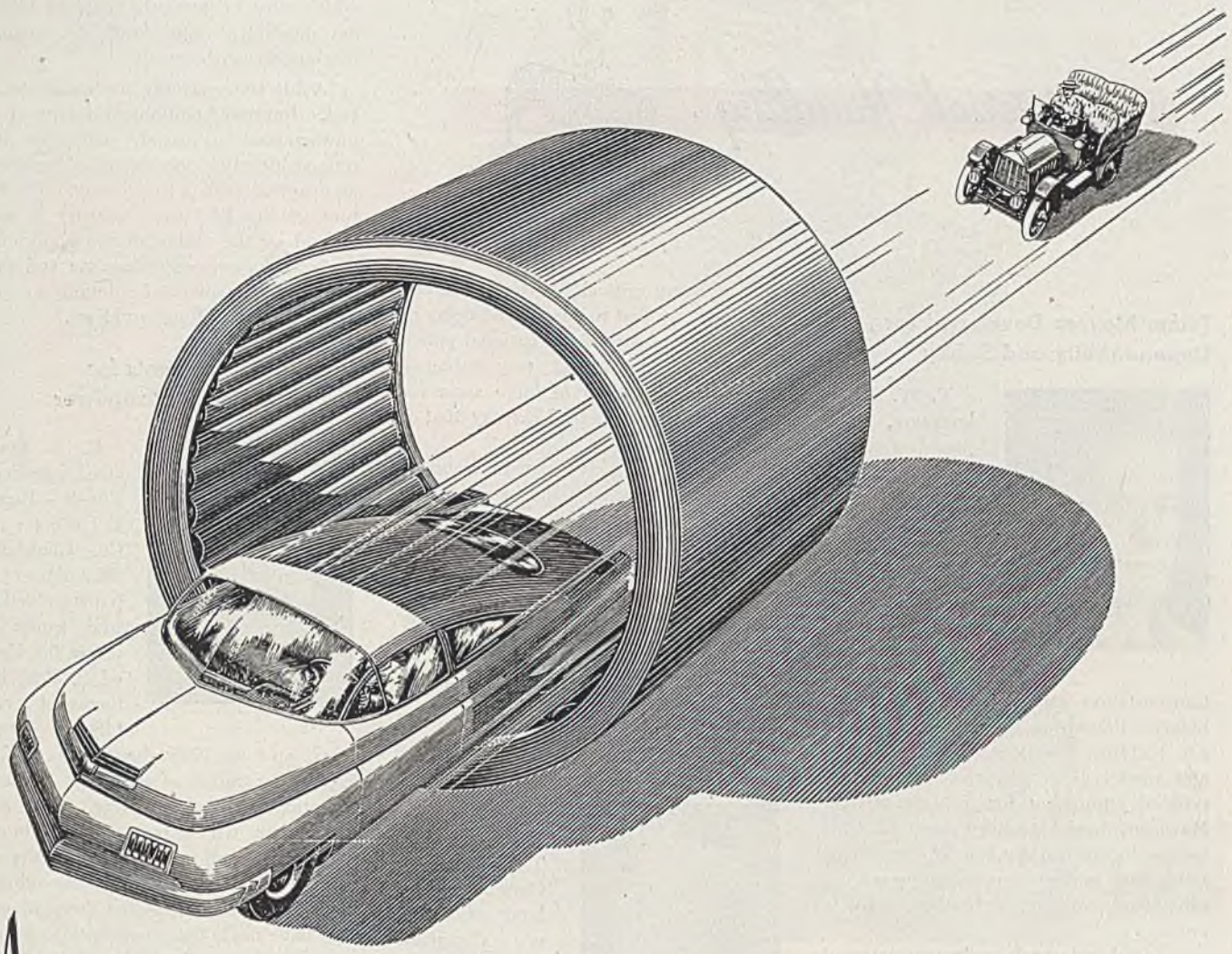
Special Presses Embody New Design-Manufacture Concepts

J. R. Haslam, Clearing Machine Corp., Chicago: "When one kind of component proved unsatisfactory in certain aircraft applications, the answer was found in changing to aluminum forgings. Among the various items of equipment required by this change-over were mechanical forging presses of larger tonnage than in existence at that time. We contracted to build these 4000-ton mechanical forging presses which required many new conceptions in the field of heavy press design and manufacture.

"Machines each weigh 325-tons, rise 23 ft above floor level, extend 8 ft below floor level, and cover 220 sq ft of floor space. Main machine elements are welded. Tierods, 20 in. in diam and 31 ft long, hold crown member to the bed through two uprights. These tierods, and nuts which are threaded to each end, are of forged steel, weighing 72 tons per set. In assembly, the rods are shrunk in place, making a rigid frame structure for forging work up to the full 4000 ton pressure. Due to size of rods, conventional means for shrinking by flame heating was impractical. Electric heating elements were inserted into tierod ends, solving not only the problem of initial tierod shrinking, but also of reheating the rods as required.

"A condition sometimes exists where, due to an oversize or underheated piece of material, the press ram stalls at bottom stroke. Due to the overload, in the case of this machine, problem of relieving this pressure is of extreme importance. By electrode heating, pressure can be relieved quickly by unshrinking the tierods, and press is put back in service by their

(*Please turn to Page* 402)



Another Engineering Advancement that is Bringing Down Costs

Engineering methods and materials have come a long way since those days in the 'twenties when the "medium priced car" sold at $3,000. And each subsequent engineering advancement has contributed to better performance at lower cost.

That's what Torrington Needle Bearings are doing—*by providing anti-friction advantages and lowering costs all along the line...*

First costs are low because Needle Bearings are adaptable to precision production at low unit cost.

Assembly and housing costs are low: the bearing's unit construction facilitates handling and speeds assembly; and only the simplest housing is required—a bore machined to proper dimensions.

And "last cost" is low: for the high capacity and efficient lubrication of Torrington Needle Bearings insure long service life. Needle Bearings never seem to wear out or require replacement.

If you are seeking improved performance at lower cost and are not fully aware of the possibilities of Needle Bearings, send for our Catalog No. 32 which gives a comprehensive picture of their many advantages.

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TORRINGTON NEEDLE BEARINGS

Prime Movers Developed for Dependability and Safety

E. W. Schellentrager, vice-president, Atlas Car & Mfg. Co., Cleveland: "There is a noticeable trend toward the use of prime movers in connection with specially built transportation equipment for industrial plants. Propulsion by power from storage batteries has been widely accepted and used. It is still the predominant type of equipment for in-plant service. However, there have been many more inquiries for special haulage equipment of the prime mover type recently, with a satisfactory volume of business actually entered.

"Special industrial equipment referred to consists of transfer cars or locomotives especially built for one particular job in an industrial plant or steel mill where dependability and safety are of paramount importance."

Much Work Still To Be Done in Equipment Engineering Field

F. E. Moore, president, Mathews Conveyor Co., Ellwood City, Pa.: "All conveyor manufacturers are very busy, and are especially involved with work of an engineering nature. There is a tremendous volume of work to be done in this field. However, it is very evident at this writing that this work, which is so vital to the success of our reconversion program, cannot be accomplished satisfactorily, unless economic and industrial turmoil subsides.

"Materials we require are very difficult to obtain with any degree of promptness. Strikes are causing severe shortages of many critical materials. It can very easily be that the continued delay in establishing some definite national policy in this connection will very seriously hamper any program of large scale reconversion and industrial activity that is generally expected.

"We and other conveyor manufacturers will be very busy with the work already on hand, if these conditions over which we have no control do not slow us down, or even stop us entirely. As I see things today, however, I hesitate to paint a picture of great industrial progress in the coming year. We can have it, and I fervently hope that we will have it."

Trained Materials Handling Engineers To Be at a Premium

Lester M. Sears, president, Towmotor Corp., Cleveland: "At the war's conclusion, the lift truck industry found itself in the enviable position of having little or no reconversion problem. That was the natural result of building a peacetime product that had gone to war with no more change than perhaps the color of the paint. Since wartime demands have so clearly spotlighted the importance of handling materials as a vital function, industry as a whole has suddenly realized that efficient handling methods increase production and, therefore, counterbalance the imposing new burdens of rising labor costs, continued high tax rates and price controls.

"Manufacturers of industrial lift trucks must, however, recognize that with their rise in popularity comes a new responsibility, the thorough training of its sales engineers. There is danger in the prevalent notion that all materials handling problems can be solved just by the purchase of certain kinds of handling equipment. Today an even greater need exists for instruction in the highly specialized handling field than for new equipment. Every industry, indeed, every plant has its own specific problems which must be properly analyzed before any intelligent application of handling machinery can be made.

"A lift truck is only the means to an end. Improper equipment results in an unwarranted overhead, while an untrained lift truck operator is as inefficient as a novice with a mule team. The future of the lift truck industry is only limited by the ability of the application engineer to correctly diagnose and prepare carefully planned solutions to constantly new handling problems."

Special Attachments for Trucks Multiply Manpower

C. B. Cook, vice president, Elwell - Parker Electric Co., Cleveland: "Number of power industrial trucks in use in the United States has increased rapidly in recent years, and in 1945 they were applied to a wider range of materials handling operations than ever before. Ease and speed with which materials are lifted, transported and placed by means of such trucks dictated their use during the war. Economies that became evident have made them necessary to peacetime activities. Planned materials handling is supplanting the haphazard, and affords competitive advantages.

"While no radical changes in basic designs of power trucks are to be reported at this time many improvements are noted in their construction, especially in attachments devised to make them more generally available, or to adapt them to specialized types of loading.

"That power trucks are exerting an increasing influence in basic industries is indicated by provisions being made for their more extensive use. Scarcely a week elapses that the United States patent office does not disclose new inventions in some way related to movement of materials by means of trucks. More patents have been granted for new designs of pallets than ever before. On one hand there is a trend toward steel for pallets of permanence and for special purposes; and on the other, efforts are being made to produce practical, throw-away paperboard pallets, to cost less than those of wood. These developments are proceeding from a strong demand from basic industries which are striving to reduce handling costs.

"The coming year is likely to see still further expansion in the use of trucks for an endless variety of a jobs in pro-

— there is a new horizon in chemistry!

Chemical engineers say, "the chemical age is here!"

With the problems of volume production in higher octane gasolines now worked out, the day has been brought nearer when we will have automobiles to use them. From the fluid catalytic cracking method can come a great many improved operations and specialized chemical processes for producing wondrous new materials.

Advances thus far, have been materially aided by pioneering developments of The Timken Roller Bearing Company in fine alloy steel seamless tubing. Through its use, chemists have extended their control over liquids to temperatures as high as 1700 degrees Fahrenheit and working pressures as high as 30,000 pounds per square inch.

The Timken Company set up the first continuing research project in high temperature tubing, seventeen years ago. Our metallurgists have worked relentlessly on such problems ever since. From their efforts have come eleven tough new alloy steels, each capable of doing battle with heat, pressure and corrosion in the petroleum, chemical and paper industries.

More special alloy steels will be coming along. If you have a problem that involves transfer of liquids or gases at high temperatures or great pressures, bring it to the No. 1 Problem Solver of the industry. Write Steel and Tube Division, The Timken Roller Bearing Company, Canton 6, Ohio. *Timken Bearings, Timken Alloy Steels and Seamless Tubes, Timken Removable Rock Bits.*

TIMKEN

Trade-mark Reg. U. S. Pat. Off.

Fine Alloy

STEEL AND SEAMLESS TUBES

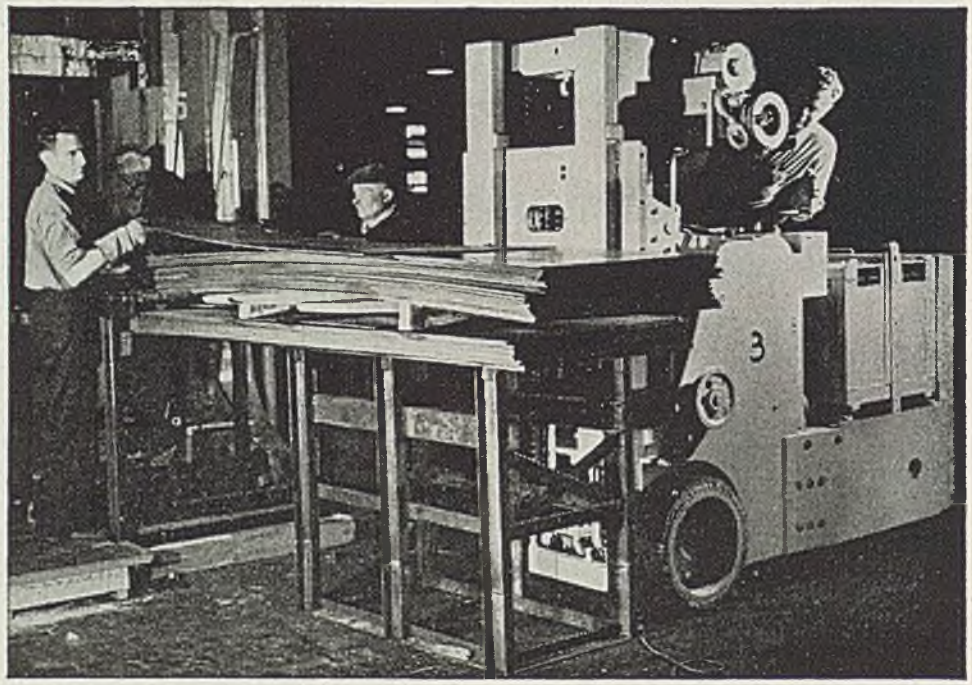
DEMONS UNLOOSED. Early in the wartime high octane gasoline program, new processes, hurriedly put to work, unloosed demons of higher temperatures and greater pressures which viciously attacked refinery tubing. New operating conditions brought corrosion problems never faced before.

Timely aid came from The Timken Roller Bearing Company, undisputed authority on such problems. Immediately, results of our long years of research were made available to everyone who needed it. Even though Timken steel mills were crowded to capacity with other vital production, our engineers traveled the length and breadth of the country, to apply our research findings and point out use of the proper tubing.

And *rivers of super-fuel* continued to flow from refineries.

★ YEARS AHEAD — THROUGH EXPERIENCE AND RESEARCH

BATTERY TRUCKS keep machines busy...



...ALKALINE BATTERIES keep trucks on the GO

In Industrial Trucks, Alkaline Batteries Give You These Important Advantages

- They are **durable mechanically;** grids, containers and other structural parts of the cells are of steel; the alkaline electrolyte is a preservative of steel.
- They can be **charged rapidly;** gassing cannot dislodge the active materials.
- They **withstand temperature extremes;** are free from freezing hazard; are easily ventilated for rapid cooling.
- They are **foolproof electrically;** are not injured by short circuiting, reverse charging or similar accidents.
- They can **stand idle indefinitely** without injury. Merely discharge, short-circuit, and store in a clean, dry place.
- They are **simple and easy to maintain.**

Fast, steady and efficient movement of materials to and from machines, 24 hours a day, is one of the important ways battery industrial trucks are helping to speed production, save man-time and cut handling costs in all kinds of busy plants. A continuous flow of materials in process is maintained without interference to machine operations. Work is spotted in the most convenient and accessible locations for feeding each machine with the least manual handling.

Keeping machines busy on round-the-clock schedules is a continuous stop-and-go handling job in which the battery industrial truck excels because of its inherent flexibility, high availability and economy.

Exchange batteries keep the truck continuously supplied with power. While one battery operates the truck, another is being charged. Except for the few minutes needed to change batteries, the truck need not stop for servicing its power unit. Its electric motor drives have a minimum of wearing parts; are inherently simple and trouble-free. The truck starts instantly; accelerates smoothly; operates quickly; gives off no fumes; consumes no power during stops. Not only does it make efficient use of power but the current used for battery charging is the lowest cost power available.

Altogether, the battery industrial truck is one of the most dependable and economical types of handling equipment — especially when powered by Edison Alkaline Batteries. With steel cell construction, a solution that is a preservative of steel, and a fool-proof electrochemical principle of operation, they are the most durable, longest lived and most trouble-free of all batteries. Edison Storage Battery Division of Thomas A. Edison, Incorporated, West Orange, N. J.

Edison
ALKALINE BATTERIES

curement, manufacturing and distribution. The relationship these factors bear to one another is the basis of our system of industrial logistics."

Wider Use of Transfer Bridges Expected in New Plants

A. F. Anjeskey, sales manager, Cleveland Tramrail Division, The Cleveland Crane & Engineering Co., Cleveland: "Prior to war, overhead traveling cranes operating on two-track runways was the only means thought of by many for lifting and transporting materials in a factory. One or several cranes would be provided for each shop bay, and they served satisfactorily as long as all movements were confined to the area over which the cranes traveled. When loads had to be taken from one bay to another rehandling of the loads would be required and this would necessitate a great deal of time-consuming effort. Because of need for efficiency and speed in handling war materials in production, more consideration was given to methods of handling when building the many new war plants. As a result, many plants were equipped with multi-runway transfer bridge systems which make possible very real economies both in time and money.

"Transfer bridges are light in weight, reliable, and serve the materials handling requirements within factory bays well. They have the important additional advantage of permitting loads to be transferred from one bridge to another, eliminating need of rehandling. Thus it is possible to transport materials from any point in a large building to any other point, even a great distance away, directly on one carrier.

"Studies have been made and data accumulated which indicate that costs of a building designed for use of multi-runway cranes or transfer bridges of the underhung type is 5 to 10 per cent lower than for buildings designed for other installations. Usually the savings in building costs will offset any possible higher costs of a transfer bridge installation.

"It is reasonable to predict that buildings of postwar construction, where proper study is made of the flow of materials or handling, will be designed to accommodate transfer bridges having a capacity of 10 tons and upwards. While such installations have been made in isolated instances, we can expect to see installations and buildings having this capacity more frequently.

"Another phase observed in materials handling is a tendency on the part of manufacturers to dispatch materials automatically on overhead equipment, with a hoist and travel unit performing the operations of lifting and carrying but being dispatched from one or several points to other destinations without an operator. We have made quite a number of such installations. It is possible today to obtain combinations permitting automatic dispatch to as many as 400 stations."

Palletizing Does Outstanding Materials Handling Job

D. L. Darnell, manager, Sales Engineering Department, Baker - Raulang Co., Cleveland: "One of the most significant recent developments in the power industrial truck industry and in the field of materials handling is the shipping of materials on pallets in unit loads. During 1945, this culminated in a program in which the Armed Forces, particularly the Navy, intended to ship all materials direct from the manufacturer's plant to the front lines in unit loads strapped or otherwise fastened to pallets. Men trained in this type of handling and shipping were sent to plants of Navy suppliers to teach them how to package their materials in unit loads, how to handle them and how to load them into railroad cars for safe shipment.

"The handling of material in unit loads is not at all a new idea but originated as early as 1914 or 1915 when the first lowlift truck was built. Before that, piece-by-piece loading and unloading operations took place every time the material moved within the plant and, finally, when it was put in cars for shipment. The lowlift truck was invented to permit handling material in unit loads. An incoming shipment was loaded onto a skid becoming a unit load. It remained on that skid when in the rough stock room and traveled on a skid from machine to machine and finally out the door for shipment. Truck required a skid with 7 to 12 in. underneath clearance, but the fork truck which appeared shortly after World War I handled the load in an outboard position on relatively thin fork tines and permitted reducing the underneath clearance to 3 or 4 in. These low skids have been termed pallets to differentiate them.

"The tinplate industry was one of the first to make shipment on pallets, utilizing some of these early fork trucks. Then, shortly afterward, the paper industry began making shipments of flat paper in unit loads and method has become standard for that industry.

"Although it has long been standard practice for all industry to handle its materials in unit loads within the plant walls, the idea of making unit inter-plant shipments was slow to catch on until war conditions forced its use as a means of saving re-handling costs.

"Power fork trucks are the accepted means of moving these unit loads, either within the plant or into cars for shipment. With a manufacturer squeezed between rising wages on one side and price ceilings on the other, it is going to be necessary to take advantage of the savings which can be gained through unit load shipping."

Overhead Traveling Cranes Allow Full Use of Floor Space

F. M. Blum, manager, Crane Sales Division, Harnischfeger Corp., Milwaukee: "The crane industry, after building through the last 5 years an unprecedented number of cranes, finds itself again in a peacetime market. We are now confronted with helping industry reconvert from their war production to their standard line of production. Many cranes during these years operated 24 hr per day, thereby, operating equivalent to 12 to 15 years under normal conditions. Some of these cranes had many years of service behind them when called upon to do this triple duty and now will be subject to costly repairs. These cranes should be replaced in order to help produce peacetime goods at low cost.

"Production methods employed during the war allowed this country to produce implements of war on such a scale as was never encountered in the history of the world. These production methods have taught industry many improvements which they could adopt in their peacetime activity.

"One of these is that the cost of handling material in a manufacturing plant is a cost that must be reckoned with.

(*Please turn to Page* 400)

Active Demand Is Probable for High-Speed Production Machines

J. Y. Scott, president, Van Norman Co., Springfield, Mass.: "I for one am firmly of the opinion that the problems facing the machine tool industry during 1946 will turn out to be extremely serious ones. With labor demanding more and more wages, with prices frozen, with machine tool costs going up and with a surplus problem which has by no means been solved, the machine tool industry obviously has its work cut out for it for some time to come.

"There is silver lining to the cloud, however, in that that the demand for high speed production machinery may be increased tremendously through the necessity of manufacturers securing greater productivity than ever before.

"If the combination mentioned in the first paragraph does not now cause a serious retardation of reconversion, then the machine tool industry may find itself quite busy, especially on special single purpose production machinery."

Transition Reveals Progressive Interest in Broaching Tools

Harry H. Gotberg, chief engineer, Colonial Broach Co., Detroit: "Transition from war to peace is bringing with it demand for broaching equipment unprecedented in prewar manufacturing. There are two reasons for this: Ability of the broaching process to remove substantial amounts of metal per hour per machine, and extremely high precision can be maintained simultaneously.

"On top of this high productivity of the broaching process, moreover, the past year has shown development of a definite trend toward reduction in manual effort in machine operation. This is exemplified in the greater demand for quick-loading and even automatic loading fixtures, employing either air or hydraulic clamping devices.

"Along with this has come a greater use of automatic broach handling mechanisms, not only reducing floor-to-floor time, but also tending to decrease operator fatigue and resulting decrease in productivity.

"Requirements for greater manufacturing accuracies—closer tolerances — have resulted in improvement not only in manufacture of broaches and broaching machines but also in the greater attention being given to such matters as holding fixture design, broach guides, etc.

"In general, the increased demand for broaching equipment is of course traceable to the desire for equipment which will reduce manufacturing costs. This applies not only to the larger producers but also to smaller manufacturers. Possibly the accuracy provided by the broaching process is also a contributing factor here."

Tungsten Carbide and Cast Alloys Alter Die Designs

C. R. Harmon, Tool & Alloy Division, Jessop Steel Co., Washington, Pa.: "Markedly changed die design has been brought about by increased use of tungsten, carbide and cast alloys. Many firms are reclaiming worn and discarded dies by milling a cavity and inserting a ring of carbide or cast alloy (nonferrous cobalt-chromium-tungsten alloy, 60 to 62 rC as cast) performance being, in many cases, far superior to that obtained with the original die.

"Three types of material are becoming increasingly popular with the die shops tooling for large production: (1) carbide; (2) cast cobalt-chromium-tungsten alloy; (3) cast-to-shape high-carbon hi-chromium steel.

"Carbides, as well as cast alloy dies, are generally of the insert type for two very good reasons: Both are more brittle than alloy steels and require the support of a backing metal; and the material cost makes it desirable to use it only on the wearing surfaces. The third type, cast-to-shape high-carbon, high-chromium is preferred to standard bars or forgings because, in addition to a saving in weight, time, and machining costs, more rapid deliveries can be obtained.

"Each of the these materials has a separate field in which it is superior, and the factors to be considered in selecting the proper material are: (1) Type of operation; (2) total production required; (3) original die cost; (4) production expectancy of each of the materials.

"Many companies, while tooling for war production, learned to appreciate the high cost of tooling, and in their reconversion are going all out for standardization—the trend being to purchase higher priced tool nad die materials at the start, with an eye to lower maintenance costs."

War-Born Outlook Views Carbides as "Metals"

W. C. Robbins, president, Carboloy Co. Detroit: "During closing years of World War II, cemented carbides underwent a transformation more real than apparent. Carbides became 'metals'. They were no longer 'tips for cuttings tools' or 'nibs for dies'. Industry began to look on carbides for what they are, *harder metals.*

"The new outlook probably was as difficult for the carbide industry to assimilate as it must have been centuries ago to the men who developed better tools by using bronzes, and then found that people wanted the bronzes more than they wanted the tools.

"Not that 'industry' of that day didn't want bronze tools. But, as today with carbides, usefulness of the metal *as a metal* overshadowed the importance of the specific use for which it was first introduced on a wide scale.

"Acceptance of carbide as hard metals has meant that we no langer think in terms of 'tool grades'—the difference between a carbide for machining cast iron and one for cutting steel—as much as we do of carbides as hard metals for any given purposes.

"That in itself has enormously widened the economic horizon for carbides. Requirements as to physical characteristics, chemical compositions, methods of fabrication and internal structure imposed on carbides by their use in cutting tools are

not usually duplicated in other fields. Thus, in the production of carbide cores for armor piercing projectiles, it was possible to reduce costs in only 2 years by over 50 per cent, and yet produce a product in this case which was actually more satisfactory.

"Fabrication methods for carbides or carbide-products are undergoing a revolution. Mass production methods, which proved the feasibility of selling carbide tools for as little as steel tools, will be the order of the day. Hard metal costs can no longer be predicated on the cost of producing carbide tips for tools or nibs for dies. They will depend on the specific use for which the hard metal is needed. That need will dictate the kind of hard metal required, the cost of raw materials employed, and the fabrication methods and equipment used."

Engineering Steels and Tool Materials Share in Progress

G. P. Witteman, assistant metallurgical engineer, Bethlehem Steel Co., Bethlehem, Pa.: "Cessation of hostilities withnessed metal cutting achievements from single and multiple purpose production lines which will either prevail or challenge ingenuity in the future.

"Many advancements, cumulative through the war period, were apparent in the whole scheme of machinability. Speaking first for engineering steels and then tool materials, these products shared well in the progress.

"Within the limits of specifications, machiners were exacting in their demands for uniformity of structure or hardness so as to maintain efficiencies and schedules. Outstanding in this connection was mass production of high-explosive, carbon-steel shell forgings which required metallurgically controlled cooling rates from the forging temperature to assure proper machinability. Annealed and heat treated alloy steels necessitated specialized equipment and close metallurgical supervision, especially with respect to uniformity, in producing desired structures. In steelmaking, sulphur continues to be the most widely used element for enhancement of machinability, embracing both carbon and alloy compositions.

"Modifications of recognized compositions for high-speed and super high-speed steel seem to be well established.

"Decided progress was made in the use of cast alloys and sintered carbides, the latter accounting for super cutting speeds employing negative rakes for turning and milling operations. Proper tool design seems to have attracted considerable attention, which should give much impetus toward correcting those difficulties which sometimes have censured the steel being cut."

Ordnance-Industry Teams Should Continue for Mutual Benefit

Brig. Gen. H. F. Safford, Ordnance Department, U. S. A., Washington: "As far as the Ordnance Department is concerned, our production program has been completed with the exception of a few special items. It appears obvious that production of Ordnance equipment henceforth will be confined almost entirely to experimental types which we hope will continue year after year in order to insure that we have at all times the most modern and efficient equipment.

"It is hoped that the Ordnance-Industry teams will continue to function without interruption in order that we may mutually benefit and be able to utilize all of the most modern production methods of machining and tooling. There should be a greatly increased use of electronics in connection with production equipment, particularly its automatic features to insure greater accuracy.

"We should continue to investigate powder metallurgy for the production of certain Ordnance items. Through our permanent arsenals and our district Ordnance offices we will be in a position to maintain continued contact with industry so that we may always be ready for any emergency."

Movement Toward Automatically Controlled Units Is Strong

W. R. King, Industrial Resale Division, General Electric Co., Schenectady, N. Y.: "From the standpoint of the electric manufacturer, the three most significant trends in the machine tool industry during 1945 were: (1) Trend toward more automatic machinery, (2) trend toward wide speed-range drives for many machine functions, and (3) trend toward the use of very high speed motors.

"More and more machines are being made completely automatic. Individual motors driving these machines are controlled by limit switches, timers, and their associated magnetic switches and relays so that their various functions are performed at the required time without attention from the machine operator.

"Use of improved cutting techniques has increased the necessity for wide speed-range adjustable speed drives to assure that each machine function takes place at exactly the correct speed. For the lower horse-power ratings, the relatively new Thy-mo-trol drives have been widely employed to obtain adjustable speed over a large range. On larger horsepower ratings, adjustable voltage drives using generators and amplidynes have been used.

"Necessity for operating internal grinding spindles at speeds higher than can be obtained with direct-drive, 60-cycle motors has resulted not only in the development of high-speed induction motors for operation at speeds from 50,000 to 100,000 rpm, but in the further development of frequency conversion equipment to provide frequencies as high as 2000 cycles suitable for motor supply. It is probable that this development may be carried to even higher motor speeds for very small diameter internal grinding, but there are now numerous installations operating over 50,000 rpm and a substantial amount of investigation is going on involving speeds around 100,000 rpm."

Newer Gear-Making Methods Cut Floor-to-Floor Time

O. L. Bard, president, Michigan Tool Co., Detroit: "Outstanding development of the past year or so in gear production methods and equipment is the attention paid to reduction in floor-to-floor time. This development bids fair to continue through 1946 and 1947.

"Maximum production per machine hour is not exclusive to the gear manufacturing field, of course. As a matter of fact, many of our gear cutting machine types, particularly the gear finishing machines, had been developed to an

extremely high output rate per machine hour even prior to war, as may be verified easily by comparing cutting speeds on these machines with sfpm on other types of machine tools.

"However, the past year has indicated that there exists a decided trend toward further reduction in total time per gear even on gear finishing machines. On these machines increased output is taking the form mainly of addition of quick-loading and even automatic loading fixtures and devices to reduce loading time.

"Development of simple checkers which can be located alongside of gear cutting equipment for 100 per cent checking of gears by the machine operator is also designed to reduce overall production time per gear while insuring maintenance of greater product accuracy in line with today's demands.

"In machines used for preliminary gear-cutting (prior to finishing) a considerable step in advance has been taken recently. Development of a machine which will cut all teeth of a gear simultaneously in a fraction of the time formerly required, undoubtedly will have the effect of stimulating improvement, directed at reducing floor to floor time, in all types of gear cutting machines."

War Implements Standardization Of Cutters for Thread Milling

S. B. Hellstrom, general manager, Detroit Tap & Tool Co., Detroit: "Advancement of thread milling to the cutter standardization stage has been brought about largely by wartime demands for high production precision threading. Need for standardization became widely recognized when many manufacturers undertook fabrication of identical ordnance parts.

"Savings in engineering and delivery time resulting from cutter standardization made the adoption of standards to meet requirements of normal industrial production a natural sequel. Now standard thread milling cutters to meet practically the entire range of usual precision thread cutting operations are stocked in blank form, finish-machined and heat-treated, ready for grinding threads to users specifications of form and tolerances.

"Necessity, in war production, to provide joined parts of high and consistent accuracy not only resulted in development of higher precision mass production threading machinery, but also made use of working and master thread gages commonplace. Tolerances previously associated with thread grinding operations were maintained in cut threads. If past experience is a criterion, industry will tend to go forward rather than back. Closer inspection tolerances for thread joining undoubtedly will be extended to peacetime products.

"Along with demands for higher production per machine hour and increased accuracy has come the necessity for better tool maintenance. Accurate control, during sharpening, of all factors that affect tool performance and better checking of sharpened tools before use are now becoming accepted practice. Special equipment for such tool quality control is being demanded more and more."

With Germany, Japan Now Out America Has Export Opportunity

Leighton A. Wilkie, president, DoAll Co., Des Plaines, Ill.: "We are optimistic about the long term prospects for the machine tool business. With Japan and Germany out of the running, the machine tool business will have a free hand in the great industrialization era that is to take place throughout the world. Even tiny countries, like those of Central America, are eager to industrialize. We are counting heavily on overseas sales because before the war it accounted for 40 per cent our business, and we have our machines in use in 44 countries.

"In order to approach foreign sales from a sound basis, we have launched a series of newspaper advertisements in Latin American countries. These ads, which appear in Spanish in all South American countries except Brazil, where they appear in Portugese, are run once a week in the leading newspapers of each town over 50,000 on the theory that the upper class—the newspaper reading public—are the ones that need to be aware of the fundamental procedure for building an industrial economy.

"The aim of the series is to create a favorable atmosphere for the importation of machine tools and to create an alertness to the important part of industry in raising the standard of living.

"To those who respond to the ads we send a new booklet which shows how large firms grow out of small ones. The book also shows the ten basic machine tools—including of course the contour sawing machine—and then the lay-out for various typical shops, such as tool room, ornamental iron shop, etc.

"We were pleased with the Machine Tool Survey that STEEL made and with the excellent manner in which it was presented. We found your conclusions in line with facts we found in a survey we made some time ago amongst 1000 of our users. The results of our survey gave us an optimistic outlook for contour sawing for the future."

New Way of Finishing Machines Encourages Plant Housekeeping

Wendell E. Whipp, president, Monarch Machine Tool Co., Sidney, O.: "Prior to the wartime limitation order eliminating the 'filling' of castings on machine tools and other industrial equipment, it had been the universal practice for many years to apply one or more coats of thick filler to castings, sand them down to a smooth finish, then apply by brush or spray gun one or more coats of finish color paint.

"Such machines when new looked well because the irregularities in the castings were covered up by the thick coating of filler. But this would crack out and flake off in use, especially when bumped or struck by any object. As a consequence, an extremely rough surface resulted. When such a machine was repainted without being completely refilled and sanded, the once smooth appearance could never be restored.

"During the 1930's, a light gray color was adopted as the American Standard color finish for machine tools and industrial equipment. This light color reflected light, was more pleasing to the operator and was desired by most industries. However, it had one drawback — it was harder to keep clean and consequently machines finished with it required more frequent painting to retain their appearance while in use. In addition, the light color had a tendency to accentuate any surface roughness.

"Under the circumstances, we here at Monarch regard as a distinct achievement the comparatively recent development of a new finish for our machine tools, known as 'Modern Texture'.

"First step in the finishing is the application of a quick-drying, light primer to the cleaned and ground castings. Then, after the machine has been built, it is sprayed with the new stipple finish. A

second coat of light sealer and a final coat of quick-drying lacquer complete the finishing job.

"Since this finish has no heavy coating of filler, the machine tool may be repainted repeatedly to keep it looking practically like new.

"New plants and new equipment, built as part of the all-out production effort to win the war, have made us all more conscious of the value of good housekeeping. Well-kept machines are so basic a part of that picture that here at Monarch we are not only applying this new finish to all our turning machines but also to every machine tool in our plant, regardless of its make".

Great Expansion in Peacetime Use of Gages Predicted

Louis F. Polk, president, Sheffield Corp., Dayton, O.: "The question has been asked, 'What are the opportunities for the increased use of gages, precision instruments, and machine tools by industry in this postwar world?' After a period of adjustment, there will be the greatest peacetime use of these products because of proven cost savings.

"Much progress was made in the past few years to provide vastly improved, faster measuring insruments, gages and machine tools to assure dimensional control with mass production. Entirely new kinds and types were developed and tested in the hardest kind of service during the emergency and are now available for peacetime production. Our country's leadership in both quality and quantity of mechanical goods must be maintained.

"Today everyone is more conscious than ever before of the economy and importance of dimensional control, interchangeability and scrap reduction. In countless plants such improvements recently have demonstrated on war jobs their ability to control quality standards, improve methods and manufactured products, while cutting manufacturing costs. Manufacturers now are applying to their peacetime products many of the modern inspection techniques and types of gaging instruments that have proved to be so helpful.

"Industrial history has countless illustrations to prove that better methods and equipment also provide more and better jobs. The greater our mechanical progress, the greater our national employment, not only in manufacturing, but also in selling and distribution as well as the many service industries. Best of all, more and more people will have the necessities, comforts, and luxuries that a short while ago were available only to the few."

Ingenuity in Special Tooling Key to Trimming Costs

R. F. Moore, president, National Tool and Die Manufacturers Association, and president, Moore Special Tool Co., Bridgeport, Conn.: "Ingenuity in special tooling is the greatest of all cost reducers on production work. I contend that there is not a job running that cannot be improved upon. The opportunities are tremendous.

"However, the present scarcity of top grade tool engineers with all-around experience hampers the working out of improved tooling methods. Adoption of a comprehensive program for developing this type of man can in a few years generate the necessary 'know how' to decrease manufacturing costs and improve quality tremendously.

"The supply of good tool and die makers, and die sinkers, also should be increased to handle the complex tooling of the future. Recognizing that the training of these craftsmen is a responsibility of our industry, we are now developing apprenticeship standards through the National Tool & Die Manufacturers Association.

"Dies are becoming more and more complicated. Progressive and compoud sets are being ordered more and more frequently. While heavy expenditures are being made for sectional, form ground dies of great precision, our industry is hard put to find adequate heat treating facilities adequate for such work. Much has been learned in the past decade about treatment of tool steels. Suprisingly little of this knowledge is being applied in some of the commercial heat treating plants.

"On many jobs which have been capably tooled for production, no special gages have been ordered. Inspection is slow, inaccurate and costly. The end result is that much work is spoiled before errors are caught. It is safe to say that—on the average—three times as much should be spent as ordinarily is being spent on special and standard gages. That added expenditure will pay big dividends now, and even bigger ones during the greatest production era of all times which lies ahead.

"A great amount of 'hurry-up' tooling will be made in the next year or two. Everyone is anxious to 'get going'. This tooling will not be of the best. After production is rolling many jobs will be retooled.. On the face of it this may seem wasteful and expensive, but in the long run it will not be.

"Few tool designers are clever enough to foresee everything. After the original tools have been on production, re-study inevitably reveals possibilities for improvement. New tooling then can be designed which will come much closer to being 100 per cent effective. The original tools are held in reserve against breakdowns or as extra to relieve periodical bottlenecks.

"Industry is becoming more and more specialized and so are the tool shops Some prefer to make molds, some dies, some gages, etc. Too few tool buyers realize the amount of skill and specialized knowledge available among our 4,000 contract tool and die shops.

"Money and time can be saved by selecting a tool manufacturer with experience on the type of work in hand. It largely is the fault of the tool shops themselves that this has not been done more generally. They should be doing a more thorough enough job in publicity and advertising. To assist buyers of special tooling, our Association is preparing a directory of its members, showing types of work which each is prepared to handle.

"Manufacturers who are facing the problem of keeping production costs down when wages are going up, will find the answer in better tooling".

Industry Must Regain Control Over Costs Lost During War

George T. Trundle Jr., president, Trundle engineering Co., Cleveland: "If we are going to have the volume of business and the high-level economy which we want in this country, industry must somehow succeed in regaining control over costs—a control that was lost during the war.

"Part of the blame for losing control of costs lies directly upon management. Under the stress of war, costs were not

so important as speed, hence controls were relaxed and careless practices were tolerated.

"Part of the blame is on labor, because labor took advantage of the situation during the war and in many cases is today seeking to perpetuate substandard performance taken for granted during the war.

"We have got to have high volume of business based upon low prices and high wages. To do that, management must be able to get out of its equipment all of the productivity which has been built into that equipment. To do this requires the full co-operation of labor. Unless labor will thus co-operate, our much-heralded postwar prosperity may be severely threatened.

"However in insisting that labor perform to standards, management must always remember that labor is only as efficient as management plans for it and gives it the tools with which to work."

Fabricated Steel Metal Planer Shows 8½-Ton Weight Reduction

H. B. Lewis, manager, Machinery Division, Lukens Steel Co., Coatesville, Pa.: "Effective use of rolled steel plate has been made by Lukenweld, Inc., division of Lukens Steel Co., Coatesville, Pa., in the design and fabrication of hot pressed ram pots for the U. S. Asbestos Division, Manheim, Pa.

"Because the dense, homogeneous structure of rolled steel plate precludes sandpockets and blow holes, it was chosen as the material best suited for this application. Steel plate also has been found to resist pressures as high as 2500 psi and to prevent liquids from seeping through the metal. The unusual simplicity of the design of this ram pot also has reduced machining to a minimum.

"This ram pot, made of silicon killed steel, weighs 3020 lb. It measures 2 ft 11 in. long by 1 ft 11¾ in. wide by 2 ft 1½ in. high.

"In another application, on a planer fabricated by Lukenweld, for Wm. Sellers & Co. Inc., Philadelphia, a saving of slightly more than 33 per cent in the weight of its parts was effected. Lukenweld design and construction brought about total weight reduction of 17,095 lb over the type in use previously.

"The largest saving was in the bed which was reduced from 26,250 lb to 12,000 lb. Other reductions in weight were: Table, 15,940 lb, instead of 17,800 lb, uprights, 6034 lb, instead of 7330 lb. The tie piece, however, is 5 lb heavier in the Lukenweld fabrication. The total weight of the planer is 34,555 lb. It measures 4 ft long by 4 ft high by 1 ft 6 in. wide."

Electrical Industry Is Working To Solve Machine Tool Problems

D. W. McGill, manager, Machinery Electrification Section, Industrial Sales Department, Westinghouse Electric Corp., East Pittsburgh, Pa.: "Reconverting plants are placing emphasis on economical and efficiently operating machinery which will increase production. Machine tools and materials handling equipment must be designed to this end. It is up to us in the electrical industry, to design equipment and systems to provide coordinated drives for such machinery.

"Use of adjustable voltage drives on machine tools has justifiably caught the fancy of many machine tool designers. Such systems utilizing dc driving motors and either unit frame ac-dc MG sets or electronic power sources—provide wide, stepless speed ranges; eliminate in many cases bulky gear units; and provide overall simplicity of operation. Various degrees of speed regulation and flexibility are obtainable from these systems—depending upon which is used.

"Of interest also is a special dc motor which by means of a unique field arrangement can operate over a speed range of approximately 8 to 1 from a constant dc power supply. This will eliminate the necessity of using a motor-generator set and an adjustable voltage system as was commonly used to obtain desired speed, ranging from 4 to 1 to 8 to 1.

"Appeals of the machine tool industry for smaller motors and higher horsepower—with resulting higher operating temperatures—will be met in practical ways in the near future.

"Electrical tracer mechanisms—to facilitate contour milling and the like—are being considered widely for incorporation into machine tools, including axle turning lathes, die-sinkers, and milling machines. This system makes use of a probe for following a model, an electronic amplifier, a dc feed motor and ac-dc motor generator set. The 'following ability' of such a system is extremely accurate.

"In the materials handling field, there is a tendency toward increased use of adjustable voltage systems to provide a stepless range of speeds for conveyors using either an electronic or a motor-generator set drive, both of which operate from an ac supply. The electrical equipment being supplied for cranes and hoists is predominantly operable from alternating current, and vigorous efforts continue to secure dc operating characteristics. Many types of systems are proposed, each of which should be studied to determine the ability of a particular control system to provide the needs of a particular application."

Centerless Grinding of Threads Saves Time and Reduces Costs

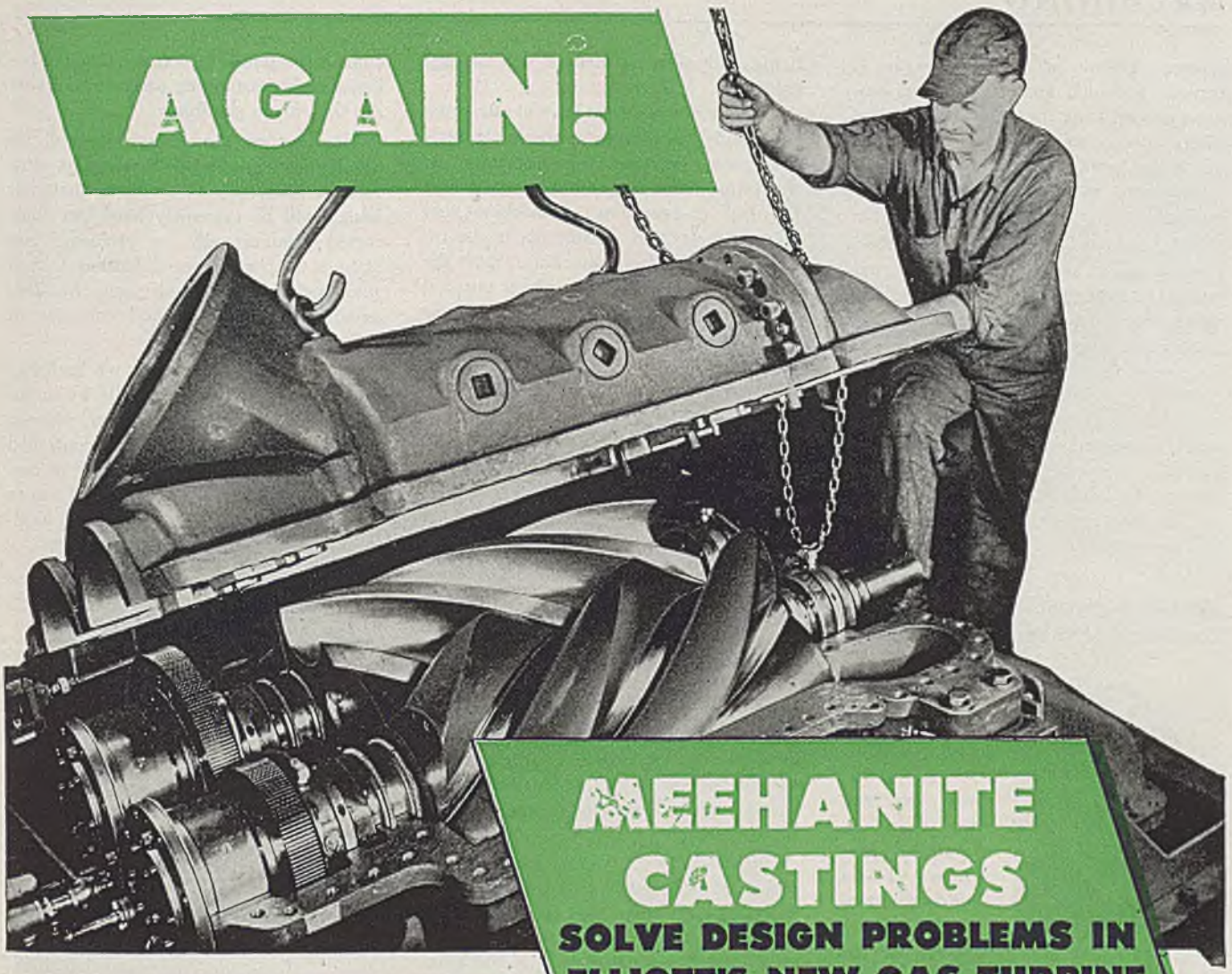
M. A. Hollengreen, vice president and general manager, Landis Tool Co., Waynesboro, Pa.: "Our centerless thread grinder, announced in the March 29, 1945, issue of STEEL, was developed to grind threads on work varying from No. 0 size, fine thread, to 5 in. diameter and pitches varying from 80 threads per inch to 4 threads per inch. Increased production, plus unusual accuracy and finish, are features of this development.

"Crush dressing the multi-grooved grinding wheel insures economy of dressing. In general, one or two grinding wheel dressings per day suffice. On numerous occasions, two to four days of uninterrupted operation have been possible before re-crushing the form on the face of the grinding wheel.

"The present machine is adapted to through feed grinding. Several applications of threaded parts have been changed somewhat in design to utilize the productive features of centerless thread grinding. Changes in routing work to grind threads full length on a part and then centerless grinding to remove the threads from certain portions of the length have resulted in production savings as well as insuring concentricity between body and threaded portions.

"Screws up to and including ⅝-in.—11 are ground to a finished size in one pass through the machine. Special

AGAIN!



MEEHANITE CASTINGS

SOLVE DESIGN PROBLEMS IN ELLIOTT'S NEW GAS TURBINE

Hailed as a most important contribution to industry's growing list of new products, the gas turbine recently announced by Elliott Company, Jeannette, Pa., depends largely for its success upon the Elliott-Lysholm Compressor illustrated. In operation air enters the bottom of the casing at the right and bites of air are trapped by the pairs of helical lobes. Male and female lobes intermesh and compress the air until the discharge port is uncovered and the air squeezed out as a steady flow of compressed air.

In this compressor Meehanite Castings were used for:

(1) Casings; (2) Rotors (silver soldered to rotor shaft); (3) Thrust bearing housings.

The rotors revolve at a top speed of 18,000 ft. per minute and of course are machined to extremely close tolerances and they must possess a structural stability to provide maintained dimensional accuracy. Temperature variations up to 150°F. demand resistance to creep and thermal shock. These properties combined with freedom from galling and good machinability are Meehanite's contributions to this unit.

Write for Bulletin No. 22, a collection of article reprints about Meehanite Castings entitled "Stories of Meehanite in Industry."

MEEHANITE FOUNDRIES

Allentown, Pa.	Traylor Engineering & Mfg. Co.
Ansonia, Conn.	Farrel-Birmingham Co., Inc.
Birmingham, Ala.	The Continental Gin Co.
Bridgewater, Mass.	The Henry Perkins Co.
Brooklyn, New York	E. W. Bliss Company
Buffalo, N. Y.	Pohlman Foundry Co., Inc.
Charleston, W. Va.	Kanawha Manufacturing Co.
Chattanooga, Tenn.	Ross-Meehan Foundries
Chicago, Ill.	Greenlee Foundry Company
Cleveland, Ohio	Fulton Foundry & Machine Co.
Denver, Colo.	The Stearns-Roger Mfg. Co.
Detroit, Mich.	Atlas Foundry Co.
Flint, Mich.	General Foundry & Mfg. Co.
Hamilton, Ohio	The Hamilton Foundry & Machine Co.
Hamilton, Ontario	Otis-Fensom Elevator Co., Ltd.
Irvington, N. J.	Barnett Foundry & Machine Co.
Jeannette, Pa.	Elliott Company
Los Angeles, Calif.	Kinney Iron Works
Milwaukee, Wis.	Koehring Company
Mt. Vernon, O., Grove City, Pa.	Cooper-Bessemer Corporation
Newark, N. J., Peoria, Ill.	M. H. Detrick Co.
New York, N. Y., Mahwah, N. J.	The American Brake Shoe Co.
Oakland, Calif.	Vulcan Foundry Company
Orillia, Ontario	E. Long, Ltd.
Philadelphia, Pa.	American Engineering Company
Philadelphia, Pa.	H. W. Butterworth & Sons Co.
Philadelphia, Pa.	Florence Pipe Foundry & Machine Co. (R. D. Wood Company, Selling Agents)
Phillipsburg, N. J.	Warren Foundry & Pipe Corp.
Pittsburgh, Pa.	Rosedale Foundry & Machine Co.
Portland, Oregon	Crawford & Doherty Foundry Co.
Rochester, N. Y.	American Laundry Machinery Co.
St. Louis, Mo.	Banner Iron Works
St. Paul, Minn.	Valley Iron Works
Seattle, Washington	Washington Iron Works
Spokane, Washington	Washington Machinery & Supply Co.

MEEHANITE RESEARCH INSTITUTE, New Rochelle, N. Y.

screws, 1½-in. in diameter with 12 threads per inch and 10 in. long have been ground from the solid in two passes. These screws were finished at the rate one every 5 min and resulted in a saving of 47 min over the former grinding method.

"The variety of materials on which threads have been ground is of particular interest. In addition to ordinary steels, heat treated or not, materials such as stainless steels, brass, bronze, copper, aluminum, hard rubber and powdered metal have been ground on the centerless thread grinder. The latter material, powdered metal, will be found in many applications in post-war developments. Grinding threads on this material by the centerless method is readily accomplished".

Military Reserve Must Include Big Stock of Standard Machines

A. G. Bryant, vice president, Cleereman Machine Tool Co., Green Bay, Wis., and 2nd vice president, National Machine Tool Builders' Association: "The outlook for the machine tool industry in 1946 will be influenced by two primary factors. First, the disposition of the Government-owned machine tools which constitute more than one-third of the grand total in existence in continental United States and which total is nearly as great as the number in operation in 1939.

"Of primary consideration is the number of these machines which will be set aside as a military reserve. As a matter of sound national policy we should retain in Government ownership and available for immediate use not only special war production machines, but sufficient general purpose machine tools so that any type of war materiel that may be required in an emergency in the future may be produced without delay.

"If any less than from 25 to 50 per cent of all Government machine tools are retained during the next year or two, those in Government responsible for such negligence will carry a great weight of responsibility.

"If the industry of this country demonstrates that it can absorb the balance of Government-owned machines, putting them to work for the production of real wealth, the employment of untold thousands and the development of our industrial facilities, then the entire scale of living and national income will be uplifted.

"To this end we must have constructive tax policies including favorable depreciation rates, an atmosphere conducive to the introduction of venture capital and the full co-operation of machine tool manufacturers and distributors in the introduction of these machines into the shops of America. These steps pursued aggressively in the next year can clarify the picture for the machine tool industry so that it may be able to proceed without such a cloud of uncertainty as now rests upon it.

"The second important influence on the future of this business will be the impact of the new developments in automatic controls, new requirements in extreme accuracies and a demand for finer finishes on a multitude of production items.

"Electronics and hydraulics have both received such an impetus during the war that the extent of their application to machine tool design cannot as yet be foretold. The importance of extreme accuracies and fine tolerances has been so demonstrated in war production that the application of jig borer precision into a vast variety of manufacturing processes is inevitable.

"In short, the immediate future of the machine tool industry depends in the first place on how wise is our national policy and in the second place upon the continued ingenuity of machine tool engineers in producing and applying to modern production and modern manufacturing principles that have been inspired by the war and that now can find usefulness in peace time".

Lapping Process Controls Size And Finish of Metering Pumps

Arthur A. Nichols, partner in charge of engineering, W. H. Nichols & Sons, Waltham, Mass.: "In the business of making high performance metering pumps for the rayon and petroleum industries, we find several marked trends. One of the most important of these is increasing use of precision equipment under adverse conditions of high heat, corrosive fluids, and high pressures.

"Why this is so can be answered only by the chemist, but that the trend is a fact is one thing of which the pump manufacturer may be certain. Further, we also know that research into this division of the pump field is worthwhile, because such outstanding products as Nylon are thus made possible.

"Designs of the pump required are usually distinguished by dimensions within microscopically close limits; materials which will be extremely hard, yet unaffected dimensionally by prolonged use at high temperature; and finishes held to microinches, which will assist by their smoothness in warding off corrosion or etching.

"Such designs of pumps we find may be manufactured commercially by extensive use of the lapping process, wherein both finish and size may be controlled nicely. At the same time choice of material can be particularly broad, since magnetic properties and degree of hardness are not important to the process".

New Induction Heating Machines Have Wide Range of Usefulness

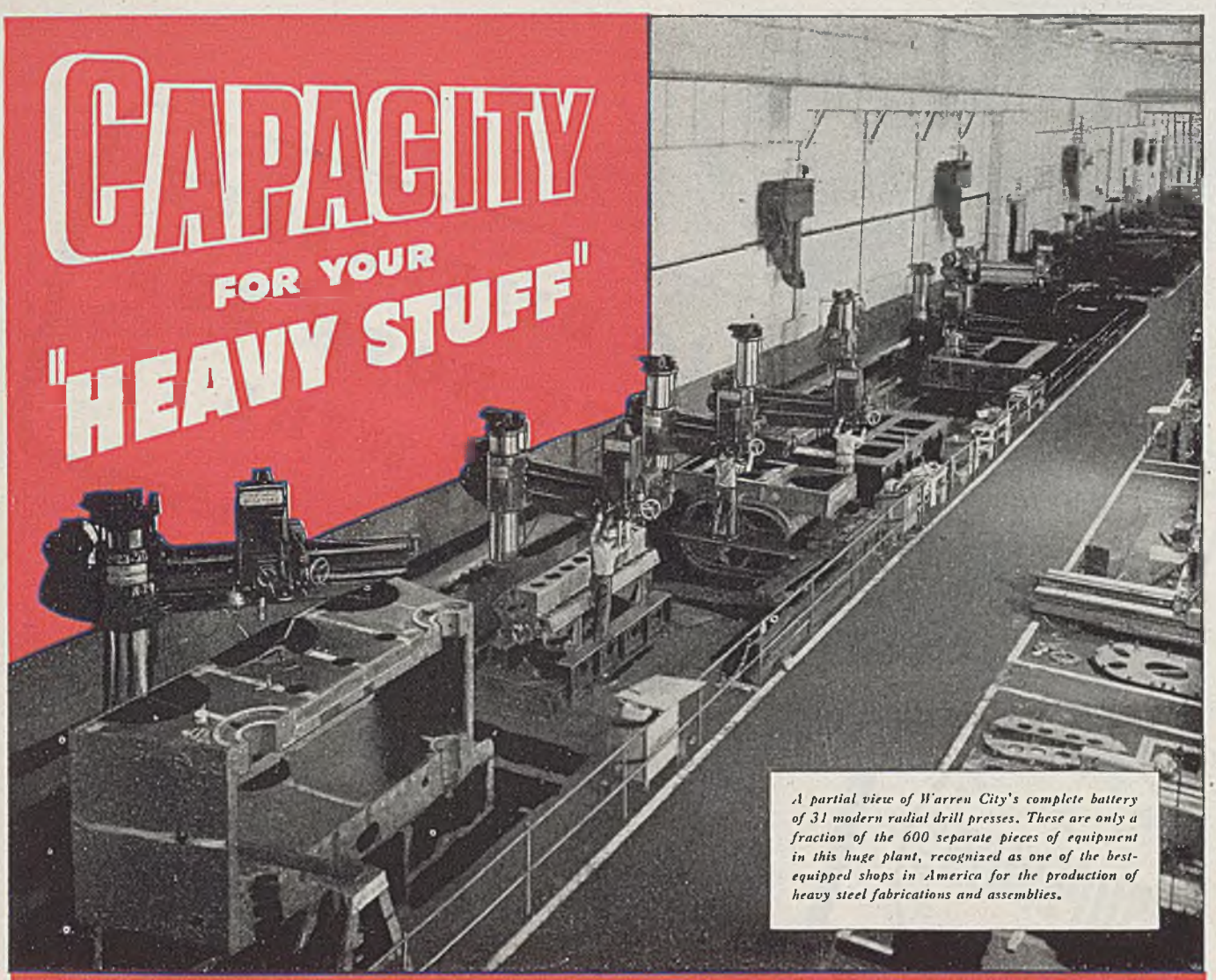
Frank W. Curtis, consulting engineer, Induction Heating Corp., New York: "During the war, many outstanding advancements were made in the field of high frequency induction heating for hardening and brazing. New uses were developed and new techniques introduced, all of which can now be applied in connection with our reconversion activities.

"Worthy of particular note is the application of induction heating generators for small-lot runs, due to improvements in quick-change coil designs and simplified fixture principles. Now, from an economic point of view, small shops can justify the installation of high frequency heating equipment for a variety of applications, and thus advantageously control their own heat treating needs, until now usually handled on the outside.

"In plants where induction heating equipment has been installed initially for a limited number of specific applications, the trend usually has been to find many more normal uses for this type of heating, in a relatively short time, so that a full-time load is quickly realized.

"Foremost of product-design changes as a result of this process, will be the fabrication of parts from two or more simplified components rather than producing them in one piece at higher cost. Some parts can now be made of two or more different types of steel, joining being performed by silver-alloy induction brazing. Then, by means of a sub-

CAPACITY FOR YOUR "HEAVY STUFF"



A partial view of Warren City's complete battery of 31 modern radial drill presses. These are only a fraction of the 600 separate pieces of equipment in this huge plant, recognized as one of the best-equipped shops in America for the production of heavy steel fabrications and assemblies.

285,000 SQ. FT. OF SPACE, DEVOTED TO HEAVY STEEL FABRICATING AND MACHINING!

IF YOUR problems include the fabrication, welding and machining of heavy steel structures of any kind, we can help you solve them—*efficiently, quickly, economically.* Our seven-million-dollar plant in eastern Ohio is one of the most complete and modern shops in America, *specifically designed* for fabricating, welding, machining and assembling heavy machinery, parts and equipment.

Our highly competent engineers have already applied war-gained welding techniques to the reconversion problems of many of our customers with amazing reductions in both cost and time. *What we have done for these customers we can do for you.*

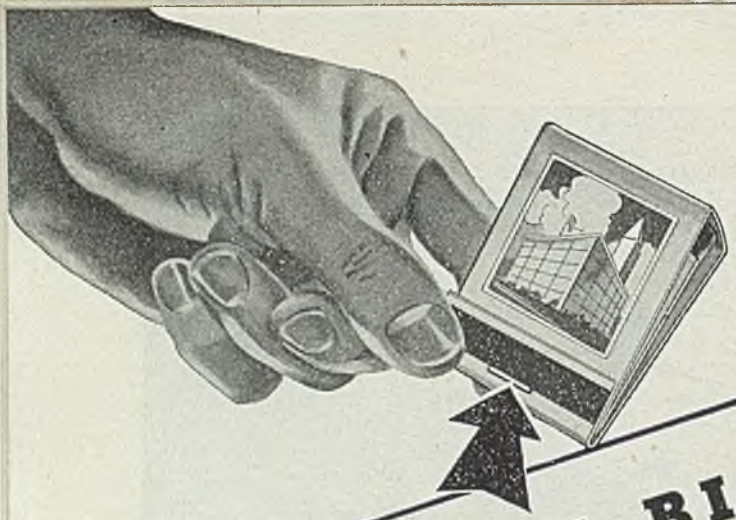
Our special welding "know-how" has effected great savings in weight, bulk and cost over other types of construction. It has resulted in substantial gains in strength, production speed, freedom from flaws, and ease of testing.

Why not let our practical-minded engineers worry about your "heavy-stuff"? They'll gladly study your needs and give you their recommendations. And—of course—there's no obligation. Write, wire or telephone us details of your requirements today.

WARREN CITY MANUFACTURING COMPANY ★★★

DEPARTMENT A
WARREN, OHIO

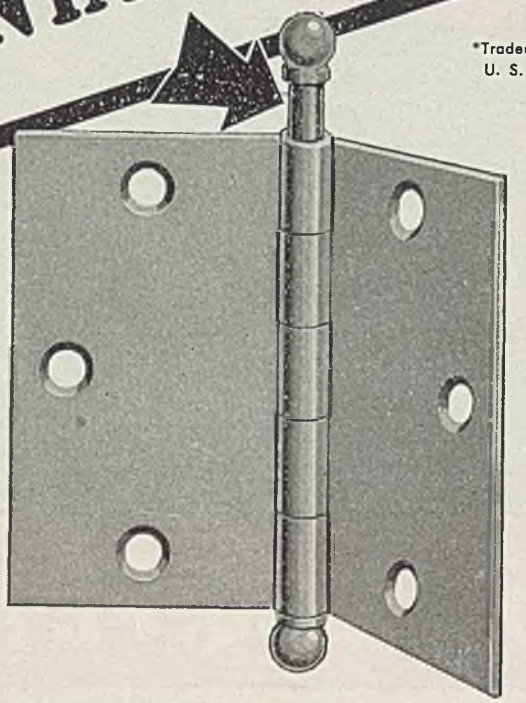
Wholly Owned Subsidiary of
GRAHAM-PAIGE MOTORS CORPORATION



THERE'S A BIG DIFFERENCE IN SIZE . . . BUT BOTH ARE CONTINENTAL* WIRE

*Trademark registered U. S. Patent Office

CONTINENTAL STEEL CORPORATION ★ SUPERIOR WIRE



THE WIRE OF A THOUSAND USES

The versatility of Continental wire is apparent when you look at the illustrations above. There is not only a big difference in the size of the wire in the match book and the pin in the door hinge, but there is a big difference in the temper, analysis, and finish. Continental wire for each of these applications is made especially to meet the individual requirements.

Continental specializes in producing wire in a vast variety of shapes, tempers, analyses, and coatings to fit the particular specifications of hundreds of products. You are invited to take advantage of this service. Write or wire today for complete information.

CONTINENTAL STEEL CORPORATION

GENERAL OFFICES •• KOKOMO, INDIANA

ODUCERS OF *Manufacturer's Wire* in many sizes, apes, tempers and finishes, including Galvanized, KOKOTE, Flame-Sealed, Coppered, Tinned, Annealed, Liquor Finished, Bright, Lead Coated, and special wire. ALSO, Coated and Uncoated Steel Sheets, Nails, Continental Chain Link Fence, and other products.

sequent treatment, localized surfaces can be induction hardened without affecting the braze and with minimum of scale or distortion.

"Another outstanding advancement is the progressive hardening of long parts where only one edge or a shallow case on the outside diameter requires treatment. Many such parts can be induction processed with so little warpage that straightening is eliminated and grinding allowances greatly reduced. All these things result in indirect savings that often overshadow the direct heating economies.

"High frequency induction heating will advance rapidly during the next year, particularly so in those plants whose managers investigate what can be accomplished on their specific problems."

Unique Automatic Cycle Control Minimizes Non-Productive Time

E. P. Blanchard, sales manager, Bullard Co., Bridgeport, Conn.: "We are keenly alive to the possibilities of fast machining, using carbides and other new or improved cutting materials. We are providing in our machines the power and rigidity, and the range of speeds and feeds, necessary for effective utilization of modern tooling.

"However, it must be remembered that nothing is gained in the end if time saved through fast cutting is lost through inefficiencies in other respects. One of the most common ways in which time is lost, is through natural hesitation on the part of operators as they perform the ritual involved in switching from function to function on work involving a cycle of operations. The cumulative effect on costs of such 'thinking-before-acting' time losses on production work, is far greater than generally is realized.

"Out of our years of investigation of this subject has materialized a unique method of cycle control which we call Man-Au-Trol, and which after successful tests on war work, we now are applying to certain of our vertical turret lathes. This permits of transfer to the machine of an ideal operational cycle, and precise automatic repetition of this cycle without loss of time between its functions. In other words, it eliminates the human element on long run production work.

"On the other hand, when setting up the machine and for runs of work involving only a few parts, this automatic control can be switched off entirely, simply by throwing a small lever. Such a shift in no way disturbs the control settings for the automatic cycle. Therefore a machine equipped with this system is a thoroughly practical manually controlled unit, as well as a highly efficient automatic. To our way of thinking, this constitutes an 'all around machine tool' in the modern sense of that term."

Surplus Machine Tools Face Rapid Technical Obsolescence

Frederick S. Blackall, Jr., president and treasurer, Taft-Peirce Mfg. Co., Woonsocket, R. I.: "While manufacturers of certain classes of machinery and tools face a major problem in their reconversion activities, it is my belief that the long term effects of the war period will prove to be bullish for the greater part of the machinery and tool industry. Machine tool builders, of course, are beset with genuine difficulties in promoting the sale of new machines while an unprecedented surplus of government owned equipment overhangs their markets.

"There is, however, evident on every side throughout the machine tool industry a resolve to go forward with all possible dispatch in the development of new and improved designs, which should begin to appear on the market one to two years hence; and I predict that technical obsolescence of presently existing machine tools will be an outstanding characteristic of the next five to ten years in machine tool circles.

"Manufacturers of perishable tools and gages should begin to enjoy a substantial and healthy business just as soon as the initial phases of reconversion have been completed. The government surplus should have little effect upon them, for tools of this character, for the most part, are purchased for a particular job and have little residual value once that job is completed. Further, they possess the virtue, from the sales manager's point of view, of wearing out, thus producing repeat order business of a most desirable character.

"The experience of most manufacturers of high precision equipment, such as gages and the more specialized production tools, during World War I and the period immediately following it, proved beyond a doubt that an era of tremendously expanded activity, such as war engenders, invariably leads to a wider appreciation of the importance and value of proper tooling in production. During the recent war, many a shop which never used gages before has learned of the genuine economies and improvements in quality and production which are an inevitable corollary of their use.

"These people will never go back to their old and relatively primitive methods of prewar days. This should result in permanently larger potential volumes of business for manufacturers of these classes of product.

"A factor often overlooked in appraising the post-war business outlook is that a normal or secular growth has occurred during the past six years which should reflect itself in a larger normal national income and production potential.

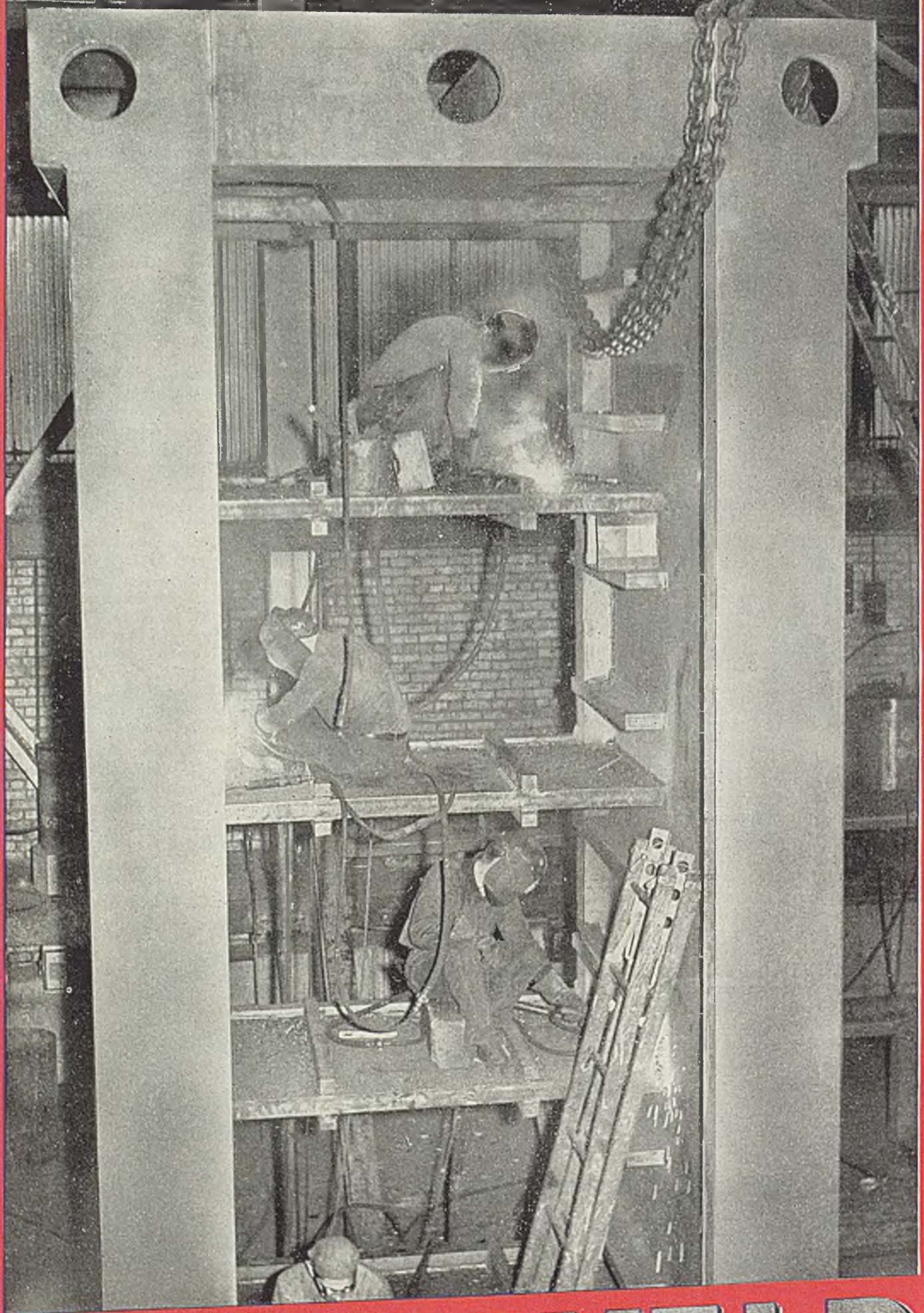
"The foregoing factors in combination point to a generally favorable outlook for manufacturers of labor-saving machinery and precision tools. That the competition will be keen, however, is beyond doubt. Despite the forecast of the Committee for Economic Development that 1947 should be a 17 per cent better machine tool year than 1939, a 51.4 per cent better year for machine accessories and tools, and a 56 per cent better year for special and industrial machinery not elsewhere classified, this is no time for complacency.

"The shop which is well equipped and aggressive in its merchandising methods will have a big start over the shop which rests on its oars, but the demand should be there for the progressive operator who goes after it and is in tiptop shape to handle it."

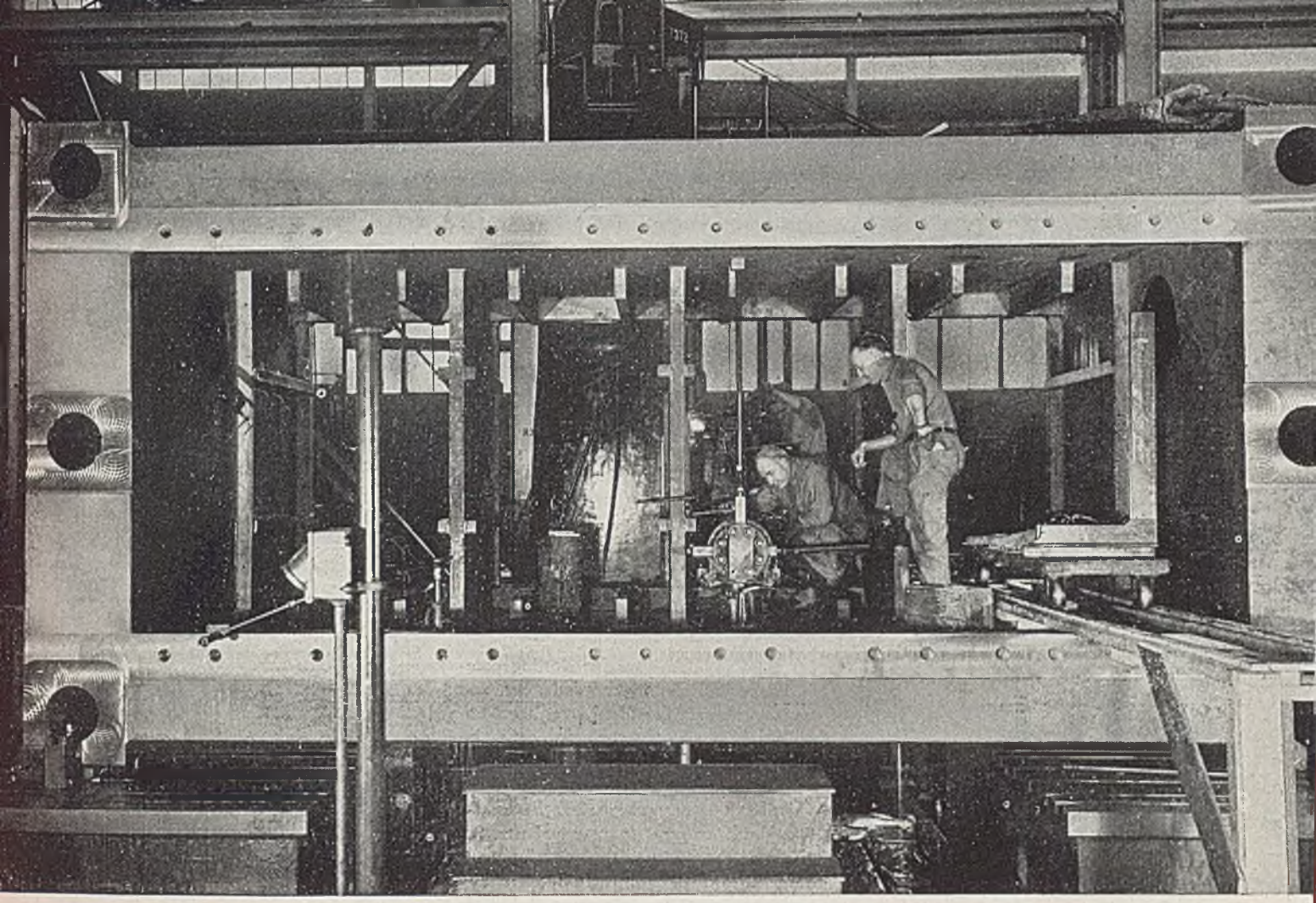
Tungsten Carbide Is Applied To Chasers for Threading Dies

W. J. Grimm, manager, Thread Tool Division, Jones & Lamson Machine Co., Springfield, Vt.: "Speaking for the Thread Tool Division of our company, we have numerous very interesting prospects for the future.

"For example, we have done some experimental work with tungsten carbide tipped die chasers and without question, you will hear more about this type of tool. We do not feel that it is a cure-all. However, on certain types of metals, plastics, and abrasive materials which quickly wear the ordinary type



DANLYWELD



The Men . . . the Machines . . . the "Know How"

for heavy structure welding and machining at

LOWER FINAL COST

Back of this job is a combination of planning — machining — stress-relieving — handling — skill and facilities that speak for themselves

Welding four stories high to precision standards

The picture at left shows four men welding simultaneously on a bed for a two-thousand ton, four-point mechanical press. The size of this structure is apparent, but also of major proportions were the problems of welding, handling, stress-relieving, and machining—Problems which were met with the needed facilities, time-tested skill, and fourteen years of experience on large structure weldments. Closely controlled preparation to avoid chance of error, and accurate welding to close tolerances materially reduced machining time.

Machined complete in one basic setup

The same bed is shown above mounted on a floor type horizontal boring mill. This machine is equipped with standard and right angle boring heads, making possible innumerable combinations for milling, boring, and facing. Reversed once during the entire operation, the same basic setup was used throughout, minimizing machining costs—This example of time and money saving is characteristic of the entire job, and typical of the Danly reputation for precision welding and machining at *lower final cost*—a reputation for "know how."

DANLY MACHINE SPECIALTIES, INC. 2100 S. 52nd Ave., Chicago 50, Ill.

WELDED AND MACHINED AT *LOWER FINAL COST*

die chasers, we feel that tungsten carbide threading tools will find a definite place.

"In thread grinding, the multi-ribbed method has attracted considerable attention and is definitely holding the spot light at this time. We have made some most interesting installations in the oil well industry and in the automotive industry. There are two different types of multi-rib thread grinding. One method is to crush the shape into the wheel by means of hardened crushing rolls. The other, which we are backing strongly at the present time, is a method of dressing the ribs on the wheel by means of a single diamond, the path or action of which is controlled by a hardened and ground former.

"In further connection with thread grinding, we are now selling equipment for grinding threads in tungsten carbide on work such as taps and gages."

New Methods of Holding Blades Add to Cutting Tool Efficiency

P. M. McKenna, president, Kennametal Inc., Latrobe, Pa.: "A highly significant development during the past year is the Kennamilling technique, an outgrowth of negative rake milling methods evolved and practiced in our company's own shops as early as 1939. Milling of steel parts became accepted in 1945, in large and small milling machines equipped with the new Kennamills.

"This new technique improves milling operations, both as to the speed of cutting, and finishes obtainable, and effects a great saving of time and expense for cutter maintenance. It comprises the use of a precision-built cutter body, or tool holder; replaceable solid blades of very strong Kennametal securely wedged-in; interchangeable blades as to cutting edges and grade of carbide for milling different materials; a method of grinding the detachable blades; and a technique of hand setting them.

"The distinctive cutting angles with other design characteristics of this 'universal' face mill reduce the power to form and remove chips and make possible a more efficient use of milling machine capacity.

"Dull blades are removed from the tool holder while it remains on the spindle or arbor, reground in a suitable fixture or grinding block on a surface grinder, then reassembled and set by hand to the shoulder of a fly cut. They can be thus positioned accurately because all wedging components are precision finished. Errors inherent in arbor or spindle set up are thereby eliminated, and much time saved as compared to that required to remove, regrind, and replace cutters of traditional design. Universal face mills and half-side mills of the new design are now available in popular sizes and other types are being developed.

"Improvements have also been made in single point tools. Certain styles, in larger sizes, are now available having separate advanceable tips held on by spring clamps. Also there is a complete line in 15 different styles of the larger sizes having tips secured to the shank with recessed socket head screws. The 'thermally strain-free' assembly of these new designs assures more consistent and lasting performance. Different types of operations are facilitated by interchangeability of tips, and stock keeping is simplified.

"Many other applications of Kennametal have been made recently, including solid carbide saws for slotting commutators, carbide-tipped wood saws, and router bits. Lathe files have been improved by providing replaceable blanks, and other types developed, such as disk files, cylindrical files, and ball files. Solid rolls for finishing strip steel have also been built and put to practical use. All of these recent 'specialty' developments have helped step up production and lower tool costs in their respective fields of application."

Common Sense Dictates Holding Of Standby Machinery Reserves

Wm. P. Kirk, president, National Machine Tool Builders' Association, and vice president and sales manager, Machinery Department, Pratt & Whitney division, Niles-Bement-Pond Co., West Hartford, Conn.: "It is vital that in our preoccupation with post-war problems we nevertheless do not lose sight of the vital importance of maintaining an adequate stand-by reserve of machine tool equipment for purposes of national defense.

"We say, 'The war is over,' but fighting has not yet stopped in various parts of the world. Many issues between nations remain unsettled. Meanwhile, the technique of instantaneous attack without warning has been perfected far beyond all past experience.

"A nation cannot produce for war requirements unless and until it possesses an adequate supply of machine tools for this purpose, and machine tools that may be needed cannot be built overnight.

"While many of the government owned machine tools built for the war will shortly be obsoleted to a certain extent by new models, nevertheless they would still be capable of performing a majority of the operations needed for military purposes.

"This time we were forewarned as to war. Next time—although we hope there will never be a next time—we may get no warning whatever. It is against that contingency that I urge the retention by the government of an ample share of the machine tools now in the government's possession."

Attachments Enhance Usefulness Of Horizontal Boring Machines

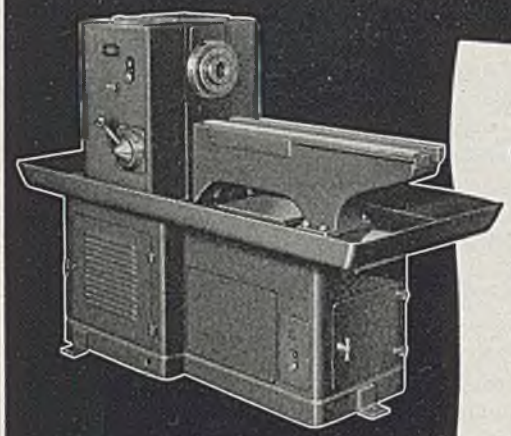
Ralph J. Kraut, president and general manager, Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.: "Notwithstanding many opinions to the contrary, I do not believe that machine tool designs generally in 1946 will differ radically from those produced during the war years. Limitations on development expense, shortages of engineers, and preoccupation with the primary job of production during the war, are the principal reasons for my expectation of this state of affairs.

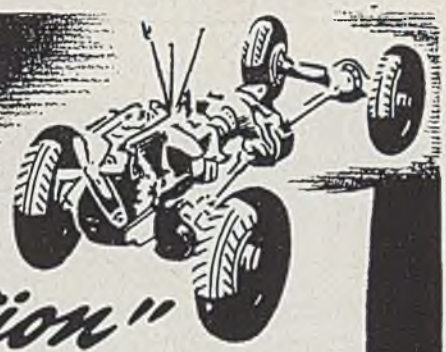
"During 1946, however, the accumulated product development ideas of machine tools will crystalize. This, combined with further technological developments resulting from the war, should result in radical and important developments in most lines of machine tools by 1947. Such improvements are most likely to involve among other things, increased horsepowers, better tooling and application thereof, electronic controls and streamlining.

"Insofar as the horizontal boring, drilling and milling machine is concerned, this was one of the most versatile and flexible machine tools prior to the war and proved to be even more so during the war. There is every reason to expect this type of machine to be of even greater importance to both production and job shops in the period which we now are entering. Greatly increased use of regular attachments and accessories, as well as special tools, jigs and fixtures should further enhance the use of this versatile standard machine tool.

"Greater emphasis in the future will be placed on selling a customer *production*. In other words, the sales engineer will make a constructive effort to see that the customer buys a horizontal boring, drilling and milling machine equipped with all proper accessories, attachments and tooling for the most effective handling of a given job, rather

Like a Truck Chassis



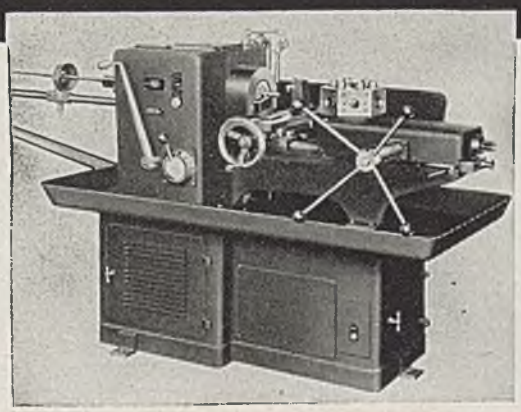


Above view shows the basic machine complete to the point of adapting it to YOUR specific requirements.

THE OSTER "Rapiduction"

Turning machine chassis is the starting Point for a wide *DIVERSITY* of Individual Applications

or, You can have it as a Complete Machine



Now, as formerly, the Oster No. 601 "RAPIDUCTION" machine can be furnished equipped with automatically indexed, 6-position turret (as illustrated at right) or with plain saddle and single tool post (as illustrated below).

Two types of drive are optional with the machine: WORM DRIVE or DIRECT DRIVE. Another option is the 4-speed motor (permitting four speed changes without change of sheaves) or the 2-speed motor, as required.

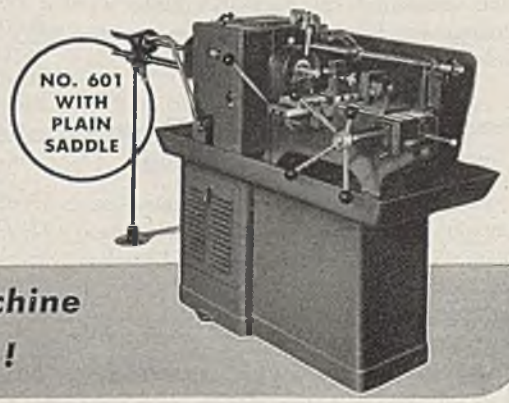
A truck chassis has no monopoly on diversified applications. With a truck chassis as a starting point, almost any specific requirements for a COMPLETE truck can be designed. Comparable flexibility of application is provided by the Oster No. 601 "RAPIDUCTION" turning machine chassis. Once your individual needs are established, either your engineers or ours can readily adapt this machine at minimum cost compared with a special machine. No. 601 "RAPIDUCTION" gives you the economy of a STANDARD machine right up to the point of where you may require certain special equipment. That means ECONOMY from the floor up! If you believe this proposition merits careful investigation, write . . .

THE OSTER MANUFACTURING CO.
2037 East 61st Street • Cleveland 3, Ohio, U. S. A.

OSTER

"Rapiduction"

The STANDARD Turning Machine with CUSTOM-BUILT Features!



than being content with selling 'just another machine'.

"Despite the tremendous wartime production of machine tools and the resulting competition of Government surplus machines, we go forward into the peacetime era with optimism and enthusiasm."

Better Machines Make More Jobs Under Our Competitive System

Tell Berna, general manager, National Machine Tool Builders' Association, Cleveland: "Looking forward into the long-term postwar future it begins to be more and more apparent that in order to sustain our domestic economy at the desired high level, we must maintain a rate of productivity substantially above prewar experience—and machine tools are the key to productivity.

"Unfortunately, in altogether too many quarters there seems to exist the false philosophy that there is only so much work to be done and that machines which succeed in increasing output per man have the effect of reducing employment totals and purchasing power, thereby adversely affecting our whole economy.

"Industrial economic history proves that exactly the reverse is true. Machines that enable men to produce more and still more, in the same period of time, make possible, under our competitive system, product prices which lead to high volume and high employment.

"In my opinion, one of the biggest jobs ahead of the metalworking industries today is to present this economic principal over and over again to employes, to customers, to government, and to the general public. For in order to achieve a rate of productivity needed to maintain a high-level economy, people at large must be *sold* upon the principle that increased productivity leads to greater employment and higher standards of living."

Product Engineers Should Know How To Design for Broaching

O. W. Bonnafe, research engineer, Lapointe Machine Tool Co., Hudson, Mass.: "It can be said that the broaching industry has proved itself capable of producing most anything within reason by broaching, by properly designed machines, fixtures and tools, in many cases with full automatic operations.

"It is a well-known fact, that broaching has proved to be about the fastest means of removing material that can be machined with cutting tools. We might say that from now on it remains more or less in the hands of the products and machine designers to design the components as much as possible with broaching as a means of machining in their mind, so that the overall cost of the product would be less, and many times reduce the number of operations. So, it would be well worth their while to acquaint themselves with all the phases of broaching, and thereby make themselves more valuable designers.

"As mentioned before, so many parts have been made by this method during the war that were considered impossible just a few years ago. Parts are being produced entirely from bar stock, produced to accuracy that only grinding formerly could give, and these parts producing at rates well exceeding 15 parts a minute. We have also produced parts weighing somewhere between 1000 and 2000 lb, removing as much as 75 lb of material by broaching. These parts were produced at a rate approximately 100 times faster than they could be by other means.

"There are on the market today, broaching machines of all types, horizontal and vertical, of surface broaching and internal broaching. Machines ranging in capacities from one ton to 75 tons. There are also broach sharpening machines designed for the purpose which makes broach sharpening and maintenance a simple proposition."

Internal Gear Shaving Machine Gives Accuracy and High Finish

Walter S. Praeg, vice president, National Broach & Machine Co., Detroit: "Among the several recent developments made by National Broach & Machine Co. recently are an internal gear shaving machine for automatic transmission gears, speed reducers and domestic appliances; and what we call the Roto Shaver for automotive ring gears.

"Our method of shaving produces gears of superior finish and high accuracy. Compensation for fire distortion and other errors in hardened gears is achieved by this shaving process. Also, it minimizes lapping and finish grinding.

"With the internal gear shaving machine, a fast; simplified clamping and ejection mechanism makes it possible to attain high production with relatively unskilled labor. Floor-to-floor time for a 6 in. diameter, 1 in. face gear is approximately 70 sec. Change in machine set-up is made in 15 to 30 min.

"Use of the Roto Shaving machine eliminates the costly 'green grinding' operation for the locating surfaces of automotive ring gears. This same machine also can be used with high degree of effectiveness to finish pressure plates, internal ring gears and other similar parts. Cutter heads can be provided for a wide variety of such applications.

"The complete cutting cycle on large truck gears, both back face and bore, is approximately 15 to 20 sec and, of course, considerably less on passenger car gears."

Tool Engineering Is Key Factor In Economic System of America

Otto W. Winter, vice president Acme Pattern & Machine Co., Buffalo, and a past president of the American Society Tool Engineers: "Recognition of a new and distinct branch of the engineering profession has come within the past year. Recent announcement of results of a nation-wide survey of leading industrialists and engineers conducted by the Education Committee, American Society of Tool Engineers, removes all question.

"For the past 30 years the *profession* of tool engineering has been developing. Today—with its brain child mass production—it is firmly established as a permanent part of the economy of this nation and the world. Its achievements in the recent war made it possible for us quickly to avail ourselves of the necessary material to bring the Axis to its knees. Its achievements prior to that war earned for America the envy and respect of the world and the highest standard of living ever known.

"In this post-war period of economic controversy, tool engineering stands clear and distinct as a guiding beacon pointing the way toward industrial peace and prosperity. It far outshines any amount of mediation, arbitration, argument or law. In the final analysis the greatest and most fundamental economic progress has been measured in accomplishment through a man-hour of work. Productivity of labor has been and will continue to be tremendously increased through tool engineering application. With this increase comes more and more improved products at lower and lower costs and prices. Progress of this character is basic, sound and real.

"It matters not whether wages are

(*Please turn to Page* 396)

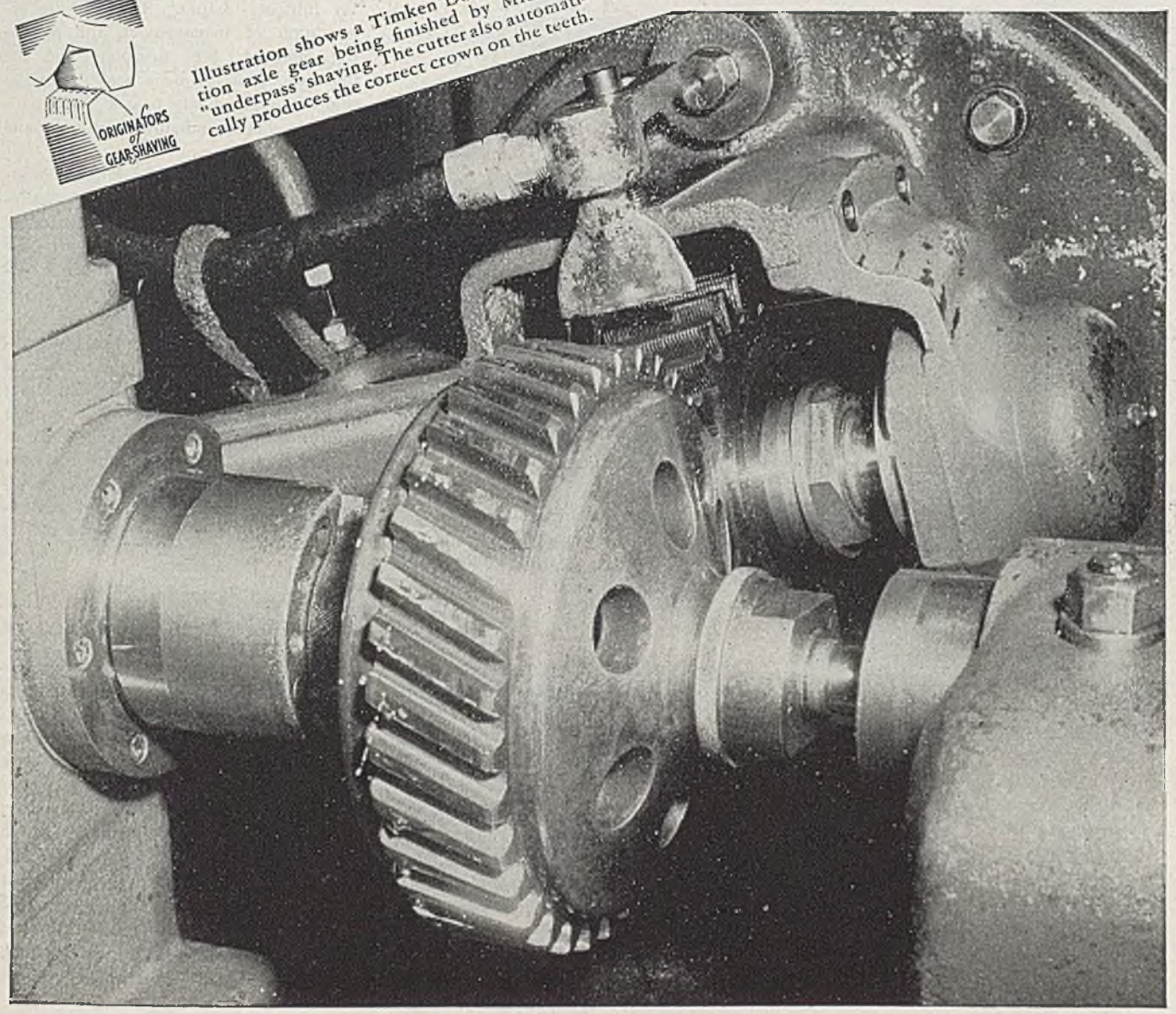


Illustration shows a Timken Double Reduction axle gear being finished by Michigan "underpass" shaving. The cutter also automatically produces the correct crown on the teeth.

Underpass Curve Shaving Boosts Gear Production 33⅓%

Sure, any kind of gear shaving is fast, but . . .

According to Wisconsin Axle Division, this Michigan 862 rotary gear finisher is producing 33⅓% more—and more uniform—gears (3½" to 16½" pitch diameters) with longer cutter life by the use of "underpass" shaving. In addition, where required, the gears are correctly curve-shaved *by the shaving cutter* at either end of the teeth.

"Underpass" shaving—exclusive on Michigan gear finishing machines—is the fastest method of producing the most accurate gears possible. In many cases a single cycle of the cutter —forward and back—is sufficient to finish a gear.

"Underpass" shaving is used interchangeably for both spur and helical gears. It is equally applicable to large as well as small gears—from ¼" to many feet in diameter.

For further information on Michigan gear finishing machines to fit your requirements, ask for "Underpass Machine Bulletins."

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS ROAD DETROIT 12, U. S. A.

Joining and Welding

Close-Held Driving Pressures Make Cold Riveting Practicable

W. E. Fowler, Jr., sales engineer, Riveting Apparatus Inc., Pittsburgh: "Rivets, as fasteners to unite prepared parts to form a completed structure, have been in use for a long time and indications are that we will use them as such for many years to come.

"For a number of years many engineers and fabricators have been carefully considering the practicability of driving large rivets cold with the usual bull riveter.

"After a great deal of experiment and study of the structure developed by cold driving, it became apparent that it was very necessary and desirable to control accurately and automatically the driving pressures within the range of the riveter being used. By controlling pressures, warping is eliminated and the metallurgical structure of the rivet and the work is protected from damage through overdriving.

"A number of structural fabricators are equipped to drive large rivets cold with controlled pressures and many others are seriously considering doing so."

Availability of AC Current Extends Use of 6011 Electrode

Pierre Champion, president, Champion Rivet Co., Cleveland: "During the past year the American Welding Society, in cooperation with ASTM, has prepared a new specification known as A 233-45T, which clearly defines the various types of welding electrodes.

"We have been particularly interested in the E 6011 type as this electrode has, in our opinion, wide application for the welding of mild steel; it is a truly universal electrode in that it operates equally well with ac current and on dc reverse. Accordingly, it does not make any difference whether the user has an ac transformer, or a motor generator welding machine; this one electrode will suit his needs and will make satisfactory welds in any position.

"There seems to be a marked trend toward use of ac transformer welders, especially for rural applications, and this is why we believe that the E 6011 type of welding electrode will be popular for mild steel aplication."

Cold Heading of Fasteners Aided by Wider Choice of Steel

L. S. Cooch, chief metallurgist, Buffalo Bolt Co., North Tonawanda, N. Y.: "Past war has been the most contributory factor in the advancement of cold heading. Previously, parts had been limited to the more simple and conventional designs, which are rapidly being added to and replaced by parts of more intricate shapes requiring close tolerances and diversified physical requirements.

"This has been made possible through use of a larger variety of steels which are adaptable to specific applications and has replaced methods of manufacturing that are more costly, involving numerous operations on a variety of machines. Cold heading of these parts has resulted in greater production, conservation of materials, machines and labor, and has in many instances resulted in a superior product due to forging operations. Also, parts are held within closer tolerances.

"Closer metallurgical control has afforded a fair degree of preliminary prediction as to the cold forming ability of a given steel. Spheroidizing furnaces utilizing controlled atmospheres for rods and wire are specifically designed for this material to produce uniformity from coil to coil in both high carbon and alloy steels which require exacting preliminary preparation. The ease of operation and flexibility of these furnaces make them economically adaptable to the necessary requirements of different grades of wire to be cold formed. Design and heat-treated physical properties of tool steels are such that long tool life is a common expectation when used for intricate shapes. Through the cooperation of management, the designing engineer, tool designers and the metallurgist, it has been possible for the cold heading industry to cold form more intricate shapes and still insure maximum tool life.

"Heat treatment of the finished products is accomplished in hermetically-sealed furnaces using controlled atmospheres. Parts are quenched from a continuous conveyor, speed of which is regulated according to the size and shape of the part, thus affording proper soaking time at heat with resulting uniformity. Quenching from the conveyor is done directly through a sealed chute into agitated oil which is held within a close temperature range. Oil is kept clean at all times and results in uniformity in quenching, freedom from scale, minimum decarburization, and close tolerances of the fabricated part."

Red Brass Accorded High Place as Industrial Piping

J. J. Vreeland, metallurgical engineer, Sales Promotion Division, Chase Brass & Copper Co., Waterbury, Conn.: "Red brass, containing 85 per cent copper and 15 per cent zinc, is being used more for industrial piping than ever before because of its excellent corrosion resistance and its ease of production. It has proven satisfactorily its economic life when used in acid sludge lines in oil refineries.

"Joining red brass pipe and tube has been done in the past using yellow brass brazing rods. This method, widely publicized under the term 'bronze welding' in reality is nothing more than butt groove brazing. Use of yellow brass brazing rods defeats the purpose for which red brass pipe or tube is intended. Brazed joint is subject to dezincification and causes premature failures of the pipe line. To overcome this, a welding rod containing a high percentage of copper with good welding qualities for oxyacetylene welding has been developed. The rod, a low silicon bronze, contains 1.5 per cent silicon, 1.0 per cent zinc and the balance, copper.

"Handling property of the rod under the torch is very satisfactory, as the weld metal is not so fluid, which increases tendency for brazing rather than welding. By maintaining a smaller pool of weld

metal under the torch, closer control is obtained, resulting in more assurance of fusion to the side walls. This lack of fluidity and ability to control the molten weld metal permits ease of welding in vertical-horizontal and overhead positions.

"In oxyacetylene welding red brass pipe and tube with wall thicknesses from 1/8 to 3/8-in. inclusive, ends to be joined should be beveled to a 45° single miter. Over 3/8-in. in wall thickness, the bevel can be reduced to a 37-1/2° single miter. A flux, specially designed for silicon bronze gas welding should be used in the conventional manner for best results.

"It is suggested that the flux, mixed with alcohol to a thin paste, be initially applied with a brush to both work and welding rods. It is recommended that for all wall thicknesses 1/4-in. and heavier, either a preheating torch or auxiliary torch be used."

Low-Temperature Silver Brazing Alloys Outstanding Development

A. M. Setapen, Handy & Harman, New York: "Silver alloy brazing in recent years has gone through a remarkable period of improvement and expansion. It has given to industry a method of joining metals, iron and steel, nonferrous, and also dissimilar metals, at low temperatures. It has speeded up and improved the joining of medium and light gage metals. Silver alloy brazing has made it practical and economical from a manufacturing standpoint to braze many of the more complex alloys which would suffer injury to their special properties by the higher temperatures involved in other methods used for joining metals.

"Leading factor in the improvement of silver alloy brazing was the development of low temperature silver brazing alloys, melting at 1175 to 1300°F. These alloys have three outstanding features: (1) Low working temperature, (2) high fluidity and complete penetration into the joint, and (3) small quantities of brazing alloys used. Joints are as strong as solid metal, gas-tight, and resistant to shock, vibration and temperature changes. Additional advantages are high electrical and thermal conductivity, high strength, reliability and speed in application.

"Responsible for much of the increase in speed and ease of application of silver alloy brazing is the preplacement of the brazing alloy. The alloys are available in the form of inserts of thin sheets, flat washers, and wire rings of round or special cross section.

"Practically all standard types of heating are applicable: Torch heat for general flexibility and adaptability, and furnace heating for larger production in batch or continuous handling are widely used. Electrical heating, including the most recent development, induction heating, has made enormous gains in recent years. Salt bath, combinations of gas air, gas oxygen and incandescent carbon, to mention a few of the methods, have been successfully employed.

"Now that reversion has come, use of silver brazing alloys seems likely to rise in volume rather than diminish.

"An interesting development is widespread interest in brazing of cast iron. It has been found economical and practical to change the design of cast iron parts, to simplify them and make them in small units, and then to assemble by silver alloy brazing, rather than to make them in the form of large complicated single casting. This may exert considerable influence on the use of silver brazing alloys."

Studies 3-Directional Loading At Right Angles on Joints

A. P. Young, associate professor of mechanical engineering, Michigan College of Mining & Technology, Houghton, Mich.: "I am interested in the progress of welding and particularly in the effect of three-directional loading at right angles on welded joints or plates in structures and vessels. The Merchant Marine, Navy and ship yards have bumped up against a few failures of welded steel ships which are apparently the result of brittle failure of the steel. Fundamental research is trying to find the answer, but I have not yet read any reports on progress made in the investigation. What little research I am doing here has progressed only as far as preparing specimens for tests.

"It looks as if reconversion and prosperity are to be subjected to a three-dimensional load which may reach ultimate strength and result in brittle failure (depressions and unemployment). I am sure that most of the boys in the armed forces never felt they were fighting for the right of organized labor to hold the big stick over industry or for the right of any union to compel a workman against his wish to join up in order to hold or obtain a job. Neither did he think that he was fighting to give to management a complete monopoly over wages, hours and prices and other economic factors.

"Management is hurting itself because it is not correcting the faults which it has inherited, and because of its antipathy to unionism. Unions are hurting themselves because of their radical unsocial attitudes, by forcing upon communities and individuals unemployment they do not want and do not vote for. Both sides at times forget that true prosperity means larger volume of consumer goods changing hands at moderate prices as a result of larger production for smaller overhead and labor cost, thus making the dollar go farther. Blowing up the dollar does not increase its buying power. Producing more goods per dollar earned does increase its buying."

War Accelerated Use of Resistance Welding

B. L. Wise, assistant manager, Welder Division, Federal Machine & Welder Co., Warren, O.: "War greatly accelerated new applications of all forms of resistance welding to high-speed, low-cost manufacture. This applies to all types of metal goods, from delicate instrument parts to heavy fabrications, from simple units to highly critical aircraft components.

"Demand for resistance welding equipment appears to be based upon a well established and steadily advancing need of all industry.

"War also tremendously accelerated research along the lines of producing a higher percentage of structually good welds.

"Probably, some of the most outstanding developments have been in the field of spot welding aluminum alloys. Stored energy machines were developed to overcome the severe power supply requirements of conventional single-phase ac aluminum welders. An inclusive study of precleaning methods for aluminum alloys prior to welding, developed means for eliminating the undesirable oxide coatings. Welding tips and tip contours were improved, and a precision, forging pressure arrangement was perfected which increased shear strength consistency while permitting normal welding variables encountered in production. These developments increased permissible number of spot welds per tip cleaning from approximately 20 spots to 500 and 1000 spots. Welding speeds increased from 50 or 60 to approximately

150 spots per min. A roller spot method of welding aluminum alloys permits the production of 100,000 spots for an 8-hr shift, as compared to prewar production of 5000 or 6000 per machine.

"Considerable improvement was made in the technique and the equipment for the flash welding aluminum alloys. Smoother flashing travel and a more rapid upset movement are obtained in flash welding equipment, as a result of refinements in hydraulic operation.

"New methods and machines now permit the production spot welding of high carbon and air hardenable steels, including armor plate. This is accomplished primarily by employing a post heating cycle, whereby the spot welded region can be quickly and economically heat treated in the spot welding machine.

"Ring projection welding has been extended from prewar maximum of 1½-in. in diam to 4 in. A new method for resistance welding large chain made from 2 and 3 in. diameter bar was important in supplying demands of the Armed Forces.

"Electronic controls used with the resistance welding machines have been simplified and circuits improved to further withstand transient surges on the power supply lines. Voltage and current compensators permit operation of welders on overloaded power supply systems. Precise electronic devices are available for the post heating cycles required in the welding of the air hardenable steels. New electronic controls were developed for the stored energy types of aluminum welders."

Spring-Lock Fasteners To Appear in Numerous Shapes

George A. Tinnerman, vice-president and general manager, Tinnerman Products Inc., Cleveland: "We look forward into 1946 with optimism; confident that consumer demand for better assembled products will continue strong, particularly in the automotive, radio, railway, stove, refrigeration and construction industries. War experience on automotive units in particular has shown the urgent need for more vibration-proof assemblies that cannot loosen under punishing service.

"Ways have been found to incorporate the self-energizing spring-lock principle of the Speed Nut in many new shapes and sizes to save space, weight and time.

"We anticipate that all industries will institute still more time-saving assembly methods while at the same time insuring assembled products against loosening from vibration and protecting porcelain, plastic and glass against damage. Some war developments have proved to be invaluable aids in the assembly of most all consumer products requiring the joining of materials.

"We see no sound reason to seriously delay accelerated production that we feel may reach a higher peak than we had in 1941."

Direct-Acting Controls for Automatic Equipment Endorsed

Fred H. Johnson, president, Progressive Welder Co., Detroit: "Outstanding trends in the resistance welding field are the increasing use of this fabrication method by smaller companies and tendency toward use of more automatic equipment in larger organizations.

"While, today, some increased use of resistance welding by mass production industries is to be noted, the more marked development is preference for ultra-speed and other types of multiple spot welders. With this equipment more welds can be produced in a single setup—reflected in less manual handling, while floor-to-floor time also is reduced and output increased. In the single-weld type of equipment, an analogous development is taking place in that there is an increasing demand for automatic loading devices.

"Welding guns for fabricating assemblies are showing a marked growth in smaller plants, likewise faced with the necessity of reducing production costs. Frequently, their installations are quite simple. One company producing large metal cabinets, for instance, found that it was able to boost production some 30 per cent, compared to previous assembly methods, by use of only two welding guns coupled to a single transformer, booster and timer.

"In the flash-welding field, considerable development currently is taking place. Modern flash welding equipment permits ready fabrication of 'one-piece' parts composed of dissimilar metals. In some cases part of the piece is of relatively hard metal while another part is soft. The welding of smaller wear-resistant pieces to larger assemblies is another application. Welding of heat-treated parts to others is a further illustration of the manner in which flash-welding is being employed to improve design and lower costs.

"Demand for automatic welding equipment has resulted in the over-development of highly complex welding controls, with their consequent operation and maintenance problems. Trend now is definitely toward simpler controls, even to elimination of many electronic types. New cam-operated and other direct-acting controls show promise of wide application."

Metallic Shielded Arc Method Both Fast and Efficient

A. F. Davis, vice-president, Lincoln Electric Co., Cleveland: "First of all, welding as an industry has continued to show rapid growth in all phases of metal working. This has been due not only to a general acceptance of the fundamental principles of welded design, but also through the stimulation arc welding has experienced through consistent technical advancements made in the process.

"Among the most significant developments has been the introduction of new arc welding machines, new electrodes and new welding techniques that have made arc welding more effective and greatly broadened its scope of applications.

"The Lincolnweld method of automatic, metallic shielded arc welding, for example, has established entirely new concepts in welding speed and efficiency in the production of items requiring unusually rigid specifications. It has been successfully applied in the fabrication of machine bases, motor and generator frames, ventilating equipment, tanks and pressure vessels and many assemblies used in the prefabrication of ships, railroad cars and other structural parts.

"A particular advantage of the method is the fact that only one grade and type of flux and one analysis of bare wire electrode are used with the same procedure for materials ranging from ingot iron to steels having up to 0.40 per cent carbon.

"Two recent important additions to the line of manual arc welders have been an engine driven, 200-amp machine with improved welding control, and a new, small welder designed for 230-v, single

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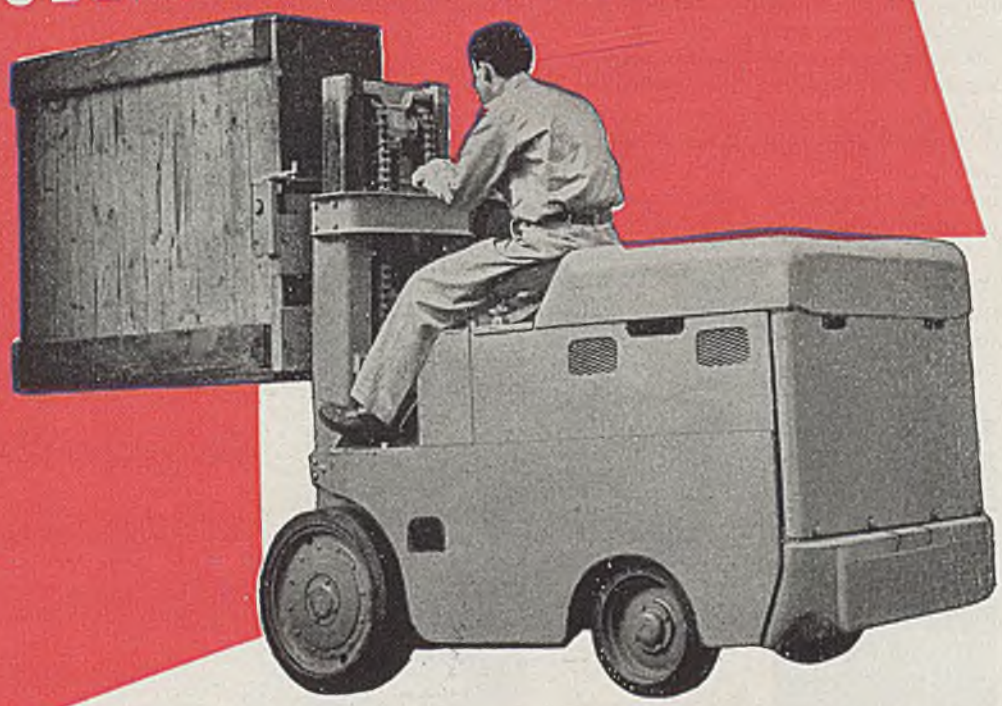

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phase power lines. The latter unit overcomes all objectionable features of previous welders built for farm or small shop use.

"Spectacular developments have also been made in the techniques of welding manually. A new method termed Fleet Welding utilizes arc force which greatly speeds up the operation of welding and, in some cases, has cut costs by more than half.

"These outstanding developments, supplemented by numerous current and pending improvements in welding electrodes and in the design of other welding supplies and accessories, have established arc welding to an even greater degree than ever before in all phases of industry concerned with the design, manufacture, construction and maintenance of metal structures.

"It is clearly evident that the contributions of welding, though already of widespread significance, are little more than suggestions of the limitless benefits which the process offers the industrial future."

Spot Welding No Longer Restricted to Thin Material

G. N. Sieger, president, S-M-S Corp., Detroit: "There are strong indications that resistance welding will be used in postwar manufacture of metal articles to a greater extent than ever before, because production savings which are possible through the application of this type of welding become more attractive to metal fabricators in proportion as labor costs tend to increase.

"Special note has been taken of development work that makes it possible to use spot welding for joining metals which have not been satisfactorily welded in previous years. Notable examples are aluminum, magnesium and the hardenable steels. These developments open up new fields for resistance welding. However it is probable that a much larger volume will be represented by extension of resistance welding in the more commonly used low carbon steels.

"The past few years have witnessed successful application of spot welding to heavier gages of mild steel in the fabrication of structures which are subjected, not only to heavy static loading, but also to important dynamic loading. Power supply problems involved in the low power factor of resistance welding machines have been satisfactorily solved partly by modifications in the electrical and control systems, and partly by refinements of technique, such as pulsation welding. The problem of electrode wear in welding heavy material has been likewise solved by improved electrode design, by giving more attention to proper electrode cooling, and by adopting better procedures for electrode maintenance.

"Another advance is the application of projection welding to the joining of heavy sections. The limitation of resistance welding to comparatively thin material has, therefore, been removed to a considerable extent.

"It will not be difficult for the metal fabricating industries to take advantage of the new procedures which make these things possible, because they are all within the range of what is considered standard equipment."

Higher Welding Standards Heritage of War Experience

Walter J. Brooking, director of testing and research, R. G. LeTourneau Inc., Peoria, Ill.: "Industry has just completed the most prodigious program of manufacturing in the history of mankind. Metallic products were well in the majority of the total production for war. Now, at the close of this period, many of our metalworking manufacturers are confronted with a considerable problem and a vital challenge; namely, the engineering and control of production of welded products.

"One byproduct of the war is the plants which are equipped for welded production complete with trained welders, inspectors, production personnel and supervision. Designs for much of their welded production were supplied by the Armed Services or other agencies, and many have not as yet had the experience, nor the necessary time, to produce welded designs for their regular peacetime or new postwar products.

"Welded production for military service has established concepts of quality, technique and perfection which may raise the standards of civilian products, especially where lightweight strong design is required; but in many cases it may also have established concepts of practice for welded production which exceed the peacetime requirements for certain types of welded structures.

"Following design, the establishment of a complete and functional engineering and production control of arc welded fabrication processing is high on the priority list of steps to be taken by many fabricators to insure their position in the postwar years. The study preliminary to the design; design of the welded product for these equipped and trained plants; and establishment of production control to make them most competitive, constitutes one of the greatest challenges and economic opportunities in today's industrial picture."

New Electrodes To Permit Higher Manual Welding Speeds

J. H. Blankenbuehler, manager, Welding Apparatus Engineering, Westinghouse Electric Corp., Trafford, Pa.: "Much experience in the use of manual and automatic electric arc welding in the manufacture of war goods has caused American manufacturers to realize the value of this tool and, they are all seeking ways and means of using welding in their peacetime products.

"We anticipate great increases in manual welding speeds with the use of new electrodes and expect that there will be a tremendous expansion in the use of automatic welding apparatus. The quite evident trend in this industry is the change to ac welding instead of direct current. The comparative simplicity of the necessary apparatus, the availability of the necessary electrodes and the inherent advantages of the alternating current make this trend logical."

Complete Assemblies in Single Cycle Goal of Machine Makers

J. A. Weiger, vice president, P. R. Mallory & Co. Inc., Indianapolis: "Resistance welding has emerged from the war as a mass production tool not only for the automotive industry but for many industries.

"The war effort stimulated programs to determine the properties of resistance welds, such as fatigue and shear strength,

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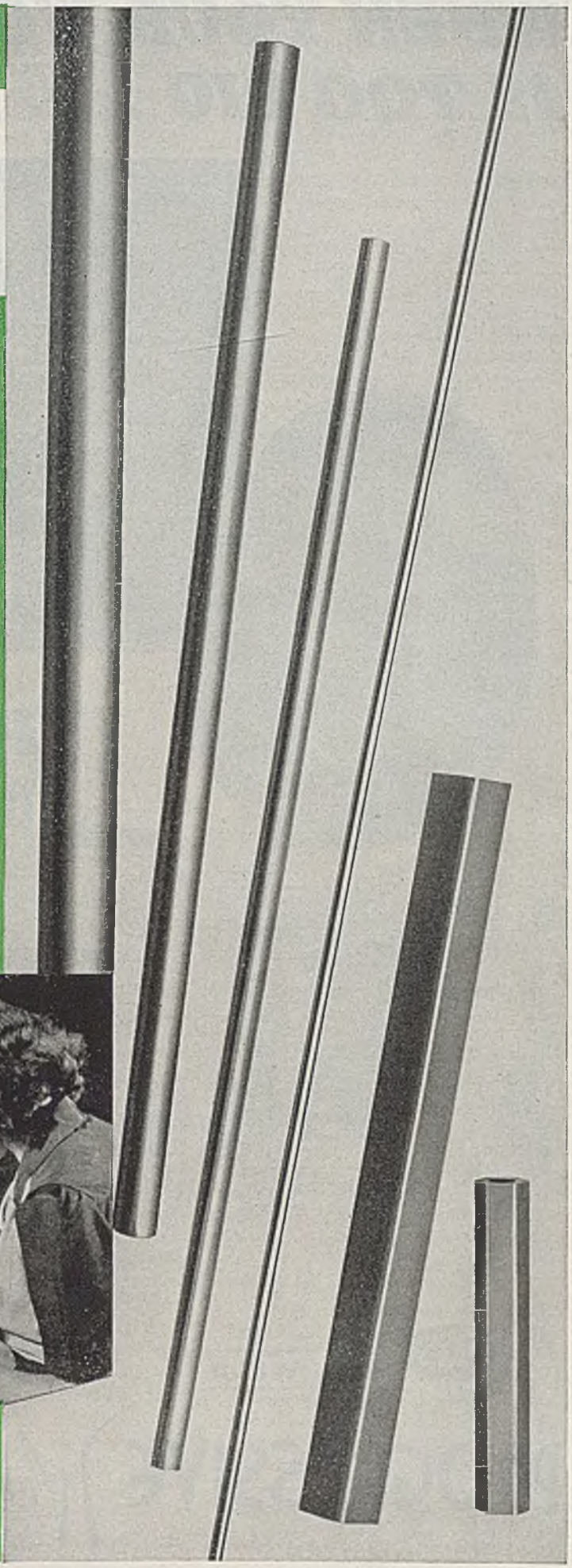

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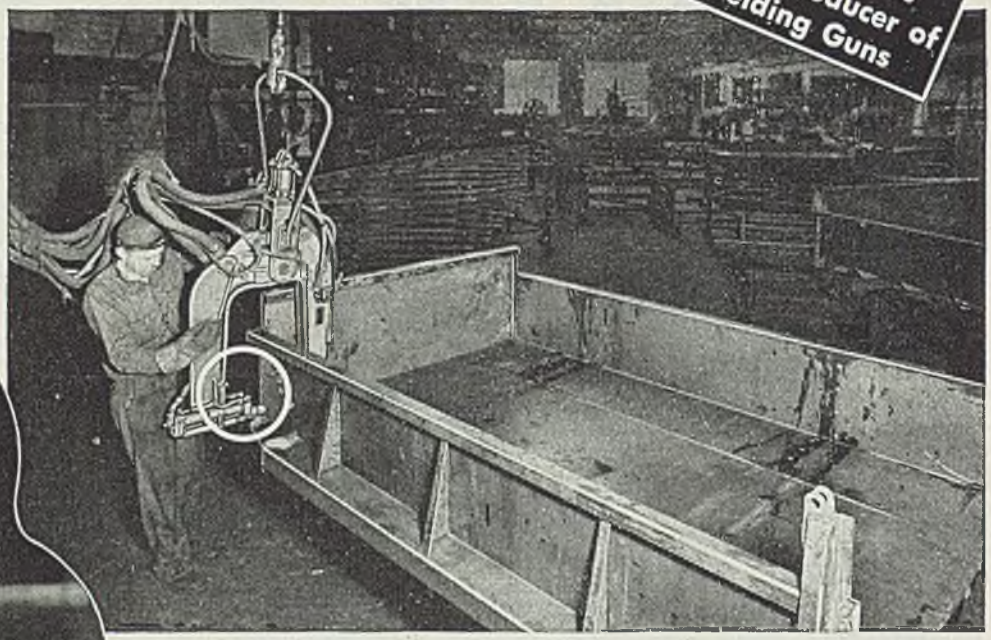

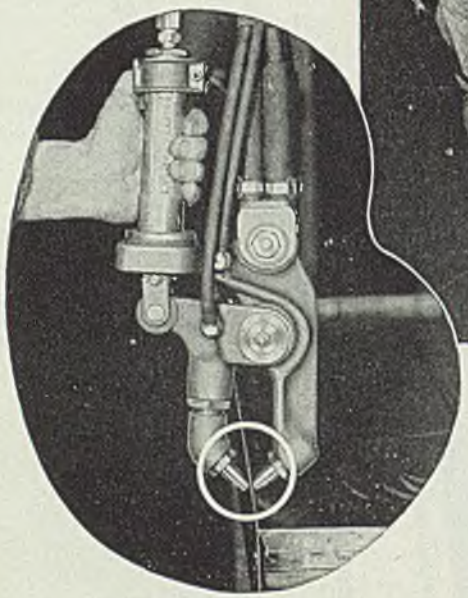

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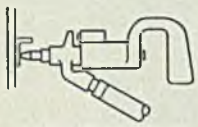

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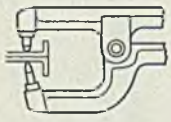

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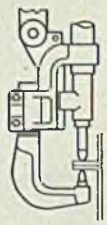

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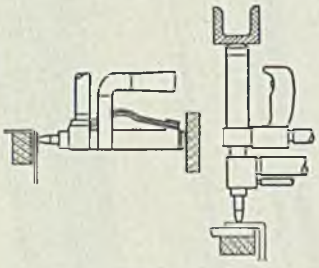

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and made possible establishment of standards principally for spot, projection and seam welds.

"Resistance welding is now an accepted method of joining nearly all metals. It is used by a majority of industries as an economical method of joining not only cold rolled steel, but also brass, bronze, aluminum and its alloys, magnesium and its alloys, coated steels, and alloy steels. Machines have been developed for fabricating pieces of large cross sectional areas up to 30 sq in.

"Metal fabricated parts required for the war effort necessitated larger quantities of rather simple and single purpose machines. Experience gained by manufacturers using resistance welding will be applied for postwar production. In order to produce more uniform welds and at a lower cost, special and precision types of machines will be built, some of which will produce in a single cycle large and complete assemblies."

No Surplus Welding Machines Allowed to Accumulate

G. O. Hoglund, welding engineer, Aluminum Co. of America, New Kensington, Pa.: "Termination of war has changed the welding picture in aluminum more radically than in the case of other metals. War production involved relatively few applications which were large from the standpoint of volume. Peacetime production will multiply the number of applications tremendously as well as the shape and type of the parts to be welded.

"All of the standard methods such as torch and arc welding, spot, seam, and flash welding, furnace, dip, and torch brazing are finding new applications. For example, flash welding of aluminum windows on a production basis and brazing of refrigerator parts illustrate in typical fashion economies to be gained through welding in these fields.

"In spite of the large amounts of welding equipment needed for war jobs, no surplus of welding equipment exists at the present time, with the possible exception of resistance welding machines used in the aircraft industry. Even this equipment can be expected to find peacetime application which will eventually utilize the surplus of available machines. Revision of basic electrical circuits need not be done and the only adaptation required will be the relatively economical changing of tips and arms to suit work.

"A promising new welding method for assembling aluminum alloy parts is seen in the development of tungsten arc welding in an argon atmosphere. This method has a primary advantage in that no fluxes are used in making the welds. This permits elimination of flux cleaning operations, thereby widening the field of application for welding. Method is still in an experimental stage and improvements in equipment and technique are still being made. However, sufficient production has been accomplished to establish its importance.

"Compared with prewar days, a much wider use of welded construction is anticipated. While all of the basic welding methods will be employed, use of metallic arc welding on structural parts is expected to increase more than other methods. Improved electrodes and equipment will bring this about. Widespread wartime use of the automatic carbon arc will probably be carried into peacetime production."

Welding Is Standby for Power Plant Maintenance

D. H. Corey, welding engineer, Detroit Edison Co., Detroit: "Throughout the war period, there was a significant increase in the utilization of welding, particularly as a maintenance tool, by the power industry. Two factors contributed in large measure to this increased use: (1) Recognized necessity for conserving critical materials, that is, making present equipment last and, as far as possible, staying out of the market for new equipment; (2) the necessity for getting worn or broken equipment back into service with the least possible 'down' time. Experience acquired as a result of this more extensive application of welding, should serve the industry well in the postwar period.

"Power plant equipment is considered, generally, to be long-lived. However, there are notable exceptions, particularly in equipment for crushing and pulverizing coal and handling ash. Hard surfacing, by welding, offers attractive possibilities for extending useful life of much of this equipment and effecting further saving by reducing the frequency of disassembling for repairs.

"Steam power plants have been designed for progressively increasing temperatures and pressures, in order to obtain higher thermal efficiencies. Welding has, for several years, been recognized as the most suitable means of joining piping materials, including valves and fittings, for the severe service conditions prevailing. Failure of a high-pressure, high-temperature steam line immediately adjacent to a welded joint, which occurred in the industry in 1943, has directed attention to a problem which had not previously been recognized. The failure, which was of a brittle nature, was attributed to the precipitation of graphite at the low-temperature side of that pipe material which had been affected by the heat of welding.

"Industry-wide sampling of welded joints in service for various lengths of time, has indicated that while cases of severe graphitization are rare, welded joints in high temperature lines should be examined periodically, to disclose cases which may ultimately develop, before they become serious. In the meantime, steel mills, fabricators, users, and independent laboratories have been engaged in research directed toward a solution of the problem. Ultimate objective is a suitable piping material which is immune to graphitization and a practical means of inhibiting graphitization, by post-weld heat treatment, in those materials now in service."

Advances Made in Joining Aluminum without Fluxes

C. I. Mac Guffie, Electric Welding Division, General Electric Co., Schenectady, N. Y.: "During 1945 the electric welding industry moved forward into new fields, and improvements in methods and processes substantially widened the applications of arc welding in the fabrication of light metals. Notable advances were also made in the arc welding of aluminum without the use of corrosive fluxes.

"Among important new products introduced, is a heavily covered electrode for welding low-alloy, high-tensile steels, such as carbon-molybdenum steel in the high-pressure piping industry, although it may also be used on fittings and innumerable structural weldments. Improved electrode holders such as an armor-clad, fully insulated holder designed for durability, maximum safety, and minimum operator fatigue still further increased safety factors in welding. Im-

proved weld-spatter-resistant compounds were formulated for use where weld spatter is undesirable and must be avoided easily and economically. One compound especially aids in instantaneously creating and maintaining an arc where low currents and small-diameter electrodes are used.

"Also newly available is a modified, lightweight arc welder of the type used on jeeps for field repairs during the war. Providing 40 to 250 amp of current and capable of handling electrodes of various sizes, these welders are expected to be widely used wherever a compact, portable welder within this current range is required.

"In areas where capacity of power lines requires the limiting of input current to the arc welder, great interest has been shown in utilizing welding for 'on the spot' repairs, resulting in new NEMA standards for these localities."

Cupro-Nickel Weldable by Submerged Arc Process

J. R. Hunter, manager, welding section, Revere Copper & Brass Inc., Rome, N. Y.: "Joining methods employed in fabrication of copper-base alloy weldments are receiving considerable attention in the reconversion to peacetime products.

"In the production field, automatic methods, such as seam welding—in no sense a new method of joining copper-base alloys—and automatic carbon arc welding are replacing some soldering assemblies and manual carbon arc welding. Furnace and resistance brazing are also being given serious consideration where size, design, and metal properties preclude use of either of the foregoing, but where success with improved design is dependent upon elimination of the human element to a high degree.

"Gas shielded arc welding utilizing inert gases—first introduced as a method of welding magnesium—is also being investigated. Of more general interest is shielding to control humidity, which unpublished research has shown to be responsible for the development of porosity in carbon arc welding of copper-base alloys.

"Perhaps the notable development is the war-proven adaptation of the submerged arc process to the welding of cupro-nickel, one of the most readily weldable of the copper-base alloys. Success with this material has turned thoughts to a similar adaptation to the silicon bronzes, which are widely used in engineering applications because of their weldability."

Spot Welding of Hardenable Steels a Distinct Success

J. W. Meadowcroft, assistant works manager, Edward G. Budd Mfg. Co., Philadelphia: "Most advances in resistance welding during the past 5 years have been in the way of refinements in existing apparatus and technique. However, there was one very important and longstanding problem which was solved for the first time, namely, the successful spot-welding of high-carbon or more hardenable steels. This job had never been done before without leaving the weld zone in a very brittle state. Process consists essentially in tempering the welding zone, in the welding machine as a part of the welding process. One or more shots of current are applied after the original weld has partly cooled. The timing and intensity of these additional shots, which are automatically applied, are critical.

"Need for such a weld was thoroughly appreciated nearly 25 years ago, but early efforts failed because they were along empirical lines of cut-and-try where the number of possible combinations of off-intervals with the current intensity and on-intervals is practically infinite, when not guided by sound knowledge of the cooling rates as related to the desired metallurgical transformations.

"Another important but less spectacular advance is in connection with voltage or current control. Since there is no simple instrument available for indicating the current delivered to a spot-welding circuit, it is obviously important to know that the welding current is always the same for a particular job. Unfortunately, in the case of heavy ac spot welding, current is so large that drop of voltage on the feeder is often considerable. This would be all right if it were always the same, but there may be 15 or 20 welding machines on the same feeder, and when two or more of these strike at once the additional voltage drop may be such as to yield a seriously understrength weld, unless the feeder is designed with more care and knowledge of probabilities than is ordinarily available.

"Two electronic control devices have been developed, both of which operate very rapidly, although final correction is not complete until after the expiration of 1 or 2 cycles of a 60-cycle current. One of these is called a voltage compensator and maintains a constant voltage on the primary side of the welding transformer. The other is called a current regulator and maintains a constant current. Both are satisfactory, with a duration of current flow of 5 cycles or more but not so good for 1 or 2 cycles.

"Another but earlier check is known as the ampere squared second recorder which gives a record of this item for every weld. If the I^2t is outside a certain safe operating range due to some unusual voltage drop, an audible or visible signal is given to indicate that that weld should be made over again.

"All of these three devices together with greatly improved feeder designs have resulted in much greater dependability of each individual weld. This has been an evolutionary process forced upon the industry by much unsatisfactory spot-welding in the early days.

"Much is yet to be desired in the flash welding field, in this same direction of quantitative knowledge and control. Some quantitative research work has already been done but there is need for much more. Considerable work in the direction of refinement has been carried out in connection with fabrication of resistance welding tubing, as well as in connection with its testing.

"Striking part of this whole picture is the rapidly increasing use of more refined or scientific methods of analysis and of measurement. In other words, the gap between the industrial application of this art and the scientific knowledge of the complex phenomena involved, is gradually being closed."

Electronic Controls Broaden Use of Resistance Welding

G. W. Garman, Industrial Control Div. General Electric Co., Schenectady: "During 1945 noteworthy progress was made in the development of new electronic controls that broaden use of resistance welding and improve products fabricated by this type of welding.

"A new low-cost method of precision

...miles ...west Teh... military operations thrusting south along the main railway line.

...their use, ...government troops drove ...to within 90 miles of Mukden, vital rail center in the battle for Manchuria.

...library, auditorium ... music room, gymnasium ... door swimming pool. One complete wing will be devoted to hospital facilities.

...evously ...knowledged that the separat... were operating in Khamseh, armed with weapons which were distributed by unknown people.

New Trigger Grip Speeds Attack on Plant Fires

Requiring only the pressure of a single finger to operate it, the trigger-control valve now supplied on all 10-, 15- and 20-pound sizes of Kidde Portable Extinguishers speeds the attack on fire by providing faster starting of the carbon dioxide discharge.

The natural way to operate extinguishers with this new valve is the right way: merely aim at the fire and pull the trigger. The valve can be easily locked in the open position, if desired, simply by a slight forward movement of the trigger. As all the working parts are fully enclosed, there is no danger of the valve's becoming fouled.

Full information on the trigger control valve may be obtained from Walter Kidde & Company, Inc.

Industrial Output

WASHINGTON 27.—The ... General output at factories and mines decreased 4 per cent in October, while in the first half of Novemb... basic industrial ...

British Brides Fall

... stationed in a little town in France for several months, woped a French girl by telling her about ...

control of resistance welding, particularly suitable for small bench welders used in the manufacture of intricate parts, seems destined to replace expensive soldering operations. Consistent welding is assured by precise control of weld time in one-cycle steps and by fine adjustment of current value.

"Another electronic control, developed for what is probably the largest flash welder in this country, provides rapid change of current from one value to another and adjustment in fine steps. This welder, which welds the alloy steel shaft to impeller of jet propulsion engine, requires four special 2300-v ignitron contactors to control the heavy current. Two of them permit normal voltage for flashing operation and the other two provide reduced voltage for tempering and annealing operations. A special electronic circuit makes it possible to change the voltage applied to the welder from 2300 to a lower value within 1 cycle, and also provides fine heat control adjustments required for flashing, upsetting, and annealing operations.

"These and several other new electronic controls have been developed with special attention to the need for equipment that is simple to install, readily accessible for servicing, and presents an attractive appearance."

Continuous Arc-Time Welding Fixtures Gain Acceptance

R. V. Anderson, chief welding engineer, Rheem Mfg. Co., Alhambra, Calif.: "We believe one of the important milestones in the welding industry was passed this year in the development and industrialization of continuous arc time welding fixtures. Use of these fixtures contemplates the welding of the longitudinal seam of tubular sections or shapes in diameters from 3 to 24-in., lengths from 24 to 72-in., and gages from 10 to 16.

"In production operations, unit sections to be welded are fed into the back of the machine and leave the front of the machine, welded. If the travel rate is set at 160 ipm, for example, the machine would weld 200 units per hour 48-in. in length. Finished weld presents an excellent appearance with a minimum of repairs. Welding speeds of 309 ipm have been achieved on 14 gage material.

"These results are only possible by using submerged melt welding with these fixtures. Materials welded by this combination are not necessarily limited to mild steel. Stainless, aluminum, copper and nickel alloys and certain types of high tensile steels have been successfully welded. Closures, such as heads and bottoms, have also been welded automatically to the tubular sections. Approximately 100 of these continuous arc time fixtures are now in use."

Notes Trend Toward Automatic Resistance-Type Equipment

I. C. Brown, sales manager, Thomson - Gibb Electric Welding Co., Lynn, Mass.: "It appears to us that developments in resistance welding and resistance welding equipment parallel those in the machine tool industry. Emphasis is being placed on welding machines that will save time and labor. Trend is decidedly toward automatic operation making use of special fixtures and dies, and our engineers have been exceedingly active in the development of welders for automatic operation.

"With resistance welding it is no longer a case of adapting the job to the welding process but rather of adapting the process in one or more of its forms—spot, projection, seam, flash or butt welding—to the individual production operation. In other words, resistance welding is engineered to the job. This is going to result in greatly increased production efficiency and economy.

"The war demonstrated the usefulness, adaptability, speed and economy of resistance welding to many who had never had previous experience with it and increased emphasis on automatic production welding is evidence in itself that the process will make even greater contributions to industry in the years that lie ahead."

Heat Treating

(*Concluded from Page 278*)

nace uniformly hard and almost bright in appearance, ready to use without any subsequent cleaning or finishing operations.

"Mechanization proved equally effective in the soldering, brazing, and surface hardening of parts by the induction heating method. A recently introduced electronic heater solders 4500 small cans per hour, another of the same type differentially surface-hardens 3600 bearing rolls per hour, while still another hardens the wearing surface of 1500 cams per hour."

Improved Control Effective in Continuous Gas Carburizing

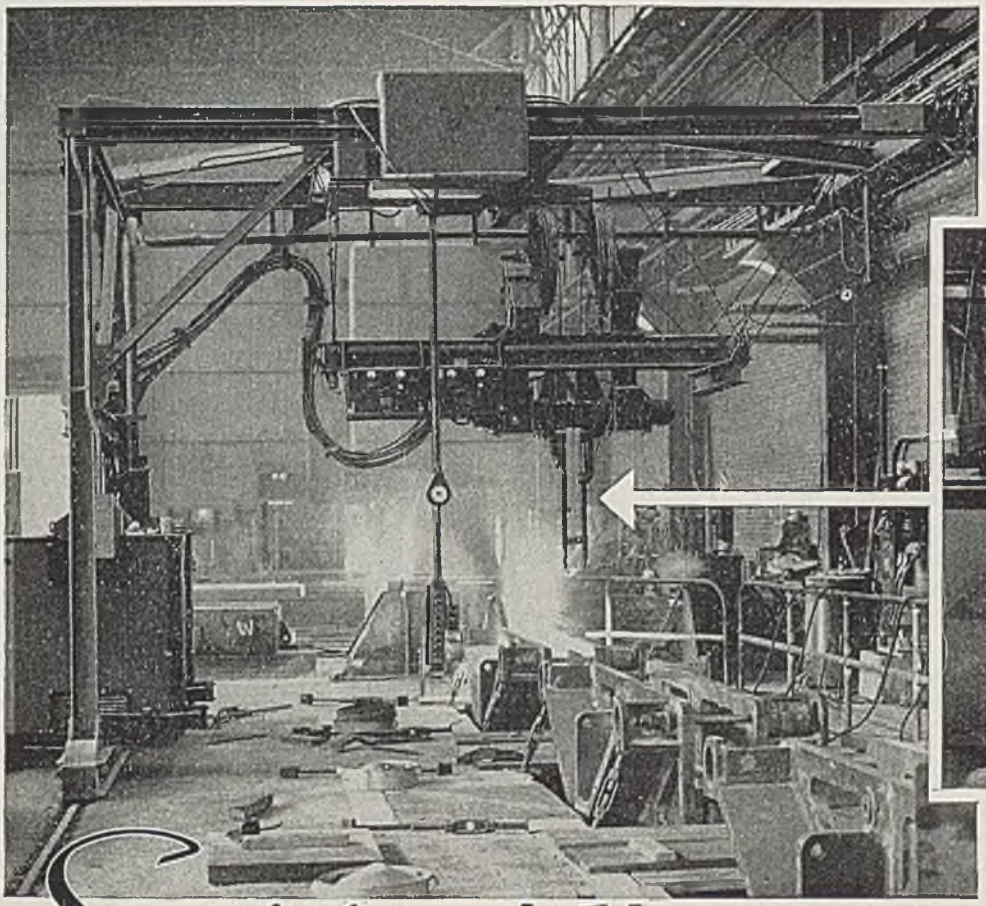
R. J. Cowan, metallurgical consultant, Cleveland: "Method of continuous gas carburizing for utilization of gases in the carburization of metals has been improved during the past year by a method of control which stabilizes the carbon content of the case. This makes it possible to produce a case of any desired carbon content on surface of the metal, which is uniform from piece to piece within very close liimts. Case depth may be set at any desired point and still maintain either a low or a high carbon content on the surface.

"Control of the carbon in this manner is accomplished by amount of hydrocarbon gas used—a larger amount raising the carbon and a smaller amount lowering it. This control is very precise and registers at once in the character of the case. In addition to this, however, moisture content of the gases must be kept at a low value at all times, as this retards carburizing and increases the difficulty of control.

"This process of control is the logical extension of the work done in the recarburization of surfaces which have lost carbon during processing. In this work it has been possible to restore the carbon to these areas and bring them to exact analysis of the remainder of the metal. The idea has been carried forward in this later work to control the carbon in those areas where it exceeds the content of the underlying metal. This brings the art of carburizing to a very high precision."

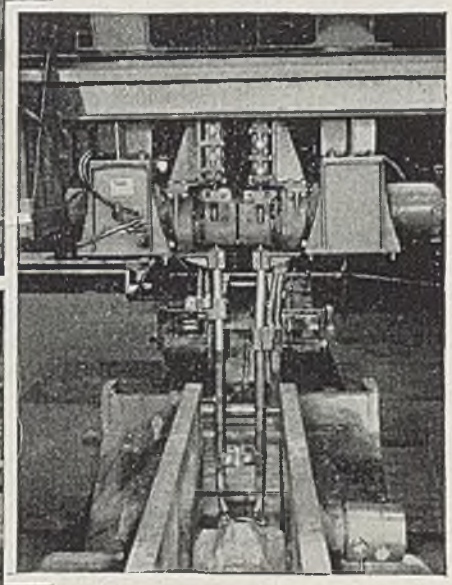
—o—

Parts too small to be production-tested with mechanical type hardness testers now may be checked by a new magnetic tester developed by the General Electric Co.'s Meter and Instrument Division. The tester, 6 in. long, 3½ in. wide and 7 in. high, consists of an alnico bar magnet set in an adjustable, soft-iron frame, which permits the air gap, and thereby the field strength, to be set at the correct value for testing pieces ranging in size from 1/16 to ½-in.



Left — This welding gantry in a prominent steel mill is the first application of the new Cleveland Tramrail stabilized hoist principle for welding purposes.

Below — The welding heads supported by the stabilized hoist, travel without sway or vibration and automatically apply a straight continuous and accurate welding bead.



Stabilized Hoist PROVIDES ~

VIBRATION-FREE TRAVEL FOR UNION MELT WELDING

The first application of a Cleveland Tramrail stabilized hoist for automatic welding by the Union Melt Process has proven completely successful. The stabilized hoist eliminates all vibration and pendulum motion at the welding heads, permitting the laying of straight, perfect welds.

The two welding heads are secured to the load bar of the hoist. The hoist in turn is supported by the Cleveland Tramrail gantry crane. The stabilized hoist which remains absolutely rigid in any position because of the unique triangular hoisting rope arrangement, can be adjusted to any height within 4'0" limits. Welds can be made of any length up to the length of the crane runway.

Welding speed may be varied from 4 to 80 inches per minute by changing the gantry travel speed by means of push buttons on the pendant control cable. A tachometer on the cable just above the buttons keeps the operator informed of the welding speed.

The gantry crane with stabilized hoist is lighter and easier to manipulate than the usual heavy structural type of welding travel equipment. It is simple to adjust, convenient to use and very flexible in application to different kinds of work.

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OVERHEAD MATERIALS HANDLING EQUIPMENT

Surface Treatment

Investigate Electroforming as Means of Plating Odd Shapes

F. B. Dahle, supervisor production research, Battelle Memorial Institute, Columbus, O.: "During the past 2 years, Battelle has worked on electroforming processes in the production of small parts. Electroforming, as a processing method, has many possibilities in the manufacture of concentric articles or articles having odd shapes. Our work has been concerned primarily with the electroforming of nickel. Through adjustment of various factors in the electroplating process we have been able to develop methods whereby nickel can be deposited on mandrels and built up to required thicknesses. The properties of the nickel deposit, furthermore, can be varied from a hard brittle material to a soft and ductile material. The properties obtained, therefore, can be made suitable for the required application.

"Electroforming as a process is old in the art; however, specific applications have been rather limited because of cost. In our development work here cost of the part made from tubing was about 18 cents; electroforming the same part reduced cost to approximately 3 cents, the reason for this being that part could be electroformed to shape and very little finishing was required.

"Another interesting development that we have under way is a study of the vapor blast method of surface preparation. This method is essentially a wet sandblasting process. It does, however, have certain advantages other than are implied in the name. With this process, abrasive sizes of the order of 2500 mesh can be used for finishing metallic surfaces. Abrasive sizes of this order, when suspended in the liquid, have considerable cutting action.

"Process was applied to the production of war materiel rather late in the progress of the war, and many parts treated by vapor blasting were of an experimental nature. These experiments, however, were quite promising and indicated that definite improvements could be expected in the operation of certain moving parts. Lubrication was improved to a notable extent where bearing surfaces had been vapor blasted, due apparently to the small microscopic depressions resulting from vapor blasting with fine mesh material. These impressions would have a tendency to retain more of the lubricant than is possible on a highly polished surface.

"It is believed the action of the abrasive removes the amorphous layer, resulting from a grinding or machining operation, from the surface of metals. Actual surface conditions resulting from vapor blasting are now being studied at Battelle."

New Pigments Capable of Increasing Paint Effectiveness

George Diehlman, research laboratories, National Lead Co., Brooklyn, N. Y.: "Many new paint products and painting procedures were developed during the wartime period. Complete information on these developments is being made available to the public as promptly as possible. Corrosion inhibitive paint primers will be improved by incorporation of those new developments which are applicable to metal protective paint products.

"Among the corrosion inhibitive pigments, red lead is still the most widely used, due to its unique properties and to its proven record of practical performance.

"Pigment E, a barium potassium chromate compound, is a new pigment under consideration. This pigment prevents the corrosion of metals by making available soluble chromate ions (CrO_4)$^=$ in the presence of moisture or water vapor. Metal protective paints containing Pigment E have given excellent results in atmospheric exposure tests.

"For the vehicle portion of paints there have been many new developments, such as styrenes, silicones, vinyl copolymers and other types of synthetics.

"By wholly or partially utilizing these new developments, metal protective paints of greater effectiveness will become available. These modern developments will result in increased effectiveness and greater economies in the protection of iron and steel against destructive forces of corrosion."

Lighter Gage Metal Used With Special Ground Coat

G. H. McIntyre, director of research, Ferro Enamel Corp., Cleveland: "Production of porcelain enamel and porcelain enameled articles was greatly curtailed during the war years. In spite of this, enameling did not entirely cease and frit companies, especially, were able to devote considerable of their research energy and talents to development of new enamels and enameling techniques.

"One recent contribution to the industry is the ground coat which will mature at the same time and temperature cycles as that for the average sheet steel cover coat. It eliminates necessity of banking parts to be fired in the ground coat, as these can be hung on furnace chains or fixed in a box furnace simultaneously with other parts being fired in cover coat. Economies are realized because of the low firing temperature required for this type of ground coat, and there is less warpage tendency which often permits product to be made from lighter gage metal.

"Most important sheet steel development during the past several years has been zirconium opacified sheet cover coat enamels. These have almost entirely replaced the former nonacid-resisting antimony bearing enamels. Advantages of zirconium over previously accepted super opaque antimony cover coat enamels are: Wider firing range, greater coverage, improved surface texture and gloss, less sagging tendency and generally thinner coatings with the same degree of whiteness.

"An entirely new development among standard acid resisting enamels based on the use of titanium both as a mill addition and in the formulation of the frit, is about ready for the market.

"Enamels can be used for both protective and decorative coating on aluminum. Enamels have been developed

which have good adherence on both cast and sheet aluminum. These are applied in one coat on the clean surface either by spraying or dipping, but spraying is the best method so far studied. There has been practically no cast iron enameling carried on in this country during the war period.

"During the war many items formerly made from heat resistant metal alloys have been fabricated in regular enameling stock of 1020 steel and coated with special enamels. Such items as airplane exhaust stacks, amphibious landing barge exhaust equipment, electric stove heating elements, and electric stove reflector pans have been finished in these special heat resisting coatings.

"Another growing use for special finishes is the application of a highly heat resisting finish to pots used for melting and casting light metal alloys. Not many of these pots have been manufactured commercially but foundries have expressed their interest. Life of the pot has been increased by use of this coating from the usual 4 or 5 days for uncoated, to several weeks for coated pots."

Electroplated Coatings Find More Container Applications

Allen G. Gray, Electroplating Division, E. I. du Pont de Nemours & Co., Inc., Cleveland: "Developments in electroplated coatings during past year have been largely in the field of new applications rather than production of new plated metals. War applications gave impetus to the study of metallurgical characteristics and corrosion resistance of many plated coatings and the information gained has led to a different conception of electroplating for many postwar applications.

"Ability of the plating industry to fill the demands of war by acting as a 'reserve' ready to step in on short notice to meet shortages of materials normally used justifies the conviction that plating will play a large part in technological developments of the future.

"Electrodeposition of tin and zinc on continuous strip in steel mills has shown considerable progress during the past year. Increased metal supplies in the near future are expected to accelerate interest in production and application of electrolytic tin and zinc coated strip. It is anticipated that thin electrolytic tin coatings will find considerably enlarged application in containers for dry-pack products.

"Reconversion problems in the plating industry are not as bad as they would be in an industry where peacetime requirements are entirely different from wartime requirements. Much of the industry is ready to supply domestic goods with the conventional bright finishes of copper, nickel and chromium, using much the same equipment."

Hot Air Drying a Boon to Hot Dip Galvanizers

Wallace G. Imhoff, president, Wallace G. Imhoff Co., Los Angeles, Calif.: "The American Society for Testing Materials has set high limits of 1.60 per cent for lead, and 0.08 per cent for iron in the grade known as Prime Western Zinc used for hot dip galvanizing. In practical operation of the galvanizing bath the zinc has on occasions gradually become thick and sluggish; quality of metal deteriorated slowly until coating difficulties reached serious proportions. This bath trouble has gradually been coming to the foreground because it has occurred in a number of plants.

"Practical research investigations have shown that cause of the trouble has been a gradual diminishing of lead content of galvanizing bath. In every case studied it was found that from 2 to 4 in. of lead were put in the pot when starting up, and that when tested at the time of worst coating and bath trouble, no lead was found in the pot. That the trouble was directly caused by absence of lead in the bath was quickly proven by adding lead to restore the original 2 to 4 in. in the bottom of the pot.

"This new situation indicates that because of the large amount of metal smelted from by-products that do not carry lead, it cannot be a lead source for the slab zinc produced. To eliminate the bath and coating troubles, a minimum amount of lead content in zincs for hot dip galvanizing should also be established. When there is no lead in the bath, and iron and aluminum are high, the bath deteriorates almost to the place where the metal cannot be used for galvanizing.

"Another technical development of greatest importance to hot dip galvanizing industry is the introduction of hot air drying to replace the old steel hot plate dryer which was direct cause of corrosion and rust forming on the work in preparing it for entering the molten zinc bath. The new hot air technique by eliminating this corrosion and rusting on the dryer, permits work to pass through the bath very much quicker, greatly decreases the zinc required per ton of product. At the same time, a much higher quality product is made with a higher production, and as a direct result lower galvanizing costs".

Tumbling Now Imparts Many Final Bright Finishes

C. W. Yerger, chairman, Lea Mfg. Co., Waterbury, Conn.: "Past year in the metal finishing field seemed to be one of heavy production and not as much development work as had been accomplished in the previous war years.

"Several things have come to the forefront during the year however which deserve special mention. One of these developments is to carry finishing of metals much further in tumbling processes than has been accomplished previously. Many final bright finishes have been obtained directly from tumbling processes by use of specially designed tumbling barrels and proper selection of abrasive agents. This selection of abrasive agents has also been carried to a higher state of development in production of buffing compositions.

"Steps forward have been taken in the refinement of surfaces obtained initially by sandblasting and now by the use of finely divided abrasives shot on metals in the form of a vapor for producing finer finishes than obtained with sandblasting.

"There has been very much interest in plating on aluminum. Some processes are now on the market having some success and there is a tendency for further developments of this idea. Also, considerable progress was made in development of bright dips for various metals which produce finishes superior to any obtained previously by this method."

Coating Compounds Formulated For Adherence to Wire

John H. Richards, Jr., director of research, Apex Alkali Products Co., Philadelphia,: "Possibly the greatest achievement of coating compounds has been registered in the field of stainless steel wire

drawing. The lime and the coating compound has eliminated the former soft oxide coating and lead coating.

"Another interesting discovery is use of the coating compound to replace the need for oven-baking operations. Coils of wire are immersed in the coating compound solution at boiling temperature for 15 min and then withdrawn into the air. The coating compound is allowed to dry on the wire and the wire is then immersed in the hot lime tub. When the lime has dried in the air it is ready for the drawbench.

"Rigid and exhaustive tests have proven that a maximum coating 0.0004-in. thick seems to be the most dense film which can be expected to be built up upon wire regardless of the number of dips in the coating compound. Any material deposited on the wire in the form of a coating compound beyond this point simply tends to build up in the die, and consequently is peeled off. Furthermore, it is only the last molecular layer of coating or lubricant on the wire between the wire and die which actually takes the brunt of the load.

"A coating compound should be formulated with the principal factor being its ability to adhere to the metal surface rather than its ability to increase the film thickness on the wire. Also, any commercially available coating compound must not only coat, but also thoroughly clean the metal surface. In fact, the coating compound will not 'take' nor the necessary film 'set up', if traces of oil, dirt, or grease remain on the wire."

Many New Coatings Available For Aluminum and Magnesium

F. H. Keller, chief, Metallography Division, Aluminum Research Laboratories, Aluminum Co. of America, New Kensington, Pa.: "During war, surface coatings and treatments were extensively employed on aluminum equipment to insure reliable performance under severe service conditions. In the near future, many of these finishes will find application both for protection and decoration.

"Foremost among the finishes is the Alumilite process for anodic coating. Dye-colored oxide coatings produced by chemical treatments are a recent development and have a promising future for such items as hookless fasteners, eyelets and other small articles difficult to treat by the Alumilite process. Still other chemically produced coatings will be available as surface preparation for paint coatings.

"Electrolytic treatments have been developed for anodic coating of magnesium alloys. These coatings are as protective as the better chemical coatings and are much more resistant to abrasion. They also can be colored with dyes.

"Plating of aluminum is being commercialized for many applications. With the zinc immersion process for preparing the surface, copper, nickel, silver, chromium, gold and rhodium platings can be applied to aluminum readily and satisfactorily. Nickel plating is being applied for hardware, silver for bus bars, gold for jewelry and novelty articles, and rhodium for reflectors. Some aluminum castings which are used for deck fittings and other parts are being electrogalvanized to provide additional protection against marine environments."

Metal Cleaning as Part of Production Cycle Urged

James Rowan Ewing, assistant to president, Solventol Chemical Products Inc., Detroit: "Metal cleaning and metal surface conditioning during process and prior to final finish have long been neglected to a great extent.

"During the war, with need for special surface condition, more attention has had to be devoted to this important subject, with resulting research, collaboration and co-operation between manufacturers of metal products, and concerns developing and manufacturing cleaning processes and materials.

"Most recently developed type of cleaner is what we call the multiple phase solution, result of years of applied research. This material brings together in one system a composition including organic and inorganic solvents for mixture with water to produce a multiple-phase bath in which an upper layer comprises an unemulsified solvent layer and a lower layer comprises a dispersion of emulsion of organic and inorganic solvents in water. Separate phases in this system maintain their character as separate layers in the tank and, though mechanically mixed in the spray application, maintain their individual character at all times.

"A multiple-phase system brings into play a new automatic extraction of soil from the circulated system. Thus the solution absorbs larger dirt loads than an ordinary emulsion, giving longer life to the solution and performing functions which neither of the two phases could perform separately or used in succession. We believe this system of cleaning will find the widest possible application in cleaning and temporarily passivating metal surfaces during manufacturing processes and prior to plating, phosphate coating, painting, and enameling."

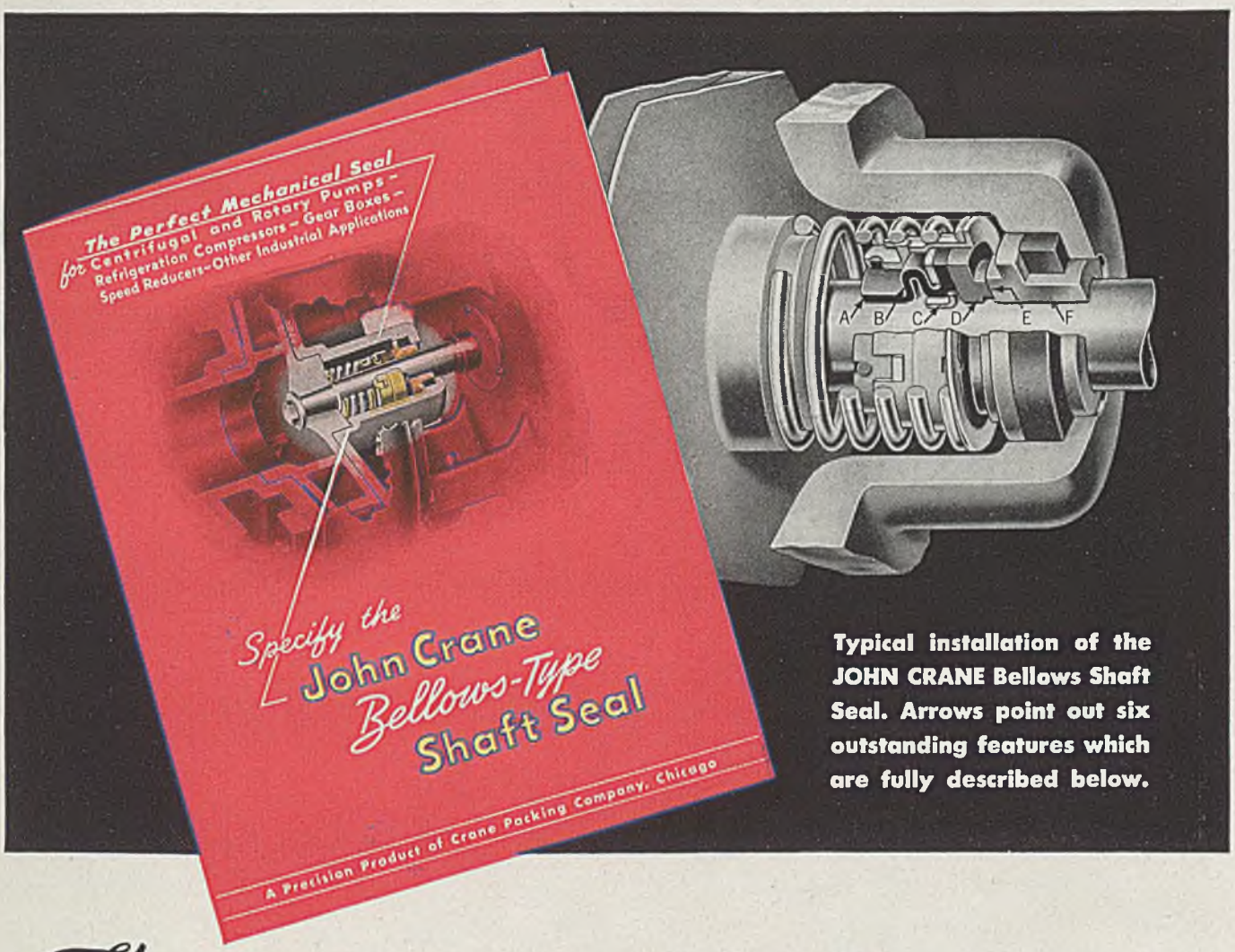
Advanced Metal Cleaning Methods Result from War

Henry Strow, chief chemist, MacDermid Inc., Waterbury, Conn.: "Conversion from war to peacetime has been a very drastic one for the plating trade. Majority of the corrosion resistant coatings used during the war are being changed to decorative finishes, with corrosion usually as a secondary consideration.

"Cadmium and zinc plating and a variety of finishes applicable to these were the major finishes throughout the war. Major emphasis now is on nickel plating, chiefly for decorative work, with corrosion resistance of a minor order only, expected. Many new formulas have been developed for the use of bulk nickel plating which enable much higher speed than have ever previously been dreamed of in the plating trade. Also, use of bright nickel has been extended, and much more is now known about its full operation. Equipment in use is of a more modern type and more emphasis has been placed on correct cycles and procedures.

"In cleaning metals, a great deal of progress has been made. Prior to war, use of reverse current cleaning was confined largely to steel. At present, such cleaning is being used almost exclusively on copper plated work, both buffed and unbuffed steel, and on zinc-base diecastings with the use of small amounts of reverse current as an aid in the adhesion of electrodeposits to brass. Materials for these uses have been developed from materials not available before the war, and results are almost spectacular.

"A proper appreciation of various factors involved in metal cleaning has come



Typical installation of the JOHN CRANE Bellows Shaft Seal. Arrows point out six outstanding features which are fully described below.

This BULLETIN *will answer Your* MECHANICAL SEAL QUESTIONS

DESIGN FEATURES

A. Tail of synthetic rubber bellows is preloaded on the shaft. Gives a positive, non-slipping drive.

B. Bellows head is flexible; adjusts automatically for washer wear and shaft end play.

C. Protecting ferrule prevents flexible bellows from adhering to shaft; assures free movement.

D. Sealing washer rotates with shaft; driven through metal parts—no torque on bellows.

E. Sealing faces both carefully lapped at our factory to insure a perfect seal.

F. Floating seat is cushioned in synthetic rubber sealing ring, eliminating stress distortion of sealing faces.

The JOHN CRANE Bellows Shaft Seal is being used with great success on centrifugal pumps, speed reducers, refrigeration compressors; all types of sealing applications. It is fully illustrated by the bulletin shown above.

The advantages this precision-built Shaft Seal has over packings are many. It reduces friction and saves power. Requires minimum attention over long periods of operation. *Completely eliminates* gland adjustment, stuffing box leakage and shaft wear.

With a JOHN CRANE Shaft Seal in your equipment, these advantages become important additional features to stress in competitive markets. Every manufacturer or Design Engineer who has a shaft sealing problem should see this bulletin. *It's informative—write for a copy!*

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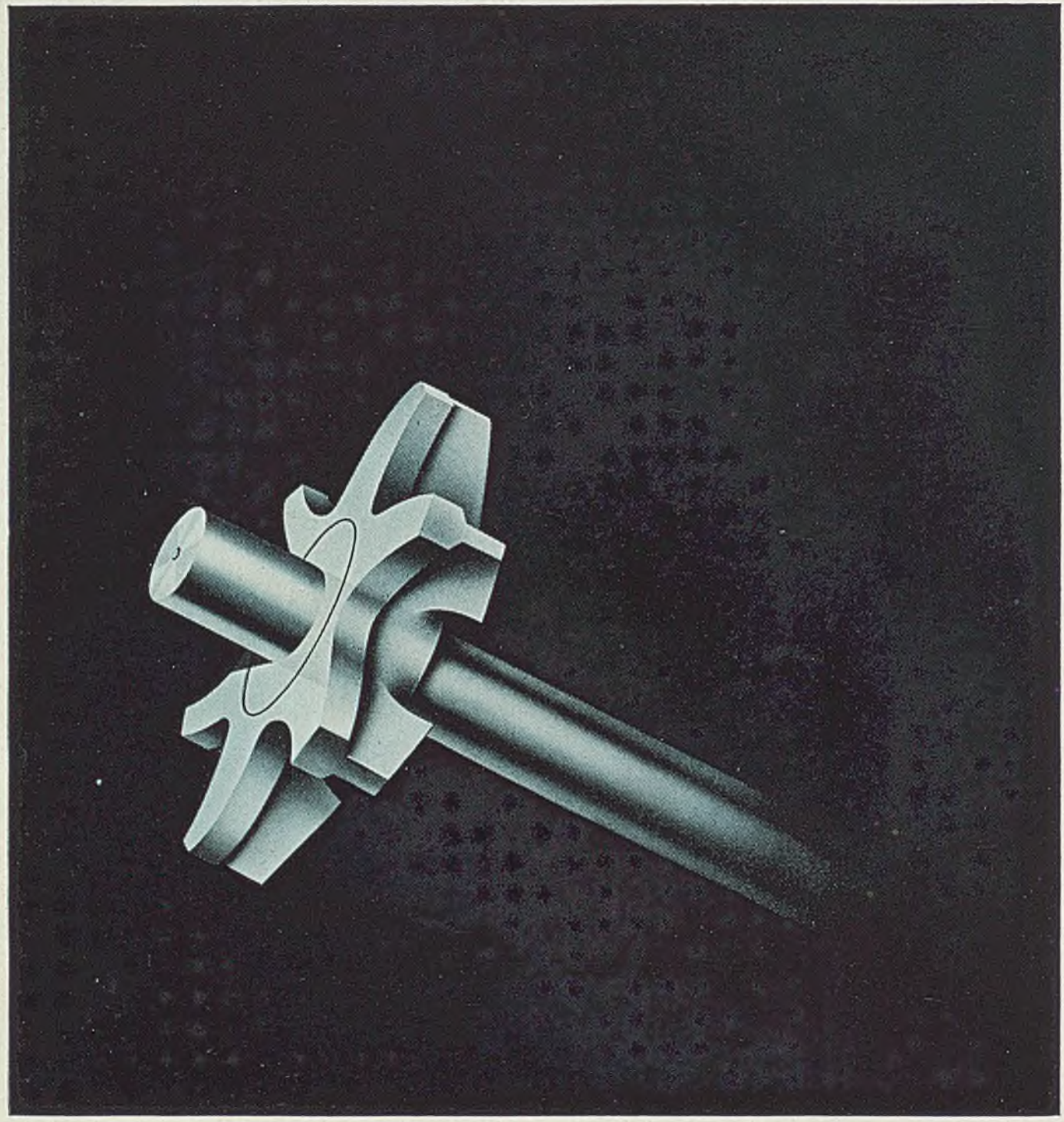

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about as a result of research during the war, and these advantages are now being aplied to peacetime production.

"Use of solvent emulsion type cleaners in pressure spray washing machines for large production has been developed and is due to be continued in most of the heavy production industries as a means of cleaning prior to inspection, assembly and similar operations, with the production of a rustproofing film which will last through a short period such as is required prior to assembly or further work. Extensive work is now being carried out in all of these fields and it seems probable that 1946 will find many more such advances in all of these fields."

Production Applications To Be Developed for Metallizing

L. E. Kunkler, president, Metallizing Co. of America, New York: "Before the war it was more or less accepted industrial practice to discard worn or mismachined parts and to scrap castings rejected because of blowholes or surface defects.

"As metals and manpower became scarce it was obvious that such relatively wasteful practices would have to be replaced by a strict conservation program. Many methods were adopted by industrialists to keep their straining equipment in operation. Among those methods which proved exceptionally effective was metallizing.

"While metallizing itself is not a particularly new idea, Mogul metallizing guns having been in use for more than 20 years, process was forcefully brought to the attention of every maintenance man by the shortage of replacement parts. Metallizing guns proved ideal for rebuilding many types of worn parts such as bushings, shafts, journals, etc. In most instances the rebuilt part, because of the oil retention characteristics of metallized surfaces, outlasted the life of the original part and the cost was amazingly low. This led to the use of metallizing in many production applications.

"Another time, materials and money saver for foundries, machine, welding, and pattern shops is the Dot-Weld process. This permits a fast, readily machinable fill-in deposit of aluminum, bronze, nickel, copper or zinc, without setting up any residual stress in the casting. The elimination of structural changes in the parent metal is accomplished by an air pressure unit built into the equipment which focuses a constant stream of cooling air on the work. Process has been successful in salvaging defective castings, both ferrous and nonferrous.

"Where castings are subject to operating pressures many foundries are using a special sealing method and solution to eliminate porosity and seal pinhole cracks. Heated solution, Cast Seal, is circulated through castings under pressure. It enters porous area at its maximum opening and by colloidal action of its base, builds up a permanent metallic bond."

Lead-Tin Bearing Overplate Proved Merits in War Use

L. A. Barera, research laboratory superintendent, Federal-Mogul Corp., Detroit: "With end of the war, production of certain type sleeve bearings has been curtailed or discontinued, while increased applications of other types can be expected. Silver lined lead-indium plated bearing used in certain aircraft engines is a typical example of the first group. Powdered copper-lead bearing with a steel back and the multiple layer bearing, i.e., steel back lined with copper-nickel powder impregnated with lead-base alloy, exemplify types belonging to the second group. In addition, some aluminum-base alloys may enter into the bimetallic bearing picture. Both the solid type and bimetallic bearings of aluminum-tin and aluminum-cadmium alloys are now going through a period of test with results indicating promise.

"Revised methods of manufacturing metal powders and improved fabrication techniques have increased the quality and production of such products. Porous metal bushings, gears, magnets, etc., are being made of ferrous powders; and large quantities of powdered copper-lead bearings on steel backs are being produced by the continuous strip process.

"Centrifugal casting methods have been further exploited in the bronze foundry on certain alloys and found to be very satisfactory from a standpoint of quality. With the utilization of these methods in casting various type bushings unusual physical properties were attained, and the saving in reduced scrap losses has warranted the installation costs of such equipment.

"Despite war's end, the tin situation is still very critical. Use of tin on steel backs of bearings as a rust preventative is no longer permitted. Other metallic coatings, hard organic finishes, oils, waxes, strip coats, are being studied as substitutes for tin in this application. For the same reason, modification of higher tin bronzes has led to alloys of a lower tin content possessing virtually the same physical characteristics.

"Overplate of a lead or lead-tin alloy on the bearing surface of certain type bearings was introduced during the war. It is claimed that this thin overplate affords increased embeddability and conformability and eliminates any inherent characteristics of bearings scoring softer shafts. A thickness of 0.001-in. or less of the electrodeposited plate has proven adequate.

"Selecting one of these developments as being the most important is difficult. The combination of all technical achievements have aided considerably in the increased production and improved quality of our war goods and should lead to greater production of better materials during this postwar period."

Additional Products Expected To Receive Rustproofing

George H. Pimbley, superintendent, International Rustproof Corp., Cleveland: "This is a time of reconstruction as well as reconversion — each industrialist is putting together his own individual postwar picture. However, this involves something more than just reassembling a jig-saw pattern that has been scattered by the disruption of war. Everyone wishes to improve upon the past and make the new to include something finer and better. A 'divine discontent' discernible in the current intense research activity is, in the air.

"But the improvement must be had with little or no increase in cost, because prevailing economic sentiment is against higher prices.

"In the field of protective coatings for steel and zinc products this ambition for improvement at moderate cost may be readily satisfied by the practice of hot phosphate coating before application of paint or oil. The cost is so low as to be easily absorbed; the improvements of finer finish and prolonged protection against rust will go far to make the product a worthy one in the better

scheme of living in the year to come. Rustproofing is going to be demanded on innumerable peacetime products that heretofore have been given only perfuctory protection. Sales executives, knowing that the general public has become rust conscious, will be able to use this fact as an added feature."

Ingenuity in Galvanizing Expands Field of Applications

W. H. Spowers, Jr., Commander, USNR, Bureau of Ships, Navy Dept., Washington; "Galvanizing has certainly done its bit during this war in new processes, new materials, new equipment. Note the ingenuity of the ammunition box galvanizing technique which enabled the issue of great quantities of these boxes. Some stamped metal ware people could well examine this technique which was made possible by the adaptation of No. 20 flux. In the field of materials the liquid bath blanket, for the prevention of zinc oxides, has been effecting great savings in critical zinc and always critical money.

"In the field of equipment, development and patenting of a galvanizing kettle lined with a metal highly impervious to the action of zinc is of utmost importance. Laboratory tests of this material have been of great interest. It is understood that the patentees are now examining the field for purpose of determining details of its exploitation.

"It must be recognized also that development of the high fired galvanizing furnace has enabled many war plants to maintain production tonnages far greater than was ever previously thought possible without reducing equipment life."

Heavier Bright Plating Forces Cleaning, Pickling Revisions

Myron B. Diggin, chief chemist, Hanson-Van Winkle-Munning Co., Matawan, N. J.: "Careful preparation of the surface and the preliminary step to actual hot dip galvanizing is receiving close study. Impact of wartime demands and experience on metal cleaning has led to a wider selection of cleaning agents, especially in the field of solvents and acidic materials, to obtain the type and degree of surface cleanliness required whether it be for electroplating, painting, welding or inspection. The variety of cleaning machines available also is broad so that co-ordination of the cleaning agent and mechanical device to the job can be accomplished.

"There has been a rapid reconversion of electroplating to bright decorative finishes. Specifications for thickness of copper-nickel-chromium or nickel-chromium deposits on automobile parts, metal furniture, electrical appliances, etc. call for heavier and more serviceable coatings. Application of heavier deposits has made it necessary to revise cleaning and pickling methods prior to plating in order to secure satisfactory deposit adhesion.

"Many special-process nickel solutions developed during the past several years are being installed. Some bright-plating nickel solutions have continuous purification systems which permit operation 24 hr per day, 7 days per week. Such production will be necessary to saturate waiting markets. The largest bright nickel solution in the world (40,000 gal of cobalt nickel solution) recently went into production. Full automatic equipment incorporates latest engineering features, such as continuous purification, heating with external heat exchangers and continuous filtration whereby solution is completely turned over once every 3 hr. Evaporation losses are replaced by pure deionized water. Desalted water is also used in rinse tanks, preventing stains on the plated work and eliminating touching-up operations.

"Bright nickel solutions of the chloride-organic brightener type and the semi-bright cobalt nickel solutions are being used on automobile bumper bars. The use of these special nickel solutions reduces buffing costs and permits higher production rates. The chloride-acetate nickel bath used during the war for building-up heavy deposits for salvage work, has been found recently to be excellent for the plating of stereotypes. There is much interest now that nickel anodes are again available, in heavy and hard nickel plating for salvage of worn ordnance machine parts.

"Composite coatings of nickel and zinc which are subsequently heat-treated have developed to the point where they will compete with hot galvanized coatings for some applications.

"Plants are now being constructed for production of metal fluoborates in commercial quantities. Tin fluoborate bath was used for plating fuse parts during the war. The copper fluoborate bath shows every indication of having better electrochemical characteristics than acid copper sulphate solutions. Other fluoborate baths — nickel, cadmium and chromium — are being actively investigated.

"A war development which is applicable to consumers' goods, is the deposition of the ternary alloy of copper, tin and zinc. Outstanding characteristics are silvery white deposits that have bright, high tarnish-and-abrasion-resistance and high corrosion protective value when deposited on many nonferrous metals and alloys; its solderability has made it attractive for radio and radar applications.

"Sodium zincate and phosphoric anodize methods for preparation of aluminum for electroplating have been developed and applied successfully to many electrical and radar devices. Anodizing methods remain substantially the same, but methods have been found for dyeing both sulphuric acid and chromic acid anodized film. An improved process for anodizing magnesium, using ac or dc current, is one war development now available. Commercial methods have been devised for dyeing these coatings almost any color."

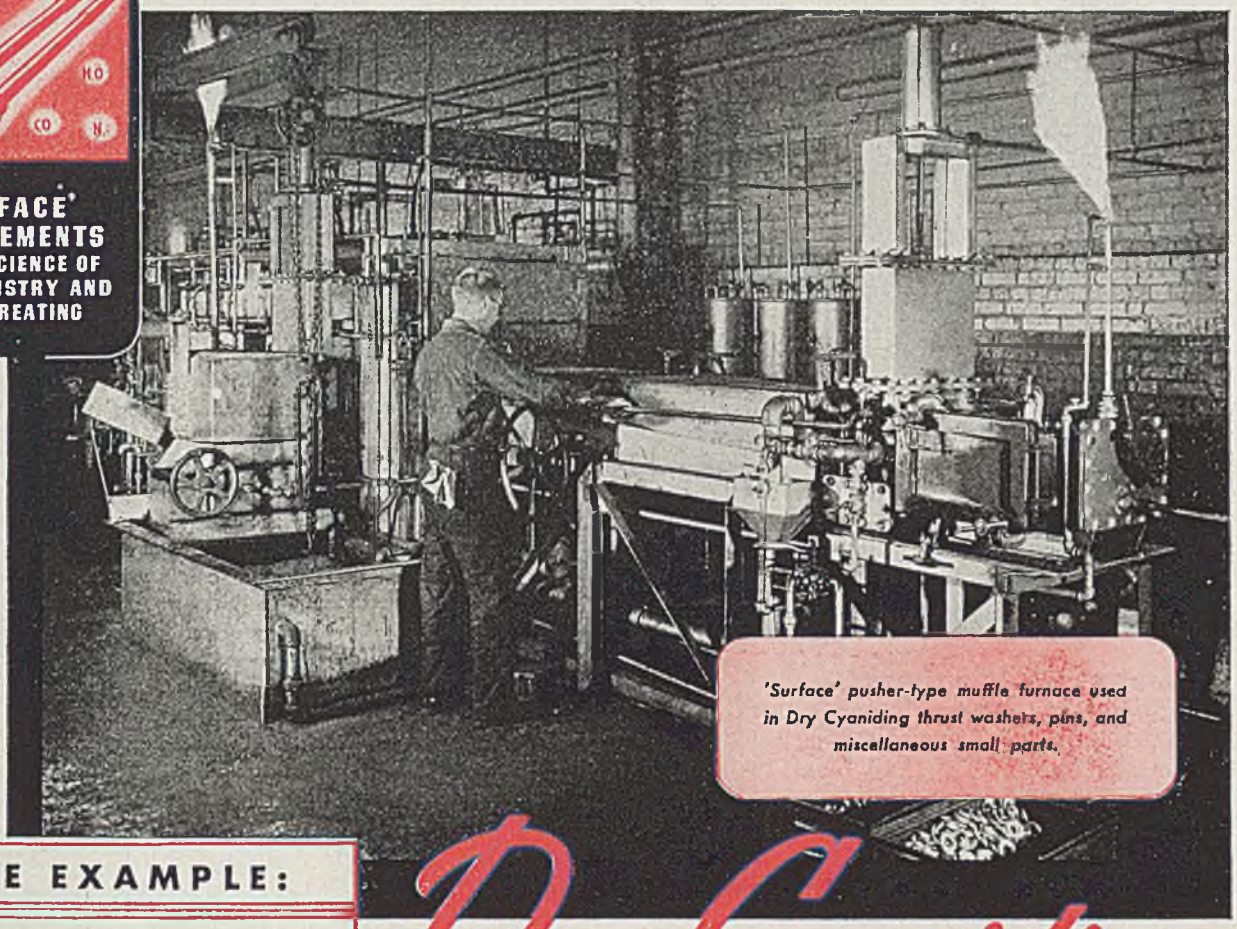
Rustproof Sheet Stands Up Under Fabrication

V. M. Darsey, president, Parker Rust-Proof Co., Detroit: "Application of a thin coating of zinc on steel followed by Bonderizing provides a product in strip and sheet form that combines excellent corrosion resistance with the paint-holding quality of metal so treated. This development is in production at several steel mills, and use was made of the product during the war to form ammunition container ends. This material provides manufacturers of sheet metal products who may not have the facilities for plating or Bonderizing, a thoroughly workable sheet already prepared and with a rust-inhibiting base. Such sheets are furnished in all popular gages and in standard widths and lengths. It is also available in coils.

"A method of treating to facilitate drawing is increasing in commercial use. The Bonderite coating serves as an excellent base for the drawing lubricant, and materially reduces wear on dies and

(*Please turn to Page* 411)

'SURFACE' ACHIEVEMENTS IN THE SCIENCE OF GAS CHEMISTRY AND HEAT TREATING



'Surface' pusher-type muffle furnace used in Dry Cyaniding thrust washers, pins, and miscellaneous small parts.

ONE EXAMPLE:

SAE 1015

DRY CYANIDING

Photomicrograph shows a typical .006" dry cyanide case put on SAE 1015 steel by treatment for approximately 45 minutes at 1500° F. followed by slow cooling to room temperature.

Dry Cyaniding

combines features of both carburizing and nitriding with the advantage of flexible and continuous control of carbon and nitrogen in the case structure. Quenching is not a requisite for obtaining extremely hard surfaces by the dry (gas) cyaniding process. Work is perfectly clean and shows substantially no distortion due to heat treatment. Any carburizing or cyaniding grade of steel or iron may be treated by the dry (gas) cyaniding process . . . The process is another 'Surface' development to come from extensive research in the Science of Gas Chemistry and Heat Treatment. Write for Bulletin SC-124 for complete details.

'Surface'

*SPECIAL ATMOSPHERE, RADIANT-TUBE FURNACES FOR: Gas Carburizing and Carbon Restoration (Skin Recovery), Clean and Bright Atmosphere Hardening, Bright Gas-Normalizing and Annealing, Dry (Gas) Cyaniding, Bright Super-Fast Gas Quenching, Atmosphere Malleableizing, Atmosphere Forging, and Specific Effects upon Metal Surfaces.

SURFACE COMBUSTION CORPORATION · TOLEDO 1, OHIO

Iron and Steel Production

Tin Plate Makers Consider Rolling Speed of 6000 FPM

G. G. Beard, vice president, United Engineering & Foundry Co., Pittsburgh: "Since the successful termination of World War II, mill and machinery manufacturers have received a large number of inquiries for new machinery, most of which entail the development of new ideas and processes. Developments have been largely in the field of flat rolled products and particularly in the rolling and surface treatment of this material.

"Developments in cold rolling, particularly that of tin plate, have been toward increased production of existing units and higher production of new units utilizing higher rolling speeds and improved materials handling facilities. In the rolling of tin plate, speeds up to 6000 fpm are now under consideration. Heavier coils are demanded to utilize the advantages of higher speeds. For this reason, considerable attention has been paid to the design of mill auxiliary equipment, for feeding the coils to the mill and for uncoiling and recoiling at the delivery end.

"Introduction of high speed to tandem cold strip mills has in turn introduced the twin-motor drive to this type of mill. Demand for sensitive speed and tension control, the limitation of the conventional pinion stand operating at high speed, and the detrimental inertia effect of large rotating parts were effective in introducing this development.

"New hot strip mills under development during 1945 on paper, but not as yet installed, give emphasis to greater production per unit by the use of heavier slab and likewise coils rather than by the use of higher speeds than those of the later prewar mills. Specifications also called for lighter finished gages than were general before the war to accommodate a definite demand for light gage hot rolled sheets and strip.

"Pickling has also seen new development aimed at speeding up and improving the efficiency of and reducing the cost of this operation. A semi-continuous pickler and other types of modified units to suit the requirements of the small tonnage plants also have been under considerable development."

Employs Labor-Saving Devices For Making Furnace Repairs

L. F. Reinartz, manager, Middletown Division, the American Rolling Mill Co., Middletown, O.: "Several plants in United States and Canada have continued experiments in the use of basic brick in the ends of furnaces from the knuckle down to the slag pockets. Others have included all-basic brick open-hearth roofs. The results, so far, have been sufficiently successful to warrant further installations.

"Suspended silica roofs have again been tried in a number of shops to increase the life of roofs and improve the safety factor when roofs must be repaired. So far, patching such roofs has not been as successful as it should be.

"Current labor shortage has emphasized the need for labor-saving devices for furnace repairs.

"A number of plants have installed suction systems for removing flue dust from checkers. Several unique types of conveyors have been perfected for handling slag out of slag pockets, as well as conveying brick for furnace repairs.

"All-welded charging and ingot cars and charging pans are being more widely used.

"During the war very little experimentation could take place because furnaces had to be put back on the line as quickly as possible whenever a repair occurred. Now that peace has come, refractory manufacturers are very active in trying to help the steel men improve the service of refractories.

"The scrap iron situation is critical in some areas. Alloy contamination is a great problem. The return of battlefield scrap iron will impose another set of problems for the harassed steelmaker.

"The fuel problem will be a serious one in months to come. The industry will be lucky if it has only one (due to coal strike) major reduction in operations this fall and winter.

"Many plants are increasing their soaking pit capacities. Various types of pits have been installed. The main aim is to have better control of heating, no matter what kind of fuel is used.

"During the war relatively few changes were made in rolling practice of standard grades of steel. The effort, now, is to train crews to go back to prewar standard practices. Return of skilled service men will go far to help solve this problem. Since V-J Day the steel industry has tried to rehabilitate some of its rolling units which gave such an exceptional account of themselves during the prewar and war days just past. More and more continuous and automatic lubrication is being installed on cranes and rolling units.

"There is a marked interest in increasing the speed of pickling as a preliminary to cold reduction. Many studies are being made in a number of plants to determine the factors which control the rate of pickling scale from hot rolled coils. Improvements are being made currently in the methods for cleaning and coating of steel sheets and strip."

Advocates Co-Ordination of Information on Steel

Earle C. Smith, chief metallurgist, Republic Steel Corp., Cleveland: "Diligent work of studying iron and steel products for purpose of description so that they might be designated by specification, proceeded under war pressure to the point that sound commercial use of those designations remains for the peacetime economy. It was not alone a job of the steel producers, for, co-operation of the military, as well as the government agencies, and the domestic and foreign users, was effective to a degree that exceeded all plans of the sponsoring organizations.

"During periods of ordinary business this work should be continued as a military insurance. It should be assisted by both government and business, so that the confusion prevalent at the start of the last two wars will not be repeated. The time element of the next war will certainly be different.

"Metals, particularly steel, were and will be again the major items of need.

All the organizations of the metal world should seriously undertake to co-ordinate information in sufficient detail to be ready at all times to meet any military emergency. The best method found to date is to standardize peacetime products, and keep military needs as nearly similar as possible.

"Co-operation between producer, user, and government representatives should continue, and any organization that does not clearly see the reason for this co-operation will find serious difficulty in existing."

Constant Control of Moisture Results in Smooth Operation

O. J. Leone, regional manager, Steel Mill Division, Bristol Co., Pittsburgh: "Control of absolute humidity in blast furnace air continues to be a live topic for discussion among operators. While it is generally agreed that constant humidity control benefits furnace operation there is a difference of opinion as to the optimum moisture level to be maintained in the blast. While some operators with dry blast systems are operating at moisture levels as low as 1 grain per cu ft of air, others are injecting moisture on the pressure side of the blower to levels as high as 20 grains. Although a number of so-called dry blast installations were made several years ago, no new recent installations have been made. A main reason for this is that the expected tonnage increases have not materialized in most installations; in addition, on many of the furnaces, drying the blast to low levels has resulted in hanging and kicking of the furnaces. Judging from recent reports it would seem that there must be a critical low humidity level for a given furnace below which further drying is not beneficial. It is interesting to note that a number of systems capable of drying to 1 to 1½ grains are being operated at 3 or 4 grain levels.

"As an alternate method of control many operators are now injecting moisture into the blast to hold a pre-determined moisture level above the normal intake humidity. Because of inability to automatically measure and control the absolute humidity in the blast main after moisture is injected, control has usually been manual, with the result that different results have been reported.

"A development which should permit wet blast control on a more scientific and accurate basis is a direct reading absolute humidity recorder which measures the absolute humidity after moisture injection and under the variable temperature and pressure conditions existing in the blast main. Constant moisture control has resulted in smoother furnace operation with less flue dust, better control of iron analysis, particularly with respect to silicon content, and in some cases small tonnage increases have been reported. If ample stove capacity is available to compensate the hot blast temperature for the moisture additions, these improved operations will be at little or no increase in coke rate; if stove capacities are too small to compensate the hot blast, operation will be at the expense of increased coke rate."

New Features Are Incorporated In Rolling Mill Equipment

F. Mohler, Industrial Engineering Division, General Electric Co., Schenectady, N. Y.: "Manifold experiences gained during the war years for producing semifinished products disclosed many possibilities for speeding up and modernizing various rolling and other processes involved in the production of finished products.

"A new 28-in. 4-high cold strip mill as well as a new 20-inch reversing, modified cluster-type cold strip mill equipped with amplidyne adjustable voltage control and amplidyne tension reel regulator were built.

"Now in the course of construction is a 5-stand, 42-in. tandem tin-plate mill which incorporates several new features and is considerably faster than any previous equipment of this type. Twin drives are used on stands No. 4 and No. 5, with a 2:1 stepup gear so as to obtain independent control of the top and bottom roll speeds and allow the use of lower speed motors. From the standpoint of possible speed range, this not only makes the mill far more flexible, but also eliminates the separate high current, low voltage IR booster generators and their high installation cost and maintenance.

"Various types of processing lines—pickling, cleaning, slitting, shearing, galvanizing, and continuous annealing lines—came in for considerable attention during 1945 from the standpoint of speeding them up, modernizing them, and improving their flexibility and operation.

"Also being built is a new 3-stand, 48-in. hot strip mill which will follow an existing 3-high plate mill and which, of course, will be used as a rougher. This mill will deliver at 1500 fpm maximum.

"Considerable equipment is being manufactured for merchant mills. The equipment for one 10-in. 18-stand mill is unique in that each stand is driven by an adjustable speed dc motor. All drives are designed to provide improved transient speed stability. This mill will deliver at 2400 fpm and is equipped with amplidyne adjustable voltage control. The arrangement of the drives is interesting in that the motors driving the vertical stands will be at approximately basement elevation, while those driving the horizontal stands will be at motor room floor elevation.

"Nearing completion is a new rod mill which is of conventional looping arrangement except that there are four drives instead of the usual three.

"Among the other equipments built during the year were several piercing, sizing, and temper mills, a radically new drawbench called the rack-type drawbench, and wire drawing and wire rewinding equipment."

Significant Developments Occur In Field of New Valve Steels

A. L. Feild, director, Research Division, Rustless Iron and Steel Corp., Baltimore: "During 1945 there was intensive activity in the field of the stainless steels and high-temperature alloys in relation to their applications for war purposes, the most spectacular of which were their use in aircraft turbo-superchargers and in the gas turbines of jet-propelled planes. While large quantities of the standard grades of stainless steel were used in both cases, a number of special high-temperature alloys found application in the turbine wheel and blading assembly. Problems involved in this assembly were further complicated by those associated with the welding operations required to join the blading to the wheel proper.

"While the development of high-temperature alloys and their fabrication was an outstanding feature of the research and development work performed by numerous companies, as well as by government agencies such as the Office of Scientific Research and Development,

there were significant developments in the field of new valve steels for internal combustion engines and in research work on stainless steels of the precipitation-hardening type.

"Special processing method for surface treatment of fabricated articles and finished products received increasingly keen attention on the part of numerous manufacturers. Among such processes should be mentioned those of electropolishing and also of blackening stainless steels. Both of these processes show every promise of greatly enlarging the markets for stainless steel products.

"Knowledge gained during the war regarding machining and welding of stainless steels and high-temperature alloys was further extended to the point where fabrication of these versatile and essential materials became more and more a matter of every day shop practice, thereby indirectly broadening postwar markets for these metals."

Temperature Measurements Are Taken During Working Stage

M. J. Bradley, Market Extension Division, Leeds & Northrup Co., Philadelphia: "Assurance that molten metal leaving the furnace meets the final chemical specifications is had by operating the furnace so that the desired physical qualities are incorporated in the metal before it is tapped. It is difficult to overestimate the important part that temperature (superheat) plays in the quality and physical properties during refining (working of the heat) and especially the tapping or pouring temperature.

"Claim for superiority of open-hearth steel is based on the fact that chemical reactions can be controlled within certain limits to provide sufficient time to shape up the heat. It is realized that the temperature of the molten bath also plays an important part in speeding up or slowing down these reactions which are in reality a product of temperature, time, and mass action. Refining operations should be based on these fundamentals and the physical qualities be considered in terms of the tapping temperature.

"Many years ago temperature studies were started on open-hearth furnaces, the scope being limited only by the equipment available. However, the demand for information speeded up the development of new tools and technique and as these became available, the studies moved from the waste gases leaving the checkers to the higher temperatures encountered in the checker chambers, fantail arches and furnace roof; at present they are concerned with flame conditions and metal temperatures within the bath. Studies are being carried on by many investigators and at present several types of temperature measuring tools are being developed, each requiring a definite technique to obtain the final results. At present some open-hearth shops and an electric furnace shop are measuring the metal temperature during the working stage and tap each heat at a specified temperature. This is resulting in better and more uniform quality as well as increased production."

New Practices in Application Of Refractories Established

H. M. Kraner, ceramic engineer, Development and Research Dept., Bethlehem Steel Co., Bethlehem, Pa.: "Ample supplies of high-quality refractories went a long way toward enabling the steel industry to accomplish its task during the past war. And this was done in spite of the general labor shortage which affected practically all industries. As we entered war, the refractories industry was better equipped with plants and technically trained personnel to supply a number of high-grade products not available in World War I.

"Several new practices in the use of refractories have been established, and many of these may be retained in the postwar period. Basic frontwalls will probably continue to be used in many plants to a greater extent than ever before. The development of all-basic furnaces with suspended roofs will undoubtedly make further progress. Several installations of suspended basic roofs have shown some interesting results and continued use should establish their real value.

"Carefully installed rammed basic bottoms have so far given a good account of themselves, particularly where a saving in installation time is imperative, and as these bottoms get older their actual performance may be better compared with that of burned-in bottoms.

"For special applications the harder-fired clay brick are becoming more common, and sillimanite and super-duty refractories are also being used more extensively and with greater profit in spite of their higher cost.

"Silica brick with lowered alumina content continue to reflect superior results in practice over brick with higher percentages of alumina, and the trend of several refractory manufacturers toward the production of brick with lowered percentages of alumina should result in the steel industry being able to procure ample quantities of superior silica refractories".

New Valve Controls Rate of Flow of Furnace Fuels

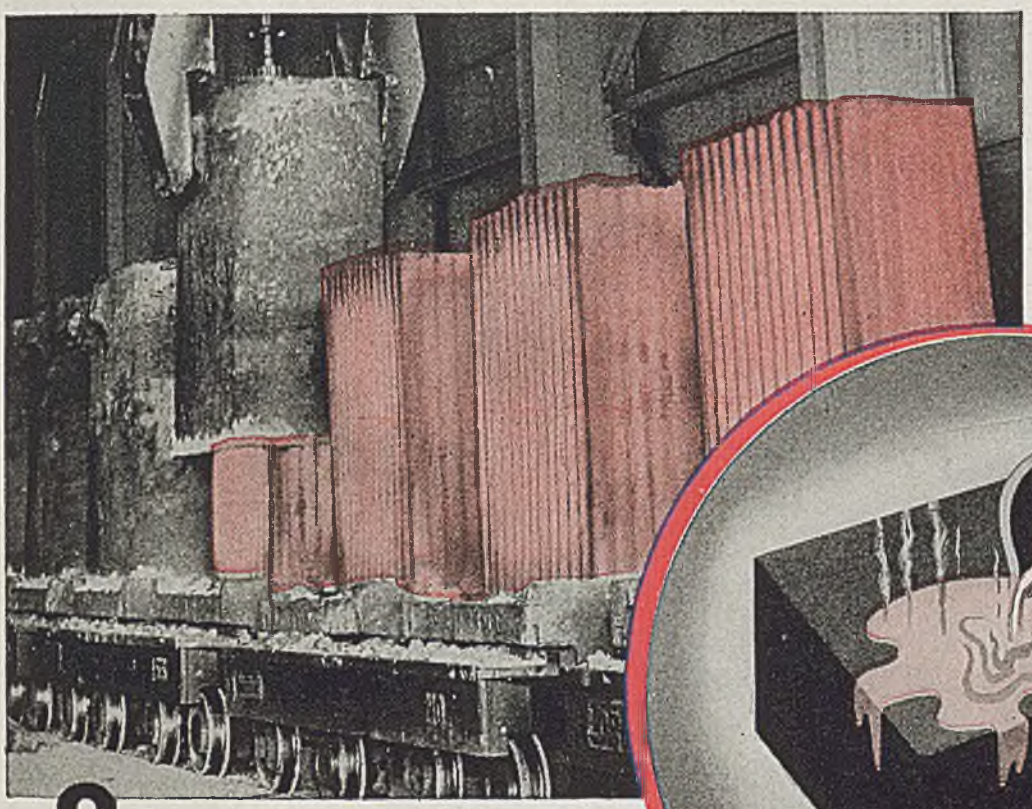
A. A. Fennell, Bloom Engineering Co., Pittsburgh: "Considerable progress has been made in applying automatic controls to melting and heating furnaces. Controlling heavy liquid fuels has been further complicated in the open hearth because of pressure changes in the system and differences of restriction in the fuel piping.

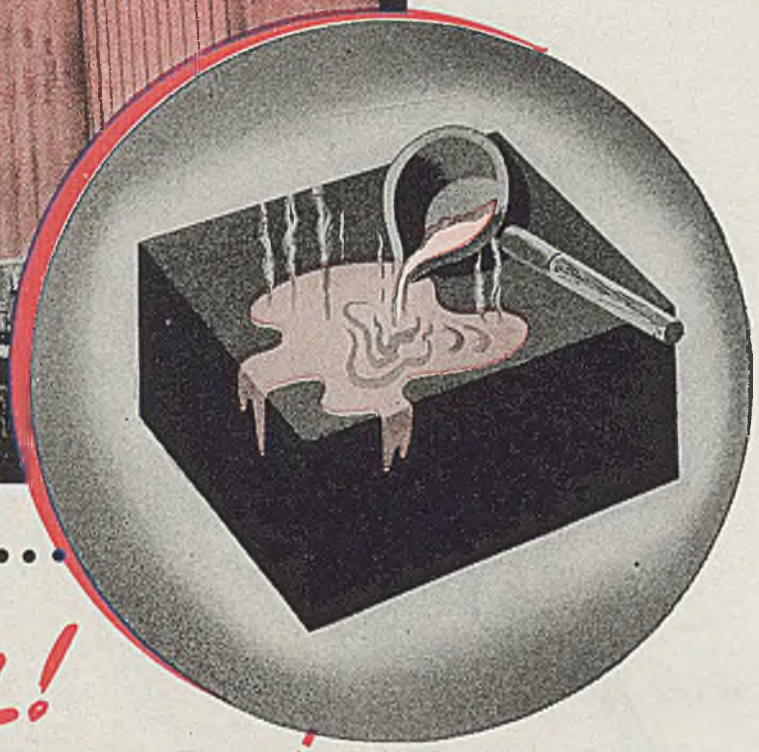
"Solids and acids present in pitch have made flow control of this fuel extremely troublesome, due to the corrosive and abrasive action on valve seats. Pulsations of piston-type pumps make control even more difficult.

"A differential flow control valve was developed to attain better furnace operation by maintaining any predetermined rate of flow regardless of pressure variations and differences in piping restrictions. The valve is essentially a piston-operated pressure regulating valve which maintains a constant differential across a variable orifice. The rate of flow, when using oil, tar and pitch, is adjusted by varying the size of the orifice".

Methods of Basic Open-Hearth Slag Analysis Rate Commendation

C. R. Funk, chief metallurgist, Railway Steel Spring Division, American Locomotive Co., Latrobe, Pa.: "Recent methods of basic open hearth slag analysis are of particular interest to all open hearth personnel. The pH method of determining basicity, the spectroscopic analysis for lime-silica ratio, and indirect analysis of basicity by converting the values of FeO and Fe_2O_3 are probably the three outstanding accomplish-





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IMAGINE!—1500 steel ingots on graphite stool inserts in one plant—*without any stickers!* That's because molten metals simply do not stick to carbon or graphite!

This eighth advantage of "National" carbon or graphite is only one of many responsible for the adoption of these materials by the metal-working industries, in the form of stool inserts, mold plugs, molds, mold wash (graphite powder), run-out troughs, and furnace linings. Another advantageous feature in run-out troughs and furnace linings: the carbon blocks are unaffected by the most corrosive slags.*

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Of parallel importance to the chemical industries are other advantages of "National" carbon and graphite and "Karbate" impervious materials. They are resistant to the corrosive action of most acids, alkalies, and solvents, and they do not contaminate solutions.

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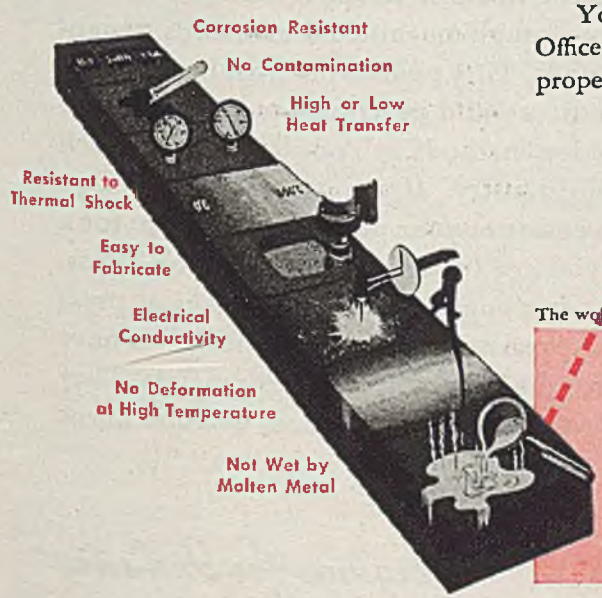

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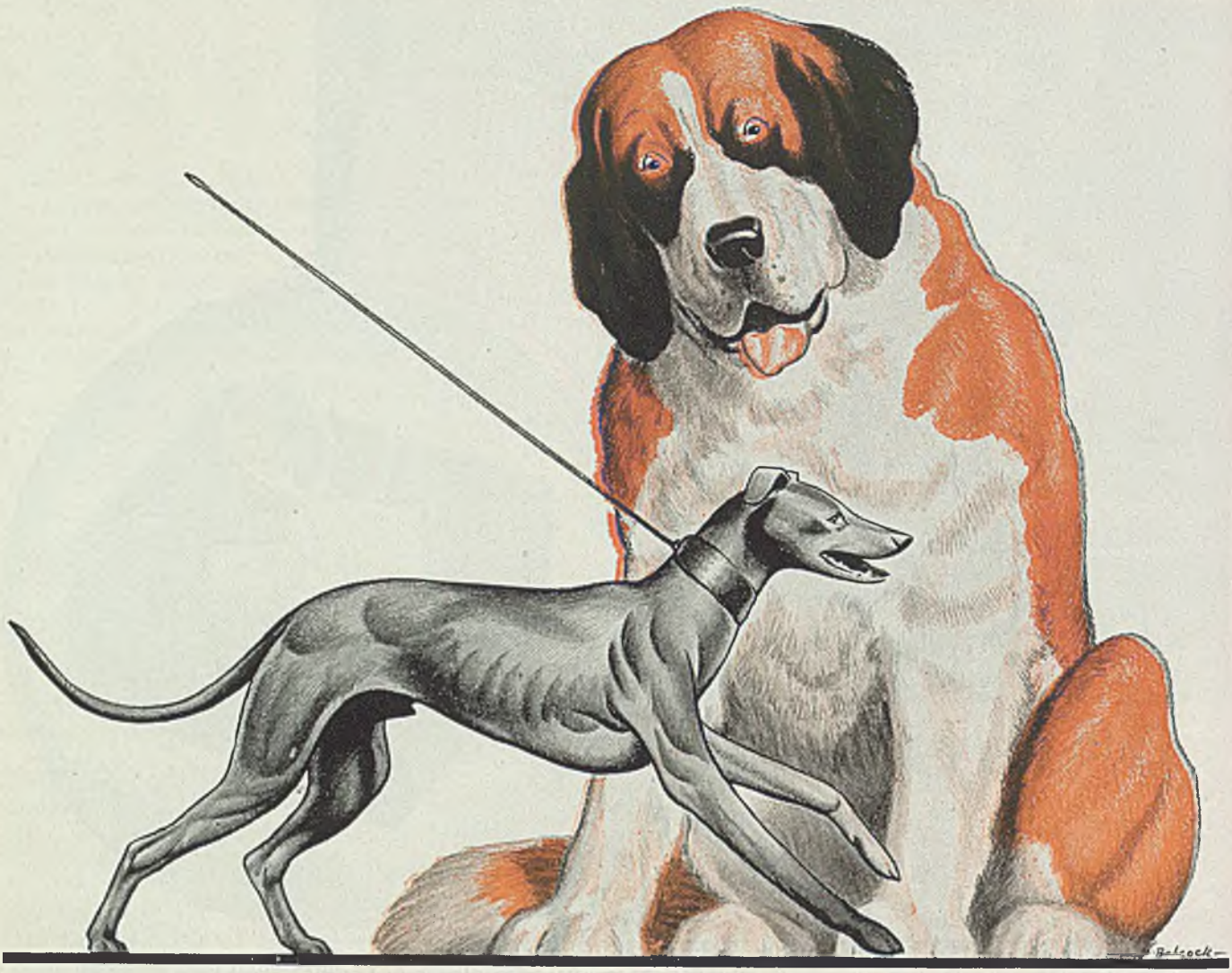
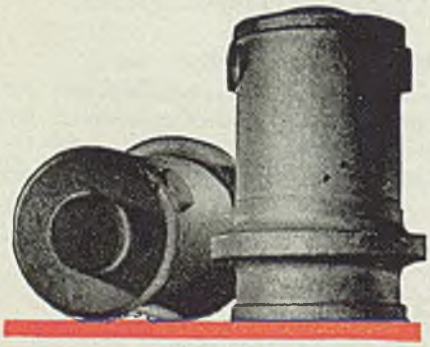


There's a vast difference in forgings, too!



ONE of Tube Turns' tough wartime forging assignments involved a cylinder head and barrel unit for P.T. boat engines. The old forging weighed over 130 pounds. Tube Turns engineers produced this one in approximately normal forging tolerances above rough machined dimensions, weighing slightly over 80 pounds. Fifty pounds of critical metal were saved, and much expensive—and precious—machining time.

New forging production methods at Tube Turns make such savings available to all industry. If you are now at work on designs for the improvement of your present product, or for a wholly new product, you are invited to consult Tube Turns. Our engineering talent, our huge upset and mechanical press forging equipment and precision heat treating facilities have achieved remarkable results with steel and light metals. They are at your service. Write, without obligation, to Tube Turns (Inc.), Louisville 1, Ky.

TUBE TURNS *Forgings for Industry*

ments with respect to giving the operator quick results of slag chemistry. There is little question that the operator must have the analysis within 10 min after test has been taken, if analysis is to be of any value.

"Published benefits of slag control have been very limited. Greatest benefit frequently discussed is that of phosphorus control, little being said about control of ore and lime additions or of improvements in steel quality, which we must assume are a part of the picture.

"Economical advantages of slag control must involve at least three things: Higher quality steel, a saving in alloys and slag forming materials, and an increase in the tons per hour of steel produced.

"Recent development of a practice of reducing chromium oxide (Cr_2O_3) from the slag to metallic chromium in the steel without increasing residual phosphorus has been a step forward in making slag control pay dividends. As high as 92 per cent of chromium charged has been recovered, with an average of approximately 80 per cent recovery obtained in everyday practice. Rigid control of slag development has made this possible. The slag pancake is employed for chemistry estimation and has proven to be entirely reliable."

Full Cold-Drawn Features Are Obtainable in Galvanized Wire

B. L. McCarthy, chief metallurgist, Wickwire Spencer Steel Division, Colorado Fuel & Iron Corp., Buffalo: "Many interesting processing problems are associated with present-day wire mill operations. As in many other industries, the war introduced, by virtue of necessity, many features which constitute definite improvements over some processing of the past.

"Outstanding in this respect is the use of galvanizing as a process treatment and the subsequent further drawing of the galvanized wire. This feature enables the wire manufacturer to produce a quality of wire in the galvanized condition similar to wire formerly produced by cold drawing, and eliminates the necessity of a subsequent heat treatment which is associated with the galvanizing. It also avoids the change in physical properties resulting from this treatment.

"Within certain limitations, items such as rope wire can today be produced in the galvanized form with the full cold drawn characteristics so desirable. Many other features of cold working, involving larger percentages of reduction as well as improved lubrication features, present interesting wire mill studies of the times.

"The question of Swedish steel versus domestic for such important items as music wire and valve spring wire is being given serious consideration. While, as of today, Swedish steel is again made available, there is every reason to believe that steel of domestic manufacture will be retained in both the valve spring and music wire quality rods.

"Modern research on heat treatment, with particular reference to tempering operations, has introduced new approaches to the manufacture of oil tempered wire. In many respects, facilities made available for atmosphere control prevent the decarburization common in annealing."

Proper Contour and Lower Costs Guaranteed by Rammed Bottoms

Everett C. Hite, combustion and refractories engineer, Timken Roller Bearing Co., Canton, O.: "The controversy of rammed versus sintered bottoms for open - hearth or electric furnaces seems to be resolving itself in favor of the ramming practice where savings in time and money are realized and a proper bottom contour is obtained. Due to these advantages it seems melt shop operators are becoming more interested in installing new bottoms at more frequent intervals and less interested in trying to beat the longest bottom life of one of their competitor's furnaces.

"Objectors to rammed bottoms point out that in burning in the rammed bottoms a considerable amount of shrinkage occurs and that in some instances where unusually thick bottoms have been installed the bottom portions are not properly burnt and many cause serious trouble if a bad boil or break through occurs. These objections are being alleviated by some operators by ramming a relatively thin bottom and in some cases thin top dressing with several inches of the old conventional sintered bottom. However, maintaining proper bottom contour again becomes a problem with increasing quantities of sintered top dressing material.

"Controversy of high versus low magnesia content ramming materials is still unsettled probably because the technique of ramming varies so much and in itself may be a more important controlling factor in the service life of a bottom than the magnesia content. It is also quite likely that the amount as well as the ratio of lime to silica in the material has a decided effect on its performance in service. The problem of evaluating competitive materials in furnace bottoms is also made increasingly difficult because rarely do two bottoms have identical service conditions."

Materials Handling Methods Reduce Operating Delays

C. D. King, chairman, Operating Committees, United States Steel Corp., Pittsburgh: "Many wartime developments will have a pronounced effect on future steelmaking operations. Improved methods of materials handling and furnace rebuilding have resulted in less furnace outage time and reduced operating delays. Use of higher pig iron charges, necessitated by scrap shortages, in turn resulted in the development of prepared charge ores.

"Further progress has been made in the use of rammed bottoms; not infrequently accompanied by a burned-in top layer of sintered magnesite and in some cases a tendency to use finer sized magnesite, has resulted in improved bottom conditions. More active interest is being displayed in the use of basic roofs.

"Operators have found considerable value in the use of flame radiation intensity measurements, providing a means of checking furnace operation and design. Improved analytical methods such as spectrographic, thimble tests, glass tube tests, etc., have contributed to rapidity of analysis and, in some cases, accuracy as well. A greater appreciation of the need for more precise quality control has stimulated the use of statistical and multiple correlation techniques."

All-Basic Open-Hearth Furnace Made Much Headway in 1945

R. P. Heuer, vice president, General Refractories Co., Philadelphia: "Considerable progress was made in 1945 toward the all-basic open hearth furnace. Fully basic ends were proved to be a definite economy over silica or the combination of silica with basic end walls.

"First furnace to be built with fully

basic ends was put in operation in May, 1944, and by August, 1945, had made approximately 152,200 tons of steel. At this point, saving over nonbasic construction was $0.079 per ton, or $12,000 for this one furnace. Only repairs necessary after production of 152,200 tons of steel were limited to the areas above floor level, so ultimate saving eventually will exceed that given.

"As a result of this performance, four additional 180-ton furnaces will be rebuilt with similar end construction. In another shop a furnace with fully basic ends was put in operation late in 1944. Experience to date has been so satisfactory that a second furnace is being rebuilt with basic ends, and this construction will be extended to the other furnaces as rapidly as feasible.

Results with Basic Roofs

"First real trials of basic main roofs were made in 1945. Two furnaces, each incorporating both basic main roof and basic ends, were operated. Detailed records are available on one of these, and first results are highly encouraging. Higher furnace temperature is permissible with the basic roof and this is reflected in time required per heat. Over a campaign of 331 heats, heat time on the basic roof for 180 ton heats was 55 min less than for silica roofs. Extra tonnage produced effected a substantial reduction in fixed charges. Campaign of 331 heats was shorter than was desired.

"It is believed that life of the roof will be lengthened by better knowledge of roof construction. The fuel consumption was slightly higher than anticipated. Much of this higher fuel consumption is believed due to air infiltration in the ends and fantails.

"The matter of efficient use of fuel requires additional study of combustion problems and regeneration. A second basic furnace was put in operation in August, 1945, and further studies are being made."

Top-Fired Soaking Pit Avoids Flame Impingement on Ingots

James M. Guthrie, assistant secretary, Loftus Engineering Corp., Pittsburgh: "For more uniform distribution of heat throughout soaking pits during all phases of heating cycles, an ingot heating pit has been designed for top firing by four burners located so that direct flame impingement upon the ingots is avoided. Two burners are built in each endwall in staggered position. By operating each pit with four burners the time required for equalizing the temperature of the ingots from top to bottom is reduced, due to the more uniform temperature of the pit during the period of initial heating cycle.

"Highly luminous, long flame, low-pressure burners are employed in order to effect a progressive release of heat in the course of flame and gaseous flow downward between and around the ingots. Products of combustion exist through outlet ports located in the endwalls of the pit, beneath the burners and near the top of the coke breeze.

"The pit furnace may be designed with or without recuperators, depending upon the fuel supply available. Any type of fuel may be used to advantage. Each pit is automatically controlled throughout, with provision for manual operation."

Developments Foreshadow New Technology in Metallurgy

Charles M. Parker, secretary, Committee on Manufacturing Problems, American Iron and Steel Institute, New York: "Close of hostilities has brought to the steel industry many problems not so much connected with reconversion as with future progress. Technical reconversion problems of the industry have been taken in full stride.

"Steel metallurgists both here and abroad have long been conscious of the benefits to be incurred by regimenting the actions of the atoms in steel and its alloys. In America the first grain-oriented steel to be produced is now an article of commerce, while from Russia come tales of a steel having a modulus of elasticity 40 per cent greater than any commercial steel. Such developments get close to atomic concepts.

"A newly developed beryllium steel is reported to attain its maximum hardness and resistance to creep at about 1300°F. Thus the trend toward the extremes of the temperature range starts, as well as the use of more exotic elements in steelmaking.

"The foregoing developments seem to be shadows of a newer technology in metallurgy in which hardenability curves and S-curves will in a large measure replace chemical composition and the iron-carbon diagram. It seems fair to predict that the microscope, aided by the X-ray, spectroscope, and electron microscope, may become the major research tool of the near future."

Removal of Price Controls To Restore Competition

William P. Witherow, president, Blaw-Knox Co., Pittsburgh.: "A removal of price controls bringing the return to a healthy competitive condition, which has always acted as a brake on the rise in the cost of living, will take our country into a new era of prosperity faster than any proposed cure for the postwar slump.

"We are about to enter a period of vast expansion and progress, which will continue for a considerable time without a let-down, and the sooner we do so, the better for our national well-being.

"Security and comforts for which the citizens have been longing can only be attained by a common determination, similar to that which brought the palm of victory to our arms. We can be headed toward our goal quite rapidly if there is a minimum of interference with the carefully studied production programs that are gradually being put into action.

"Number of orders for peacetime goods already received indicates that the nation is on the threshold of an era whose prosperity will be unmatched by any other heretofore recorded by history. In order to make that prosperity a reality, we must all pull together. If dislocations of the nation's orderly reconversion are permitted to retard our swing into a bountiful future, then the good times which have been so confidently predicted by many, may be a long way off.

"The only machine that will provide jobs and opportunity is production. We must permit nothing to throw sand into its gears".

Canadian Company Pleased With Basic Construction in Furnaces

A. K. Moore, superintendent of open hearths, Steel Co. of Canada, Ltd., Hamilton, Canada: "At present, and during the past year, perhaps the most interesting phase of developmental work at this plant has been experimental use of basic construction. Progressing from an experimental full basic end on one of our 50 ton furnaces in our No. 1 open hearth we installed suspended basic construction on both ends of one of our 180 ton furnaces. This construction

(*Please turn to Page* 398)

Limitations of Centrifugal Casting Better Understood

John Howe Hall, Swarthmore, Pa.: "In 1945, there was little entirely new in the steel foundry industry, but a lot of progress was made in exploring and developing methods and processes already initiated.

"Centrifugal casting came in for considerable attention, and some outstanding jobs were done. In particular, there was a bit of what might almost be called debunking, and the limitations of the process are now better understood than a year or two ago. Its real usefulness in several fields has been confirmed. Centrifugal casting of special alloys for high temperature application in gas turbines and jet motors, has been further developed in several foundries specializing in these unusual metals.

"Precision casting methods, mentioned by everyone as an outstanding development of 1944, was further exploited, and there will undoubtedly be a lot of development of the process in the next few years.

"Compositions and heat treatments for heavy cast armor parts came in for a lot of attention, most of the information on the subject still being 'restricted'. Manufacture and heat treatment of heavy one-piece cast armor parts for American, British and Canadian tanks, was one of the outstanding wartime accomplishments of the industry.

"Specifications for steel castings have come in for considerable attention, and the ASTM is moving toward simplification of the top-heavy list of specifications that is now on the books. Less progress was made in this respect on the specifications for castings for high temperature service than might have been wished, but in this matter it is particularly true that large bodies move slowly. SAE is preparing to shatter precedent by drafting a specification for carbon and alloy castings for automotive service, some of which will be bought on a hardenability requirement in addition to (and partly superseding) the usual physical property requirements.

"Steel Founders' Society of America has published the results of outstanding research work carried out under their supervision. In particular, a study of core oils, and one on the dimensions of necked-down risers, are of very great value."

Better Heat Control Produces Metals To Very Close Limits

A. W. Gregg, executive engineer, Foundry Equipment Department, Whiting Corp., Harvey, Ill.: "Improved controls for all kinds of melting furnaces have made it possible to produce metal to close limits with respect to chemical composition, physical properties (both static and dynamic) and microstructure.

"In the steel foundries, there has been a great increase in the use of liquid quenching and tempering, practiced in the past by few foundries.

"Automatic regulators for operating electrodes in arc furnaces introduced about 30 years ago have been constantly improved. The most popular regulator today is the rotating type. Electronic control equipment recently introduced, and to some extent still in the development stage, may prove to be the most accurate and most responsive of all regulators. The equipment has no moving parts and maintenance should be limited to tube replacements.

"Hydraulic control equipment for positioning electrodes is gaining in popularity. Rapid response to the electrical control equipment and exceedingly accurate positioning of electrodes are demonstrated features of this type.

"An improved design for top charge electric furnaces has been introduced recently wherein the roof only is raised prior to swinging it aside. This design permits the use of much smaller hydraulic cylinders. The weight of the roof *only* is uniformly distributed on the sidewall rafractories in this furnace. Side-blow converters have experienced a revival of popularity because of the development of electronic flame control equipment. This instrument records the luminosity of the flame and catches the end point of the blow more accurately than is possible for the human eye. The equipment indicates when a boil is about to occur enabling the operator to reduce pressure promptly. Because of this, blowing loss has been materially reduced.

"A new design for the side-blow converter has been developed by a steelmaker who has been experimenting with them. Apparently the equipment will have advantages over the orthodox vessel in greater flexibility, better lining life and reduced blowing loss. Steel mill operators have become interested in side-blow operation because of the fact that there is practically no pickup of nitrogen during the blow in contrast to the high nitrogen pickup experienced in standard bottom-blow bessemer operation. The new design for the side-blow converter makes possible greatly increased capacities as compared with the older type of vessel."

Bell-Type Annealing Furnaces Show Advantages in Foundry

Harry A. Schwartz, manager of research, National Malleable & Steel Castings Co., Cleveland: "Apparently, the malleable foundry industry in particular, and the foundry industry in general, is like almost all other branches of manufacturing, being required to more and more greatly mechanize its processes. It is, of course, merely platitudinous to say that as wage rates rise, industry can spend more and more in the form of capital investment, depreciation and maintenance on equipment, provided this equipment increases production per manhour.

"In the foundry this has meant further development of continuous pouring and the conveying of molds, castings, etc. In the annealing departments of malleable foundries it has created an interest in various types of more modern units. Particularly the bell-type annealing furnace in which a muffle heated electrically or by radiant tubes, is lowered over a charge to be replaced later by another bell at lower temperature, is being studied attentively in many quarters, and has been introduced in some places.

"There is an increasing tendency for

the co-operative solution of various fundamental problems. The Steel Founders' Society of America has financed and is conducting a rather extensive research project in co-operation with various appropriate agencies. The American Foundrymen's Association has long been active in this direction and is becoming more so. This trend was strongly increased by government pressure during the war for interests working in the same field to co-operate and exchange information. Apparently, to some extent at least, the results have commended themselves sufficiently to justify the continuance of such relations."

Designer and Foundryman Co-Operate To Insure Quality

Carl F. Joseph, chief metallurgist, Saginaw Malleable Iron Division, General Motors Corp., Saginaw, Mich.: "Malleable iron industry will prosper in the peacetime era to a greater extent by constantly producing better product. One of the factors influencing quality of castings is the co-operation between designer and foundryman. Trend in recent years has been in the direction of better relationship between these two departments, and the necessity for the continuance of this cannot be emphasized too greatly.

"The casting industry is too often blamed for failures due, in many cases, to faulty design. Excessive foundry scrap, unsound castings and continued foundry troubles on many jobs could be eliminated or reduced if the casting had been properly designed at the start. Whole-hearted collaboration between the designer and the foundryman is essential from inception of the idea to delivery of the casting as a finished piece.

"Some purchasers have inaugurated an idea that is worthy of further thought by other casting buyers. In purchasing their castings, the following notice is enclosed with the blueprints and purchase order:

'Important Notice
To Foundry

'We depend on your experience as foundrymen to guide us in all problems of foundry practice, and therefore request that you make a thorough study of this casting before proceeding with construction of pattern equipment.

'If you have any suggestions for changes in design, which, in your opinion, will facilitate the foundry problems and will result in better castings, they will be given every consideration in the light of functional design. If no suggestions are made, we must consider it as your acceptance of the design.

'We are attaching extra drawing, and we ask that same be marked up showing parting line, gating, etc. and returned promptly. Our tool design will then establish locating points for first and second operations, and these locating points will be incorporated on the drawing and copy showing same will be sent to you.

'Your co-operation and promptness in following this procedure will be appreciated'.

"Co-operation of this kind is what the foundry industry welcomes. It creates a better understanding of all problems involved in the production of satisfactory castings. As our industry moves further into the peacetime era, production of cheaper and better castings will become paramount in the minds of all progressive foundrymen."

S-R Method of Stress Analysis Recommended as Research "Tool"

John W. Bolton, chief metallurgist, Lunkenheimer Co., Cincinnati,: "Among the many developments in the iron and nonferrous foundry fields likely to prove quite significant in the future, but as yet having little notice in the trade press are application of the S-R (stress resistance) method for evaluation of stresses in cast irons, and studies of directional solidification in nonferrous alloys. While well publicized within a restricted group, it perhaps is not fully realized by metallurgists in general that the current studies on graphitization in low carbon wrought and cast steels is going to promote better understanding of certain features of the iron carbon diagram—also to influence choice of alloys, applications of welding techniques, and methods used in manufacture of said wrought and cast products.

"Appearance of a standard specification (ASTM-A-278) for cast irons usable to 650° F suggests suitability of same for pressure vessels at temperatures well above those permitted by various code and regulatory bodies. The reactions of these bodies, and of manufacturers of these products toward this specification will prove interesting. To date it appears that there is considerable inertia, if not reluctance, to take advantage of newer and improved classes of cast iron for such usage.

"Extension in usage of gray iron depends upon sound evaluation of its properties. Since gray irons are not truly elastic materials, the convential formulae do not apply in respect to true developed stresses. SR (strain-resistance) gages can be used to determine strains and stresses developed in beams and other members. This was described last September before ASME's Cincinnati meeting."

Low Temperature Equipment Suited for Cast Steels

Charles W. Briggs, technical and research director, Steel Founders' Society of America, Cleveland,: "Technical developments have been made in the steel casting industry during 1945 in two major ways: (1) Through an understanding of the critical dimensions of necked-down risers, the production of high quality castings has benefitted and operation costs have been reduced in the cleaning department; and, (2) during the year the industry has compared core oils and binders in order to develop acceptance tests of these important material supplies. One of the reasons for making such studies was the interest that has been taken by the industry to establish procedures of quality control throughout the steel casting manufacturing cycle. A control of the quality of the supplies will go a long ways towards establishing quality control procedures in an industry.

"Considerable information on the properties of carbon and alloy cast steels at low temperatures, down to minus 185° F, has been obtained during the past year. The values indicate that cast steels are to be preferred as engineering materials for equipment operating at low temperatures. Also, a greater understanding of hardenability bands is being attained by the industry through research studies and through the correlation and comparison of cast steels with wrought steels of similar composition. Hardenability values show that results can be used interchangeably.

"Studies on the improvement of surface appearance of castings have gone

forward through co-operative research between a university and a number of steel foundries, under the direction of the Steel Founders' Society of America."

Great Increases in Strength Of Cast Iron Reported

Donald J. Reese, Development and Research Division, International Nickel Co. Inc., New York: "Cast iron 'Picture of the Year' was that of atom-bombed Hiroshima showing undamaged cast iron radiators in the midst of complete destruction. As the type of cast iron used in radiation castings is not designed for impact resistance or any other demanding engineering property one might well ask, 'Is this material as brittle as is commonly supposed?' or 'What are the engineering properties of cast iron designed for engineering services?'

"The day has passed when the engineer will accept 25,000 psi as the ultimate strength of cast iron and with a factor of safety of 10 bases his design on a unit stress of 2500 psi. During the year one of our nationally known manufacturers obtained ultimate strengths of 108,500 psi on 1.2 in. diameter sections. There are producers throughout the land consistently adhering to specification requirements for engineering gray irons. Instead of a factor of safety of 10, the design engineer can reduce this factor of ignorance by 75 per cent and still have all the assurance he needs. Although no one will propose that he reduce this factor to unity, there have been destructive tests, investigating stresses used in design, that reached unity before failure occurred.

"We have known too little about the material gray iron. During 1946 the Navy put a directive on the Naval Research Laboratory intended to develop fundamental knowledge on this engineering material. The Gray Iron Founders' Society established a fellowship to permit further research at one of our engineering schools. This is in addition to their program of fostering fact-finding investigations in engineering schools. There are numerous other developments of this type intended to develop engineering data on this material.

"The industry has determined that its capacity in terms of product tons is 19 million tons annually, and that it now has an accumulated demand of 30 million tons. This industry is conscious of its responsibility to the nation's welfare. Though it has capacity to satisfy a major portion of today's real requirements, the industry is expanding its facilities for specific products, it is installing mechanical devices to lessen the physical efforts of humans and it is making the foundry an attractive and pleasant place to work."

Meehanite Castings Made by Investment Molding Technique

Oliver Smalley, president, Meehanite Metal Corp., New Rochelle, N. Y.: "During the past 12 months considerable experimentation has been conducted on the applicability of Meehanite, cast iron and steel to investment molding and some interesting results have been obtained.

"Manufacture of castings to precise dimensions is claimed to be one of those advances coming out of the war. The method employed—the so-called lost wax process—has been successfully used largely in making castings up to 7 lb in weight where the form did not permit machining or where production to exceedingly fine dimensions was necessary.

"In the manufacture of Meehanite and steel castings by this process, where plaster is not desirable as a bond, a high-grade silica base material bonded by a silicate or silica-forming compound that sets up quickly is usually selected. Ethyl silicate is supplied in solution form, mixed with alcohol and, upon the evaporation of the alcohol, subsequently dehydrates and deposits a jelly silica bond in the interstices of the refractory grains, thus producing a refractory that is exceedingly smooth.

"We have not made any outstanding progress in the basic founders' craftsmanship, but we have made considerable progress in the production of castings at lower cost and in the ability to produce a metal better fitted to withstand the high stresses of modern engineering service.

"Greatest asset of the casting industry is its flexibility. No matter what the form, molten metal will faithfully follow its convolutions. This art is capable of making metal take such an infinite variety of shapes or forms in three dimensions, a fact sometimes overlooked on the basis of engineering necessity and because of opinions formulated from the false premise that iron castings are inferior to other materials of construction.

"A more balanced viewpoint toward casting is being attained in engineering thinking. Designers are giving much more attention to stress analysis as a guide in arriving at final design, for such analysis enables location of material in the most advantageous manner to resist imposed stress or to produce the greatest rigidity in the most satisfactory manner. The stress analyst is of great assistance in helping cost determinations by deciding upon these factors from his point of view.

"With these thoughts in mind, members of the Meehanite Research Institute are going to continue in 1946 to place emphasis upon studies of stress distribution by experimental means including photo-elasticity, stress gage analysis, stresscoat or brittle lacquer analysis."

Gray Iron Found Resistant to Breakage and Distortion

W. L. Seelbach, secretary and treasurer, Forest City Foundries Co., Cleveland: "There probably have been more gray iron foundries mechanized during 1945 than all the preceding years added together. A great many companies are contemplating mechanization of their foundries in '46. This is a very important step because it will give the users of gray iron castings a cleaner and more uniform cast iron to work with. In addition to this mechanization of gray iron foundries, it will eliminate considerable excess labor; will permit the foundries to be better ventilated, cleaner and more attractive to the foundry workers.

"Another outstanding development for 1945 is the progress that has been made in cupola research by some of the gray iron foundries. This is of great importance because it should enable those foundries to produce a consistently uniform gray iron casting with chemical and physical properties that can be controlled to a minimum variation.

"The year 1945 proved a recognized fact that gray iron can stand a tremendous amount of shock and pressure without breakage, distortion, or warping. This was proved by a picture taken by Associated Press of a section of Hiroshima after the atomic bomb blast. This picture shows two cast iron radiators which are the only two metallic articles

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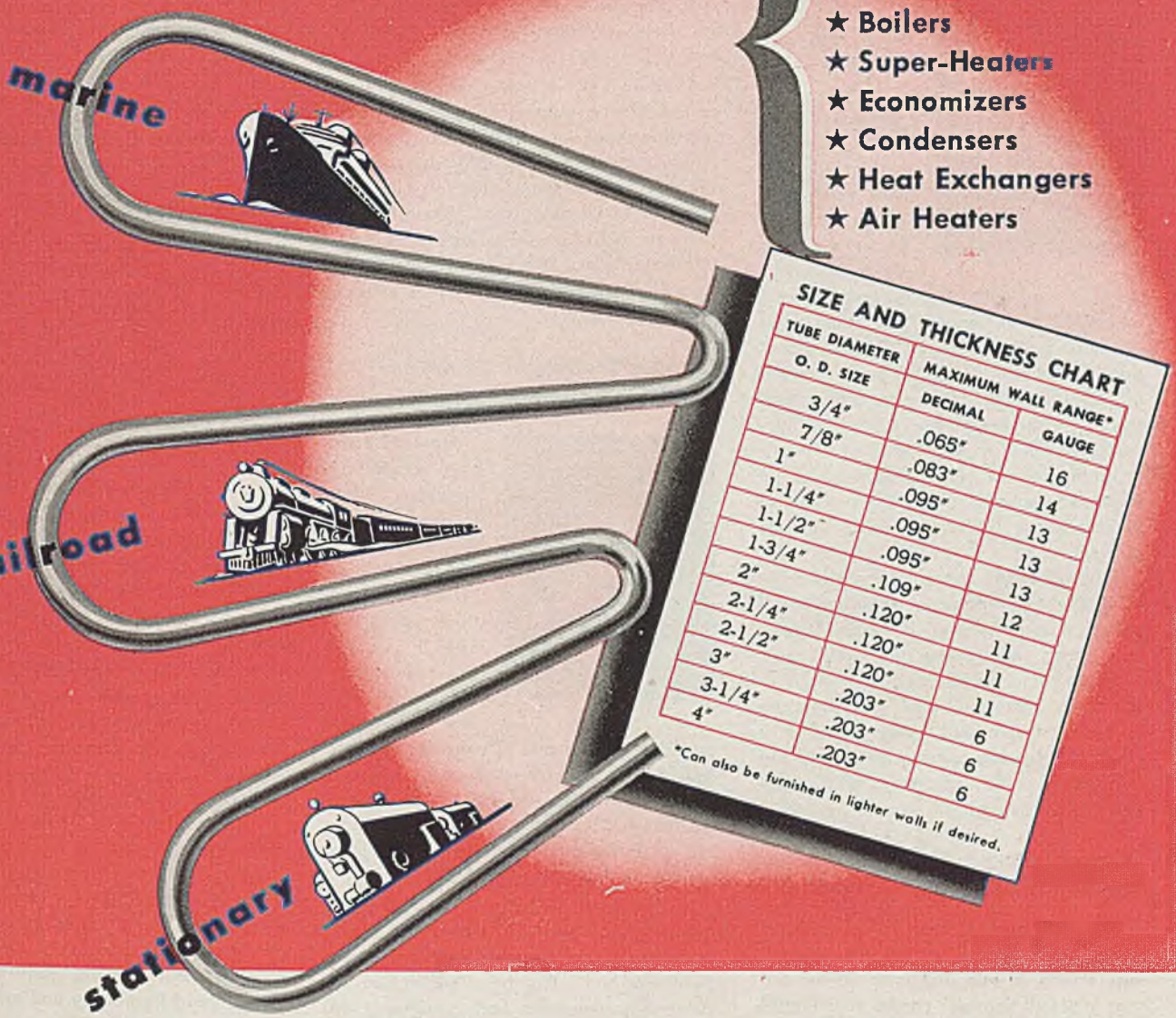

SIZE AND THICKNESS CHART

TUBE DIAMETER O. D. SIZE	MAXIMUM WALL RANGE* DECIMAL	GAUGE
3/4"	.065"	16
7/8"	.083"	14
1"	.095"	13
1-1/4"	.095"	13
1-1/2"	.095"	13
1-3/4"	.109"	12
2"	.120"	11
2-1/4"	.120"	11
2-1/2"	.120"	11
3"	.203"	6
3-1/4"	.203"	6
4"	.203"	6

*Can also be furnished in lighter walls if desired.

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in the entire area covered by the picture that are not either shattered, distorted, warped or crushed.

"It took an atomic bomb blast to prove what gray iron foundrymen have always known."

Modernization of Equipment to Result in Higher Grade Product

R. G. McElivee, manager, Iron Foundry Division, Vanadium Corp. of America, Detroit: "Visits among the gray iron foundries which make up this vast industry have disclosed a very definite trend toward modernization of equipment. In some cases emphasis is being placed on better production facilities which tend toward more efficient operation, in other cases toward closer controls which will be reflected in a higher grade product. Standardization of methods brought about by improved facilities will itself be helpful in securing a better and more uniform product.

"Housekeeping to make foundries more attractive to workers is receiving much attention and will also have its influence in quality. Altogether the whole trend is in the direction of more scientific control and operation, and of laboratory facilities which will make possible a closer relationship between the specifying engineer and the company which produces the castings."

Furnace Silver Brazing Solves Complex Design Problem

S. D. Heron, Research Laboratories, Ethyl Corp., Detroit: "In many cases, cast iron is an essential material for certain types of internal combustion engine cylinders. In some cases the design requirements are such that cylinder parts become very difficult to cast, particularly where pressure tightness to high pressure gases and to liquids of high penetrating power is concerned.

"Recent experience with such castings has indicated that a difficult casting problem may be solved by the use of two or more very simple castings assembled into a unit by furnace silver brazing. If desirable, a composite structure of cast iron and steel may be used. Until the recent development of the Kolene process, silver brazing of cast iron was not a commercial process. Furnace brazing of so treated cast iron parts using preplaced silver alloy inserts now appears to be a simple and acceptable commercial process.

"Designers (among them the writer) of liquid cooled engines have too frequently in the past and even during present time, shown a strong tendency to push their design difficulties into the iron foundry. In many cases this proceeding not only increases costs but produces a not too reliable product, since core sand and core wires cannot be definitely detected nor can they be removed.

"Use of a silver brazed assembly may, on the face of it, appear to increase costs, but this view neglects the often considerable costs of foundry difficulties. Furthermore, the designer, due to space limitations, often wishes to separate two parts by as little as ⅛-in. or less of cooling water space but is unable to do so as such thin cores will wash in a large percentage of cases."

Smaller Malleable Foundries Improve Handling Facilities

James H. Lansing, consulting engineer, Malleable Founders Society, Cleveland: "During wartime months of 1945, production of malleable iron castings was maintained at annual rate of close to one million tons. Reconversion and, in some cases, substitution of lighter peacetime castings for heavier armament ones, during final months, probably lowered the annual total below that of 1944.

"In 1946, an activity of the malleable industry, which should prove significant and of value as it moves further into the peacetime era, has been utilization of plant improvements and equipment to increase efficiency, reduce heavy work and improve working conditions. As in preceding years, larger plants and those engaged in long running production work have continued their mechanization programs.

"Of particular interest, however, and to their advantage, have been the steps taken by the smaller plants and ones whose diversified production is not well adapted to continuous conveyor operation. These plants have made such improvements as installing small tractor yard cranes for unloading and handling material; utilizing electric or gasoline powered trucks to charge furnaces and handle material throughout the plant; installing molten metal handling equipment; employing gravity roll conveyors; and installing annealing pot handling and exhausted pot dumping and packing handling equipment. For improved quality control, greater use has also been made of laboratory facilities.

"It is believed that the improvements made during 1945 will not only make for more efficient operation, but will aid in solving the continuing manpower problem by permanently establishing the foundries as desirable places in which to work."

Future Steel Castings To Be Subjected to Severe Service

Frank X. Hohn, assistant works manager and chief metallurgist, Scullin Steel Co., St. Louis: "With the end of war, industry is free to incorporate all of its amassed knowledge of quality and quantity control into their peacetime production. This will have the effect of not only giving the consumer more for his money, but of increasing his demands for manufacturers' products and of proving his confidence them.

"Radio offers frequency modulation, color television, and a host of electronic devices. Transportation offers improved diesel engines, gas turbines, and jet propulsion to mention a few. What then, have we in the steel industry to offer?

"It is evident that in the future steel castings are going to be asked to take and withstand a terrific beating. Operations at high temperatures, pressures, and stresses will be the rule rather than the exception. We may even be asked to develop steel castings that will stand the rigors of harnessing and using atomic energy.

"In my opinion, one of the factors which the industry has to offer and which will help meet these problems is control of metal soundness through widespread use of radiographic inspection, for this is a primary consideration, in the long life and useful service of any steel casting. Army, Navy and Air Corps have shown how a sound casting will outlive and outperform an unsound one; and on the basis of this, required that at least their highly stressed castings meet certain standards of radiographic quality. It would be well to supply this vast experience to our peacetime production.

"In our plant we have found that radiography not only helps in establish-

Where lightness cuts . . . fatigue

cuts time . . . cuts labor . . . cuts cost

Here's a sturdy portable power saw built to cut more than lumber! It's cutting *expenses* on many a job. Skillful design, with *lightweight magnesium,* has held its weight down to 36 pounds.

This product is regarded by its manufacturer, The Mall Tool Company, as the most powerful saw of its type for making heavy cuts. Its combination of lightness and strength owes a great deal to the durable magnesium castings that form the motor housing and back handle, weighing only 2½ lbs.; gear housing, 3½ lbs.; upper guard, 2 lbs.; lower guard, 1 lb.; front handle, ¼ lb.; and bearing cap, ⅓ lb.

It's one of many fine new products making use of magnesium. For further information, contact the nearest Dow office.

Ready . . . to make products move!

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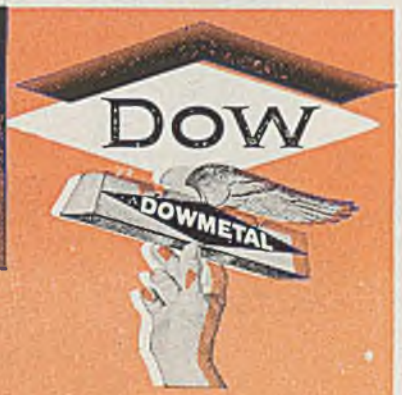
LIGHTEST OF ALL STRUCTURAL METALS

Produced by Dow in ample quantities, magnesium metal is now freely available in all common forms for widespread use.

Many modern plants throughout the country are working with magnesium, following standard procedures and shop techniques.

Magnesium parts of virtually every size and description are being used in a growing variety of fine new products of many kinds.



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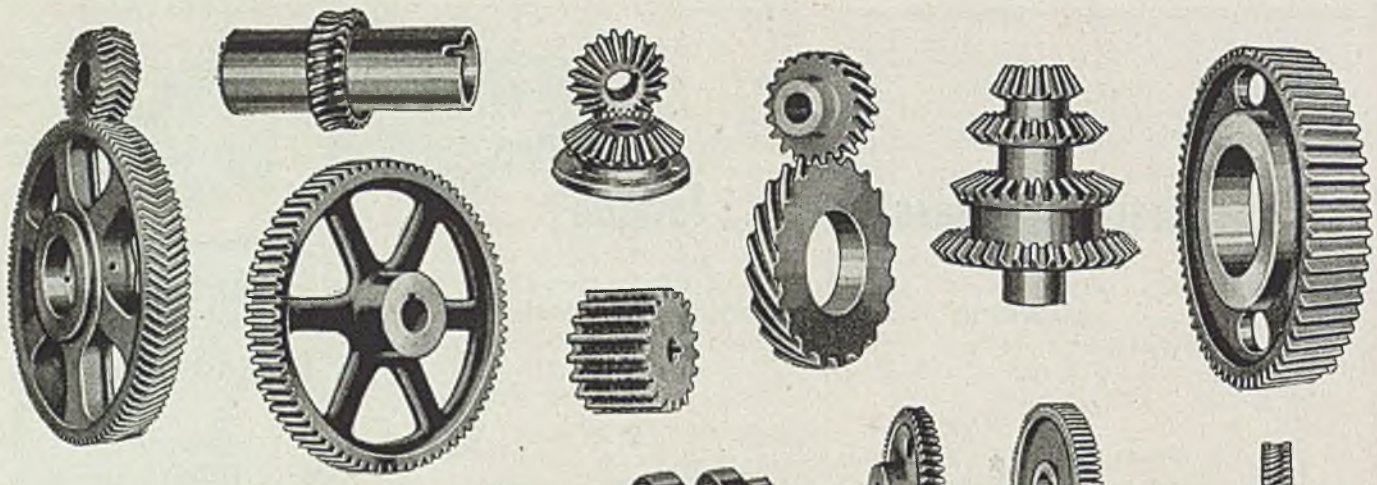

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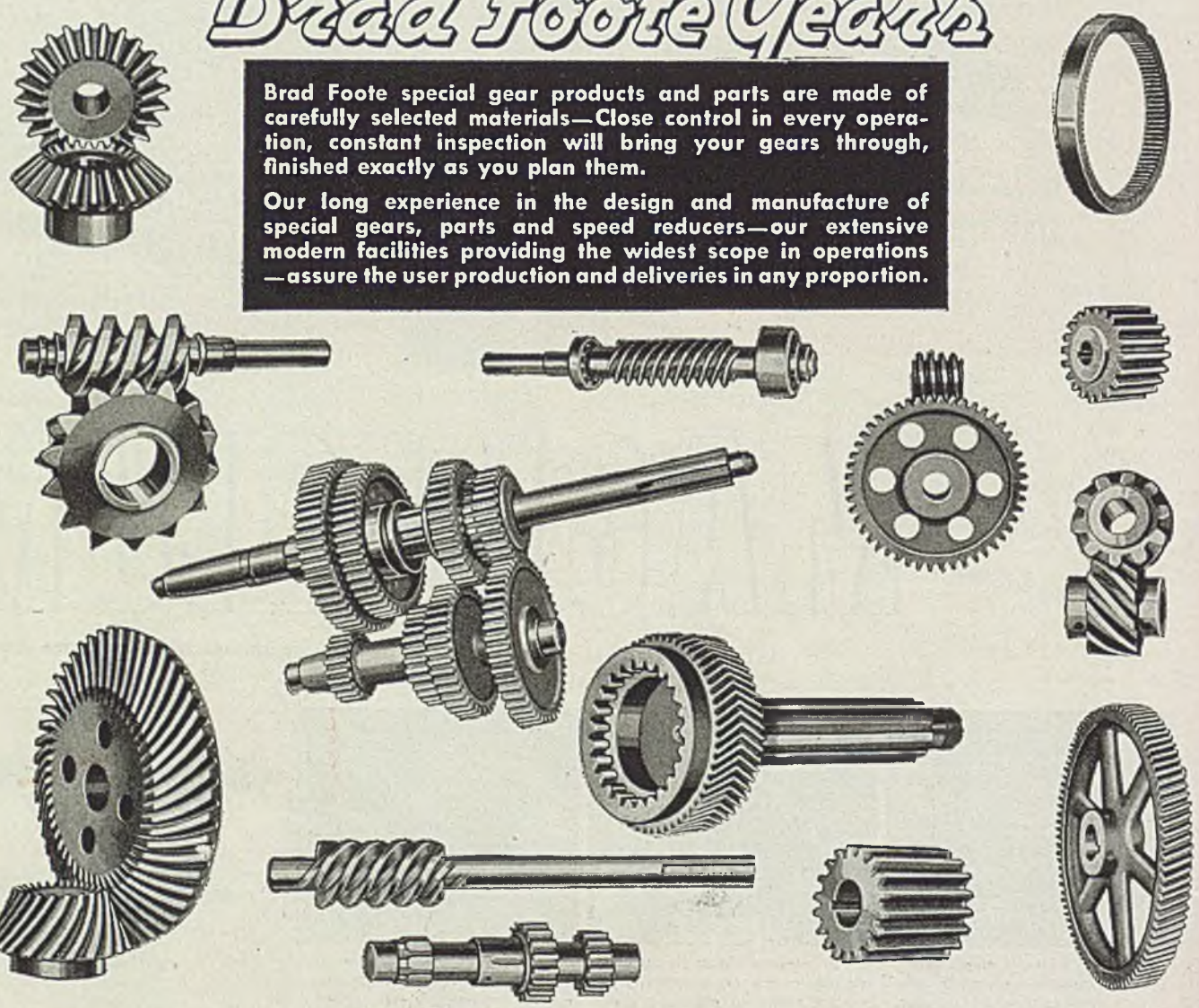
Brad Foote special gear products and parts are made of carefully selected materials—Close control in every operation, constant inspection will bring your gears through, finished exactly as you plan them.

Our long experience in the design and manufacture of special gears, parts and speed reducers—our extensive modern facilities providing the widest scope in operations—assure the user production and deliveries in any proportion.



ARMY E NAVY

BRAD FOOTE GEAR WORKS

1309 SOUTH CICERO AVENUE
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ing foundry techniques, lowering production costs, and saving machining time, but also stands as a monitor, through spot-checking, to maintain a satisfactory casting, thus assuring customers a serviceable product."

Better Working Conditions Expected in Near Future

Harold J. Roast, vice-president, Canadian Bronze Co. Ltd., Montreal, Canada: "Foundry industry does not seem to appeal to the coming generation of young men. At least, this is my experience in Canada and friends in the United States seem to have the same viewpoint. The question arises, what can be done about it?

"The large modern foundries in United States are undoubtedly built along lines that make them pleasant places in which to work, but there are very many foundries to which this does not apply, yet these foundries often supply a very much needed want in the sum total of foundry economy. If these foundries are to get the men they need, a complete change in housekeeping will have to be made.

"There is no reason why the foundries, however small, should not have a cleanly swept floor, good ventilation and freedom from excessive dust in the atmosphere, not to mention every facility for the men to change their clothes when they come in, showers, etc., and re-dress before they leave. In such cases, anyone watching the exit door of the foundry would see men well-dressed and with clean faces and hands going off happy to enjoy the good woman's cooking at home. This also reminds one of the need of a separate eating place outside the casting and molding floor of the foundry."

Foundry Modernization Gaining Momentum

Wilfred H. White, metallurgist, Jackson Iron & Steel Co., Jackson, O.: "The iron foundry has been one of the most important industries in the development of our civilization. Originally, it was a very crude arrangement where men labored with sand, fuel and hot metal to form useful castings. At that time, almost anything which contained iron and had a useful shape was acceptable.

"The modern foundry of today is quite different. All the heavy work is done by modern equipment such as cranes and conveyors. In many plants men do little more than push buttons. Their time and effort now can be spent on control and precision, rather than on back-breaking labor.

"Among foundries in operation today, both extremes may be found. Many are in a process of evolution and represent some stage of development. There is a constant progress toward better working conditions and better metallurgical control of the product. The war has been a great stimulus because men have been scarce and specifications exacting. Only by the use of modern equipment could the foundries meet such a combination. Due to restrictions, many could not complete their plans, but with the close of the war this process is gaining momentum."

Large Users of Die Castings Again Look to Zinc

A. D. Weigolt, general superintendent, Precision Castings Co. Inc., Cleveland: "One of the surprising things noted in the die casting industry since the end of the war is the strong position still enjoyed by zinc. While aluminum has definitely made some progress and was in the driver's seat during the war period, some of the optimistic predictions made in respect to an anticipated tremendous trend toward aluminum at the expense of zinc just have not materialized.

"We find that large users of die castings, like automotive and household appliances, are following closely the established custom prior to the war. Zinc tonnage still enjoys a substantial margin over aluminum.

"It remains to be seen, of course, what these industries will do when they come to plan new models and new production. It is quite possible that a year from now we will find a definite trend toward aluminum, particularly if the price of aluminum drops sufficiently to place it in a more advantageous competitive position with gray iron, brass and zinc.

"Present savings in die castings over other methods of production must, of necessity, be realized primarily in the choice of metals, rather than technical improvements in production methods, as there have been no outstanding improvements along that line during the past year".

Need Suitable Steel for Brass Die Casting Dies

Charles Pack, vice president, Doehler-Jarvis Corp., New York: "During the war, trend toward aluminum die casting was quite marked, and the die casting industry was faced with the problem of converting a major portion of its die casting facilities to zinc base alloys in accordance with prewar practice.

"Although the die casting industry is limited to production of nonferrous metal castings, it is interesting to note that one of the basic problems confronting the industry is really a ferrous metal problem. I refer to the urgent need for developing a suitable steel to be used for dies in the brass die casting process.

Although our company has been producing a certain quantity of brass die castings for the past 15 years, we are still confronted with the problem that dies used for brass die casting have a comparatively short life and must be replaced at frequent intervals. The development of a suitable die steel for brass die casting would create a tremendous volume of business for this type of production.

"It is important to realize the existence of this problem and the great possibilities for the sale of a suitable steel that would meet brass die casting requirements".

Radiography and Fluoroscopy Reveal Porosity in Castings

R. W. Dively, metallurgist, Hoover Co., North Canton, O.: "The past few years have brought great advancements to the die casting industry. Metallurgical control may be considered as one of the advancements which to a great extent, took place during the war period. It has not been many years since any combination of elements of an aluminum base alloy was considered usable for die casting. In most cases specifications were disregarded as far as physical and mechanical properties were concerned and alloy

chemistry was never thought to be important. For aluminum alloys, cold chamber machines have given castings that can be made practically porous free.

"Because of proper metallurgical control, aluminum die castings have been applied to critical applications where mechanical and physical characteristics are determining factors. Therefore, analysis of alloys must be held within specification limits to meet the properties desired. This analysis is obtained by the spectrographic method which takes approximately 2 hours for the solid samples against 6 to 8 for analysis of wet samples.

"Proper casting temperature can be determined for each job which will secure maximum mechanical properties for the alloy employed. If the metal is carried at a temperature close to the liquidus a segregation will occur. In some cases lines appear on the surface of the casting, however, a positive method of determination is by the use of radiographic and microscopic equipment.

Determining Porosity

"Radiography and fluoroscopy is a means of revealing the amount and location of the porosity in the casting. This is very valuable equipment for the die caster in gating and venting a casting to hold the porosity to a minimum.

"Elimination of iron pick-up from the use of cast iron pots is important, when the maximum mechanical properties of any aluminum alloy are desired. It has been ascertained that the iron content is increased materially in the alloy after each melting in a cast iron pot without a protective coating. This content will vary depending on the temperature of the alloy, and sometimes is increased as much as 0.25 per cent. There are several types of protective coatings that can be used in order to stop the reaction of the iron with the aluminum."

Zinc Alloy Die Castings Offer Many Advantages

R. Davison, Manager Development Division, New Jersey Zinc Co., New York: "In gathering together new applications of zinc alloy die castings for display in an exhibit for the forthcoming National Metal Congress in Cleveland, more and more product engineers are availing themselves of the combined physical and economic advantages of this method of fabrication.

"There are two explanations for this trend: (1) The widely recognized accomplishments of the die casting industry in turning out ordnance and other military items in huge quantities, has pointed up both physical and economic characteristics of this high-speed production method; and (2) many products are being completely redesigned to meet the competition of postwar selling, and others are being offered for the first time. This means that designers are in a position to start from scratch insofar as the choice of production methods and materials is concerned. To the open-minded engineer, physical and economic advantages of zinc alloy die castings are most attractive."

Cold Chamber Machines Boost Die Casting Production

Herbert Chase, consultant on die casting, Forest Hills, N. Y.: "Technical advances in the die casting industry are a result of slow, continuous development but the commercial status often changes rapidly, as in past year, and 1945 started with most die casters turning out zinc alloy products chiefly for ordnance applications in prodigious quantities and making aluminum, magnesium and brass castings, mostly for war uses, in quantities close to the maximum ever attained.

"With the end of war, cancellations of contracts nearly stopped war work and hundreds of pre-war dies were put into use as orders for conversion castings came in. Other hundreds of new dies were started and every established die caster found his die shop jammed with work. Most shops had far more requests for quotations than they could handle and die shops still have many months of new die orders to fill.

"During the war, many die casters added cold chamber machines needed for war demands and this is expected to increase the output of aluminum, magnesium and copper base castings with decided improvement in quality over the pre-war average when old gooseneck machines made most of the aluminum castings. It is probable that this increase in equipment will boost the total tonnage of the high-melting-point alloy castings but there is as yet little or no indication that there will be less demand for the zinc alloys which, prewar, accounted for about 75 per cent of the total tonnage of all die castings produced. As a matter of fact, many cold chamber machines have been reconverted to enable their use in the casting of zinc alloys.

"Shift to cold chamber machines for aluminum has been accompanied by the development of new alloys having superior mechanical properties. High silicon alloys are favored as a rule, especially for complex or difficult castings but the Alcoa '218' alloy containing 8 per cent magnesium is gaining ground and is favored especially for parts to be anodized. Also, it has 2 to 4 times the impact strength of other aluminum alloys. Several of the older aluminum alloys, including those with substantial nickel content, are now considered practically obsolete for die casting purposes."

Radical Improvements in Die Casting Machines Significant

F. W. McIntyre, president, Reed Prentice Corp., Worcester, Mass.: "Advancement of die casting since V-J Day has been very extensive, and demand today is way beyond capacity of the industry. Many companies are expanding to take care of their own requirements of die castings, and this has put a heavy load on the die casting machine manufacturers to deliver the requirements in time for reconversion of industry.

"There have been radical improvements in the die casting machines, such as increased locking pressures and increased pressure on material. Machines have also been simplified by eliminating pressure bottles in many cases, and having direct hydraulic operation rather than through pressure tanks. Controls and arrangement for setting dies have been improved for easier operation, and all parts of the machines have been kept very accessible.

"One other radical feature is construction of machines to allow the customer to change over from cold-chamber horizontal type for brass, aluminum, and magnesium to a self-contained furnace construction, including vertical plunger and gooseneck type for zinc and other metals.

"Machines have been developed with capacity up to 9 to 12 lb of aluminum with die locking pressure of 400 tons.

"Engineering service on die casting process has been set up. The manufacturers of the machines have made arrangements to furnish die casting die designs and also furnish the complete installation including machines and dies."

Reconversion: Workers demolish the last concrete pillbox at Whitehall on corner of Downing Street

Europe turns left

Trend is toward socialism and nationalization of key industries. Labor party in saddle in Great Britain, while France, Holland and Czechoslovakia move toward more governmental control. Iron and steel production, spurred by needs for reconstruction, expected to rise throughout 1946

By VINCENT DELPORT
European Editor, STEEL

OWING to the spectacular advance in the production of iron and steel in the United States from 1940 to 1944 there is no doubt that world output during the years 1942-43 exceeded all previous records. Despite the fact that statistics covering the war years are not yet available for most countries, the aggregate output of the United States, Great Britain, Germany and satellite countries, and Russia alone should have exceeded the world total of 135 million tons of steel and 100 million tons of pig iron produced in 1939, which, at that time, was a record year.

The picture is different for the year 1945 for, from the end of the war against Germany in May—in fact, for some short time before the end—German iron and steel works came to a standstill, and production in France, Belgium and Luxemburg had practically ceased about the time of the Allied invasion in 1944; it is only since the middle of 1945 that output in the last three named countries began to rise again, at a very slow rate. Furthermore, in the United States, England and Canada, the period of reconversion from wartime to peacetime production has caused a slowdown of activities of iron and steel works.

Taking into account only those countries for which reliable statistics of production are at present available, it can be estimated that world output of steel in 1945 will have reached at least 115 million tons as against 135 million tons in 1939 and 108 million tons in 1938. In regard to pig iron the output for 1945 should exceed 85 million tons, compared with 100 million tons in 1939 and 81 million in 1938.

In view of the huge demand for iron and steel products that will be caused by the needs of reconstruction in Europe, there is strong reason to believe that output in 1946 will tend to rise and eventually reach and exceed the rate of production of the peak year, 1939. This trend will be helped by gradually increasing facilities in such countries as France, Belgium, Czechoslovakia, Poland, and by a possible resumption of production—although limited—in Germany.

In considering the postwar outlook for steel production and trade, three factors should be borne in mind: First, the overriding preponderance of the United States in capacity of production. In 1944, the output of steel in the United States reached the record figure of 90 million tons in round figures. This represents two-thirds of the total world output of 1939, when practically every country was producing very near its capacity at that time. In Europe, now that Germany will have lost her leadership for some years to come, the front rank will be taken by Russia, whose annual output of steel may attain 20 million tons within the next five years. Britain would come next, especially if plans to increase steel capacity to 16 million tons materialize.

Second, in Western Europe, particularly in France, the principal reason why steel production is taking a long time to get into its stride is the lack of coal and coke. French blast furnaces in the Lorraine and Moselle districts depend mostly on Ruhr coal for their supplies, and the resumption of coal mining in Germany, as well as in France, is very slow. Furthermore, in France, and in Great Britain as well, the coal mining industry is passing through an extremely difficult period. Older men are tired and their output per man-shift is low. Young men are unwilling to work in the mines. Many mines need modern equipment. In France and Belgium, maintenance has been neglected for obvious reasons, and in Britain a number of seams are hardly worthwhile exploiting any further. In Britain the labor government soon will be passing legislation to nationalize the mining industry in the hope that conditions of work will be improved and production increased; the mines in northern France are already operated by the state, but results so far have not been encouraging. This problem of coal is bound to affect the iron and steel industry for some time to come.

Third, reference has been made to nationalization of the coal mines. This question of nationalization looms large in Europe insofar as the iron and steel industry is concerned. Not only is the nationalization of certain key industries in the program of the present British government, but it is also being seriously considered (*Please turn to Page* 387)

Reconversion of British industry to peacetime production has not been as rapid as many had hoped. At left is shown scene in plant of Morris Motors at Cowley. The picture was taken last summer. Photo by NEA

BRITAIN FACES BIG TASK

Projected nationalization of industry complicates task of reconverting to peacetime. Iron and steel production continues hedged in by wartime rules and regulations. Industry's war record outstanding

By J. A. HORTON
British Correspondent, STEEL

EQUIPPED with armaments forged in the steelworks of the Allied nations and a determination to win through, whatever the cost, the liberating armies secured complete victory and obtained the unconditional surrender of Germany and Japan in 1945.

The year brought peace, though Britain almost to the last few days suffered destruction from the enemy's "sting in the tail," the rocket. As a hangover of nearly six years' struggle with a determined enemy, Britain found itself faced with a multitude of problems. The desired objective had been achieved only by co-ordinating all resources under state control, a course which no one can suggest was other than the right one, and indeed the only one in such an emergency. But the war is over, and unlike America, Britain is moving slowly in the relaxation of the orders and regulations which surround the iron and steel industry like a hedge.

Some progress in reconverting industry to civilian production is reported. But it has been disappointingly slow. Recently former Prime Minister Churchill charged in a debate in Parliament that the Labor government had "fettered and hobbled" industry and enterprise, and impeded the nation's reconversion and demobilization. He said British reconversion lagged far behind that in America, claiming this was due to the fact industry and enterprise were fettered and hobbled at every step by an ever-spreading network of controls and regulations.

Replying to Churchill, Prime Minister Attlee said a certain amount of munitions production had to be continued and that his government was pursuing the demobilization plans which had been advocated by Churchill before the latter left office. Attlee said 100,000 men a week were being released from the armed services, and that 1,500,000 would be back in civilian life by Jan. 1.

The swing to the left in the political world has put into power a government pledged to nationalize the industry, and though it may take time, it will presumably implement that pledge or answer for it to the electors.

The coal industry is moving swiftly towards nationalization, and what is more likely than that the steel industry should follow? That is perhaps why the five-year plan for steel, to cost £120 millions sterling, and announced just prior to the Labor party's rise to power, seems to have faded into the background, though the British iron and steel federation affirms that plans for rehabilitation and recon- (*Please turn to Page* 388)

WORLD PRODUCTION OF STEEL INGOTS AND CASTINGS

Gross Tons

	°°1945	1944	1943	1942	1941	1940	1939	1938	1937	1929
United States	71,334,670	80 037,116	79 318,314	76,813,429	73,963,624	60,518,419	47,672,195	28,693,000	51,526,000	56,433,000
Canada	2,750,000	3,024,410	2,701,313	2,786,929	2,411,887	1,985,000	1,300,000	1,156,000	1,352,000	1,391,000
Great Britain	12,300,000	12,142,200	13,031,000	12,941,700	12,312,200	12,975,300	13,221,300	10,398,000	12,984,000	9,636,000
France	1,500,000	1,275,000	2,325,000	2,160,000	2,350,000	3,290,000	7,735,000	6,087,000	7,793,000	9,544,000
Belgium	700,000	575,000	1,600,000	1,430,000	1,550,000	1,800,000	3,000,000	2,248,000	3,801,000	4,066,000
Luxemburg	200,000	.....	.....	.....	.....	.....	1,800,000	1,414,000	2,470,000	2,659,000
Italy	.....	.....	.....	.....	.....	.....	2,350,000	2,286,000	2,054,000	2,109,000
Spain	650,000	650,000	640,000	.....	.....	.....	500,000	465,000	100,000	985,000
Sweden	1,250,000	1,300,000	.....	.....	.....	.....	1,100,000	963,000	1,088,000	683,000
Germany°	.....	.....	.....	20,500,000	20,800 000	19,000,000	17,560,000	22,922,000	19,531,000	15.986,000
Austria	.....	.....			.....	.....	.....	.....	640,000	622,000
Czechia	.....	.....			.....	.....	1,250,000	1,733,000	2,281,000	2,103,000
Poland	.....	.....			.....	.....	1,600,000	1,517,000	1,420,000	1,355,000
Hungary	.....	.....			.....	.....	750,000	638,000	654,000	505,000
Russia	15,000,000	.....			.....	.....	18,500,000	18,150,000	17,493,000	4,828,000
Japan†	.....	.....			.....	.....	6,300,000	6,000,000	5,718,000	2,249,000
India	1,000 000	.....			.....	.....	1,000,000	966,000	895,000	575,000
Australia	1,200,000	.....			.....	.....	1,200,000	1,151,000	1,074,000	460,000
Miscellaneous	750 000	.....			.....	.....	900,000	900,000	900,000	400,000
World total	.....	.....	.....	.....	.....	.....	134,983,000	107,687,000	133,774,000	118,763,000

Due to war conditions figures for many countries for 1940 and subsequent years are not available.

° Includes Austrian production from January, 1938. † Includes Manchuria and Korea. °° Estimated.

WORLD PRODUCTION OF PIG IRON AND FERROALLOYS

Gross Tons

	°°1945	1944	1943	1942	1941	1940	1939	1938	1937	1929
United States	47,337,614	56,130,534	56,044,595	53,555,497	45,042,023	42,320,011	31,943,000	19,161,000	37,127,000	42,614,000
Canada	1,750,000	1,852,628	1,528,053	1,763,406	1,554,708	1,270,000	800,000	758,000	979,000	1,160,000
Great Britain	7,250,000	6,736,500	7,187,000	7,725,600	7,392,500	8,204,600	7,979,800	6,761,000	8,493,000	7,589,000
France	1,000,000	2,835,000	4,825,000	3,765,000	3,290,000	3,605,000	7,225,000	5,964,000	7,787,000	10,198,000
Belgium	1,100,000	.....	.....	.....	.....	.....	3,000,000	2,426,000	3,743,000	4,030,000
Luxemburg	250,000	.....	.....	.....	.....	.....	1,750,000	1,526,000	2,473,000	2,860,000
Italy	.....	.....	.....	.....	.....	.....	1,000,000	913,000	849,000	718,000
Spain	350,000	360,000	530,000	.....	.....	.....	500,000	435,000	126,000	740,000
Sweden	900,000	980,000	.....	.....	.....	.....	625,000	652,000	682,000	516,000
Germany°	.....	13,500,000	15,750,000	15,250,000	15,300,000	13,750,000	17,450,000	18,300,000	15,703,000	13,187,000
Austria	.....	.....			.....	.....	.....	.....	383,000	455,000
Czechia	.....	.....			.....	.....	1,000,000	1,215,000	1,648,000	1,618,000
Poland	.....	.....			.....	.....	1,000,000	952,000	712,000	693,000
Hungary	.....	.....			.....	.....	450,000	330,000	359,000	362,000
Russia	12,000,000	.....			.....	.....	15,000,000	14,479,000	14,288,000	4,253,000
Japan†	.....	.....			.....	.....	3,250,000	3,000,000	2,758,000	1,491,000
India	1,800,000	.....			.....	.....	1,800,000	1,634,000	1,629,000	1,343,000
Australia	1,100,000	.....			.....	.....	1,100,000	1,072,000	914,000	420,000
Miscellaneous	750,000	.....			.....	.....	1,200,000	1,150,000	1,200,000	750,000
World total	.....	.....	.....	.....	.....	.....	100,418,000	80,728,000	101,853,000	97,073,000

Due to war conditions figures for many countries for 1940 and subsequent years are not available.

° Includes Austrian production from January, 1938. † Includes Manchuria and Korea. °° Estimated.

By LEON JAUDOIN
French Correspondent, STEEL

FUEL SHORTAGE LIMITS FRENCH OUTPUT

Steel production scheduled to reach 4 million tons in 1946 provided sufficient coal and coke are made available. Scarcity of manpower, disrupted transportation facilities and uncertainty as to future government policy on controls also are restricting factors

BEFORE the second world war, French industry and trade were conducted under a policy of almost complete liberalism. When war came, all industries came directly under state control to insure the most intensive production. However, administrative centralization became heavy to bear, and from this originated the idea of a kind of buffer between the state and enterprise, which took the form of "organized profession," the word profession being taken to cover the various trades and industries.

Organized profession, on the one hand, transmitted the directives from the state to enterprise and, on the other hand, made known to the state the requirements of its members.

The bill of Aug. 16, 1940, defined the relations between the state and the professions, laying down a systematic general conception of organization of aims and methods in respect of state intervention. It was under this system of complete direction by the state that French industry and trade existed during the occupation.

A brief explanation of the general scheme follows and is necessary to understand the present organization, particularly as it applies to the iron and steel industry.

In each of the principal professions the ministry of industrial production was represented by a "government delegate." Each profession of sufficient importance, or a group of related professions, formed a "committee of organization," managed by a representative of the profession. These committees of organization were of the nature of an emanation of the various professions towards the government, with a view to making known to the government the requirements and opinions of the professions.

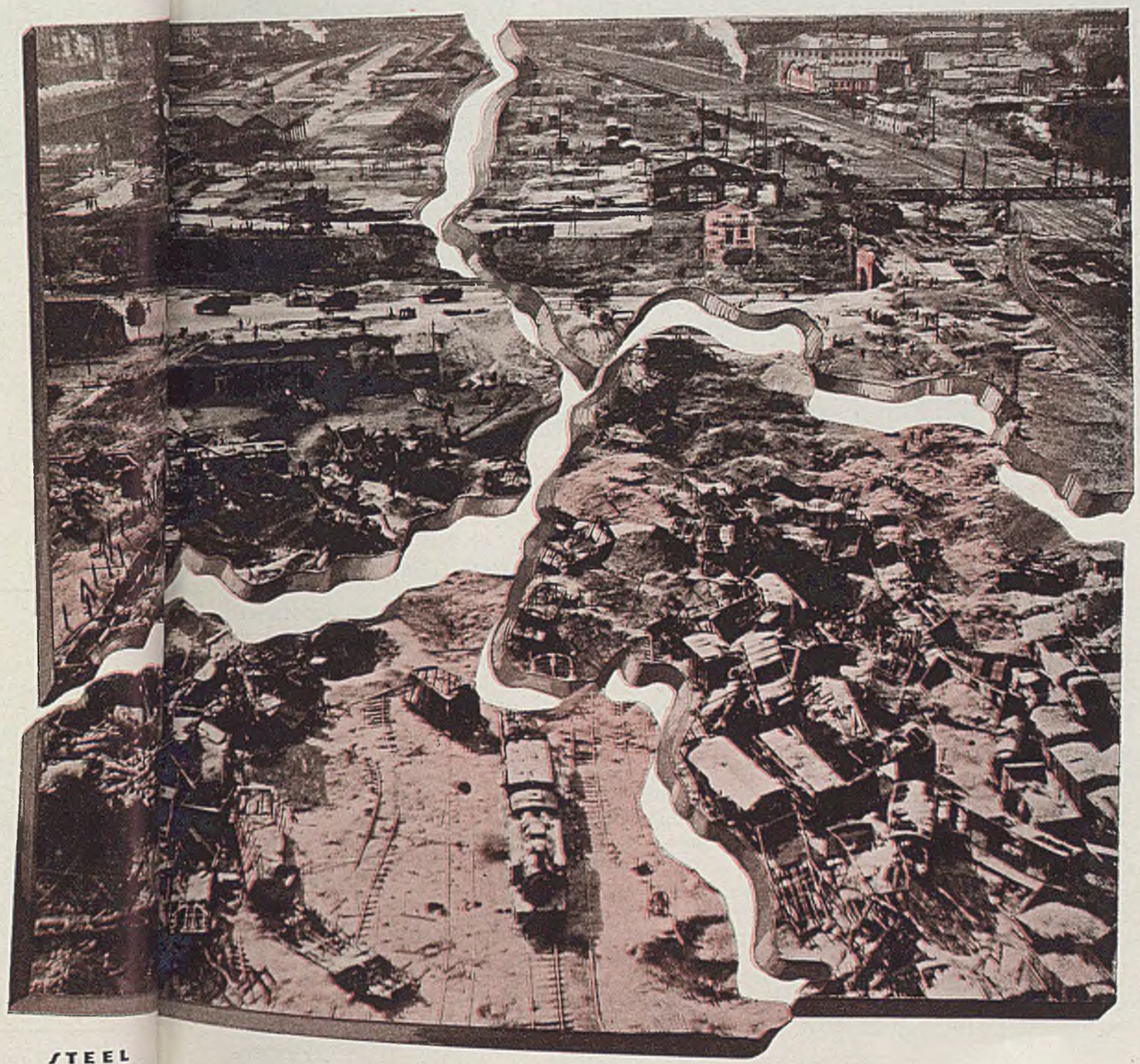
The following functions were delegated to the committees of organization: 1. *To decide,* on such matters as programs of production, priorities, etc.; 2. *to manage* by means of statistical returns from the various undertakings and by forming subsidiary committees, etc.; 3. *to establish conditions* in regard to prices, requisitions, sanctions, etc.; 4. *to represent* the profession in its relations with the administration and, in particular, with the ministry of industrial production.

By a bill, dated Sept. 10, 1940, the allocation of raw materials was taken from the committees of organization and put in charge of special bodies which could delegate part of their attributions to the committees under specified conditions.

All employers' syndicates that existed prior to the war were disbanded. Among these were the *Comite des Houillieres* for the coal industry and the *Comite des Forges* for the iron and steel industry. New syndicates, styled *Chambres Syndicates Professionnelles,* were substituted for the old syndicates and came under the control of the committees of organization. Thus the committees, although representing a particular industry or trade, were bound to place the national interest before the interest of the profession, whereas the syndicates were charged with the defense of the interests of the profession itself.

Such was the organization of industry and trade in France as created in 1940. The system did not work with complete smoothness, partly owing to the shortage of materials, partly due to the attitude of the state towards economic matters. It is also to be noted that the occupation authorities had the high hand on French means of production —within the limits set up by resistance on the part of industrialists.

Applied to the iron and steel industry, the particular committee of organization was the C.O.R.S.I.D., or *Comite d'Organisation de la* (*Please turn to Page* 390)

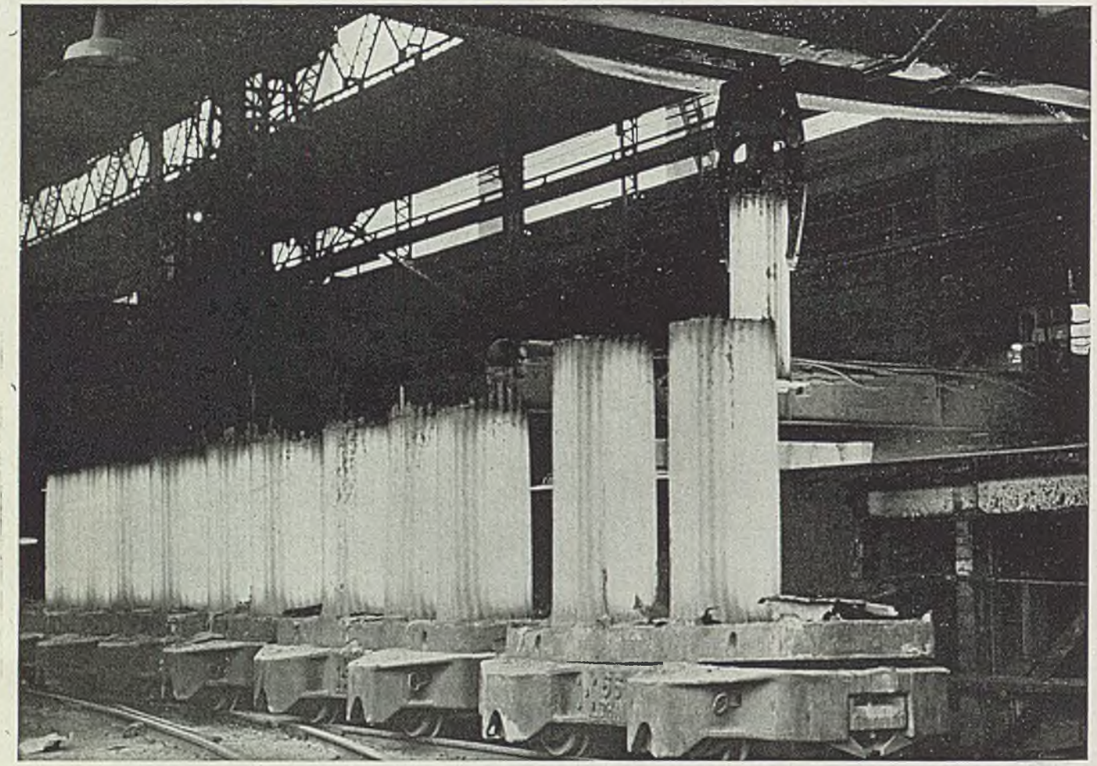


Disrupted transportation facilities, resulting from heavy bombing, are hindering movement of raw materials to French iron and steel mills. Photo shows railroad yard near Paris after an Allied attack. NEA photo

DOMESTIC MARKET SUMMARY

By G. H. MANLOVE
Associate Editor, STEEL

Steel mills enter 1946 with heavy backlogs. Year just ended marked by sharp readjustments necessitated by rapidly changing demands for war and for reconversion. Pricing policies are large problem in face of increased labor and other costs during war years



Steel order backlogs were heavy as the mills entered the new year and consumers were clamoring for steel to be turned into peacetime products. Above, steel ingots are charged into soaking pits for heating to proper rolling temperature at McKeesport, Pa., plant of National Tube Co.

IN ALL its history the steel industry probably never has experienced another such year as 1945. With two wars ending a few months apart sharp readjustments were necessary in moving from war needs to providing for peacetime products. Entering the year with heavy backlogs, it carried the burden through to the end and passed into 1946 with the load fully as heavy as at the beginning.

All efforts to catch up with demand proved unavailing as one obstacle after another interposed itself, heavy snows in January impeding transportation, strikes in its own plants and in the coal industy, insufficient labor, scarcity of pig iron and scrap. All these drawbacks prevented full production and caused orders to pile up in backlogs rivaling the heaviest accumulation of the war years.

Burden on steel mills was heavy in effort to keep pace with the constant change in conditions, which altered almost day to day as events moved with unusual celerity. In view of such a situation it was inevitable that production should lag far behind the war years, even in the face of tremendous demand from civilian manfacturers, interfering with reconversion plans of the latter by limiting supply of steel for their operations.

Steelmaking in 1944 was at an average rate of 95.5 per cent of capacity for the entire year, with peaks above 98 in some months. In 1945 production for the first three quarters was only 86.6 per cent, with only one month touching 95 and a low of 70.7 being recorded in midsummer. As a result tonnage fell off in equal measure and for 11 months totaled 73,706,031 tons against 82,214,662 tons for the comparable period in 1944. The difference of 8,508,631 tons was more than equal to full output of the best months of the war and had it not been lost would have made a world of difference in the situation. Starting the year practically on the basis of war output, tonnage held well through May and then tapered steadily the remainder of the year.

Ceiling prices held through the year, with Office of Price Administration yielding to pressure for relief by granting two increases in pig iron prices and two in finished steel, neither being considered sufficient to compensate for increased wage and material costs. Effective Feb. 14, pig iron prices were advanced $1 per ton, the first change in pig iron prices since producers announced a rise of $1 late in 1940, the resulting level being frozen in 1941 by OPA. The second pig iron advance was effective Oct. 23, increasing prices 75 cents per ton on all grades except charcoal.

As of Jan. 11, OPA announced upward revisions on five steel products, as interim increases, pending a more general revision. Hot-rolled carbon plates and sheets were increased $2 per ton, galvanized sheets and steel rails $3 per ton and nails and staples other than galvanized $5 per ton. Effective May 23, further announcement of price increases was made, the advances being applied to the schedule of April 16, 1941, and including the interim advances allowed in January. These increases were: Carbon semi-finished steel $2 per gross ton; carbon steel tube rounds and billets, $4; carbon plates, $3; rails, except light, $3; light rails, $5; tin plate, $3 per net ton; carbon hot-rolled bars and bar shapes, $2; carbon wire rods, $3; carbon manufacturers' and merchants' wire, $3; nails and staples, except galvanized, $7; twisted barbless and barbed wire, $2; bale ties, $7; hot-rolled sheets, $2; galvanized sheets, $2; track spikes, $5.

OPA, as of Aug. 6, allowed an increase of $2 per ton on cold-finished bars to compensate for the increased cost of hot-rolled bars to cold rollers, who had been absorbing the increase since May. On announcement of the May mill increases, OPA insisted that warehouses absorb the higher prices except on such items as certain wire products, painted roofing and siding and bale ties.

Meanwhile, steelmakers insisted the advances fell far short of covering increased costs and asked for a further rise of $7 per ton. At the same time wage demands for an increase of $2 per day were being pressed and steel interests insisted if these were granted further advances in selling prices would be necessary to compensate. OPA at one time seemed about to grant some further relief, but late in the year postponed action pending outcome of wage negotiations. A deadlock then ensued and no progress was made either in prices or wages, with OPA taking the position no general price increases would be allowed in 1945 but that the situation would be reviewed early in 1946 after financial reports for the year had been issued. It was indicated, however, that some relief might be granted nonintegrated companies suffering financial hardship.

Deliveries throughout the entire year were much delayed. Starting in January, mills had heavy backlogs, mainly for war purposes. During that month heavy snows slowed transportation and shipments and interfered with production.

Early in the year increased demand for war material for the final push caused an increase in directives, which pushed back deliveries of much Controlled Materials Plan tonnage. Noting this effect, War Production Board instituted closer scrutiny of directives and only the most pressing demands were given preferred attention.

As early as March the end of the European phase of the war could be foreseen, and various measures were taken to relieve overloading of the mills with war tonnage. A Navy program for 84 combat ships of 636,830 tons displacement was cut back to 12 ships and resulting steel order cancellation affected mill rollings as early as April. In mid-April the shell program was reduced 10 per cent, and late that month the merchant shipbuilding program was reduced by cancellation of 30 to 40 tankers, releasing 120,000 tons of plates and 40,000 tons of shapes.

With collapse of the Nazis, ending the war May 8, buying of plates and shapes dropped sharply and steelmakers expected a flood of cancellations, in which they were not disappointed, though the number was below expectations and the process dragged far longer than was anticipated. Early cancellations affected mainly remote deliveries and did not have much effect on nearby schedules, such mill-rolling gaps as developed being filled at once by civilian orders moved up from later schedules.

In June it developed that prospects were not bright for unrated steel orders to obtain place on third quarter schedules, although they were pressing hard. Consumers delayed cancelling in order to maintain their positions. War Production Board took cognizance and attempted to clear duplicate orders. About mid-July WPB froze third quarter output of sheets and strip but soon released the freeze as it proved impossible to hold it.

When Japan surrendered in the middle of August, production dropped to 60 per cent of capacity for part of the week. Cancellations came out in greater volume than after V-E Day, and much confusion resulted at mills, which were forced to slow production until new schedules could be made up. However, demand for civilian needs was heavy, and steel ingot operations recovered rapidly though not rising to the level in effect at the time the war ended.

Controlled Materials Plan, which had done excellent service for many months in guiding production, ceased to be effective Sept. 30, the problem being left to mills to separate rated and unrated tonnage. In order to meet emergencies and break bottlenecks, priorities of AAA, MM and CC were established, but were little used. By the middle of September volume of bookings approached the greatest of war years and deliveries on some prducts were deferred to the next year.

During the year, faced by tremendous demand, far larger than could be produced, (*Please turn to Page* 395)

Average Monthly Quotations in 1945

Base or Furnace, Unless Otherwise Specified; Scrap, Delivered to Consumers

PITTSBURGH

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Structural Shapes	2.10c	2.10c	2.10c	2.10c	2.10c	2.10c	2.10c	2.10c	2.10c	2.10c	2.10c	2.10c
Plates	2.15	2.20	2.20	2.20	2.20	2.25	2.25	2.25	2.25	2.25	2.25	2.25
Bars	2.15	2.15	2.15	2.15	2.20	2.25	2.25	2.25	2.25	2.25	2.25	2.25
Cold-Finished Steel Bars	2.65	2.65	2.65	2.65	2.65	2.65	2.65	2.75	2.75	2.75	2.75	2.75
Strip, Hot-Rolled	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10
Strip, Cold-Rolled	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80
Standard Spikes	3.00	3.00	3.00	3.00	3.00	3.25	3.25	3.25	3.25	3.25	3.25	3.25
Plain Wire	2.60	2.60	2.60	2.60	2.65	2.75	2.75	2.75	2.75	2.75	2.75	2.75
Structural Rivets	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
Hot Rolled Sheets	2.15	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20
No. 24 Galvanized Sheets	3.60	3.65	3.65	3.65	3.65	3.70	3.70	3.70	3.70	3.70	3.70	3.70
Tin Plate, base box	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Wire Nails	2.70	2.80	2.80	2.80	2.85	2.90	2.90	2.90	2.90	2.90	2.90	2.90
Steel Pipe, 1 to 3-inch, % discount (base $200 per ton)	68½%	68½%	68½%	68½%	68½%	68½%	68½%	68½%	68½%	68½%	68½%	68½%
Bessemer Pig Iron, Neville Island base	24.50c	25.00c	25.50c	25.50c	25.50c	25.50c	25.50c	25.50c	25.50c	25.65c	26.25c	26.25c
Basic Pig Iron, Neville Island base	23.50	24.00	24.50	24.50	24.50	24.50	24.50	24.50	24.50	24.65	25.25	25.25
No. 2 Foundry Pig Iron, Neville Island Base	24.00	24.50	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.15	25.75	25.75
Malleable Pig Iron, Neville Island Base	24.00	24.50	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.15	25.75	25.75
Bessemer Ferrosilicon, 10 percent (Jackson co. base)	37.50	38.00	38.50	38.50	38.50	38.50	38.50	38.50	38.50	38.65	39.25	39.25
Billets, Bessemer and Open-Hearth	34.00	34.00	34.00	34.00	34.00	34.50	36.00	36.00	36.00	36.00	36.00	36.00
Sheet Bars, Bessemer and Open-Hearth	34.00	34.00	34.00	34.00	34.50	36.00	36.00	36.00	36.00	36.00	36.00	36.00
Wire Rods	2.00	2.00	2.00	2.00	2.05	2.15	2.15	2.15	2.15	2.15	2.15	2.15
Furnace Coke, spot	7.00	7.00	7.00	7.00	7.00	7.50	7.50	7.50	7.50	7.50	7.50	7.50
Foundry Coke, spot	7.75	7.75	7.75	7.75	7.75	8.25	8.25	8.25	8.25	8.25	8.25	8.25
Heavy Melting Steel Scrap	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
Low Phosphorous Scrap	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00
No. 1 Cast Scrap	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00

CHICAGO

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Bars	2.15c	2.15c	2.15c	2.15c	2.17c	2.25c	2.25c	2.25c	2.25c	2.25c	2.25c	2.25c
Plates	2.17	2.20	2.20	2.20	2.22	2.25	2.25	2.25	2.25	2.25	2.25	2.25
Structural Shapes	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10
Rail Steel Bars	2.15	2.15	2.15	2.15	2.17	2.25	2.25	2.25	2.25	2.25	2.25	2.25
Cold Rolled Sheets	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05
No. 2 Foundry and Malleable Pig Iron	$24.00	$24.50	$25.00	$25.00	$25.00	$25.00	$25.00	$25.00	$25.00	$25.19	$25.75	$25.75
Lake Superior Charcoal Iron, Delivered Chicago	37.34	37.34	37.34	37.34	37.34	37.34	37.34	37.34	37.34	37.34	37.34	37.34
Heavy Melting Steel Scrap	18.75	18.75	18.75	18.75	18.75	18.75	18.75	18.75	18.75	18.75	18.75	18.75
Rails for Rolling	22.25	22.25	22.25	22.25	22.25	22.25	22.25	22.25	22.25	22.25	22.25	22.25
No. 1 Machinery Cast Scrap	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00

EASTERN PENNSYLVANIA

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Tank Plates, delivered Philadelphia	2.25c	2.25c	2.25c	2.25c	2.26c	2.30c	2.30c	2.30c	2.30c	2.30c	2.30c	2.30c
Structural Shapes, delivered Philadelphia	2.215	2.215	2.215	2.215	2.215	2.215	2.215	2.215	2.215	2.215	2.215	2.215
Steel Bars, delivered Philadelphia	2.47	2.47	2.47	2.47	2.495	2.57	2.57	2.57	2.57	2.57	2.57	2.57
Hot Rolled Sheets, delivered Philadelphia	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37
Basic Pig Iron, delivered	$25.34	$25.84	$26.34	$26.34	$26.34	$26.34	$26.34	$26.34	$26.34	$26.53	$27.09	$27.09
No. 2X Foundry Pig Iron, delivered Philadelphia	26.21	26.71	27.21	27.21	27.21	27.21	27.21	27.21	27.21	27.40	27.96	27.96
Standard Low Phosphorus Pig Iron, delivered	30.74	31.24	31.74	31.74	31.74	31.74	31.74	31.74	31.74	31.92	32.49	32.49
No. 1 Heavy Melting Scrap	$18.75	$18.75	$18.75	$18.75	$18.75	$18.75	$18.75	$18.75	$18.75	$18.75	$18.75	$18.75
No. 1 Cupola Cast Scrap	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
Spiegeleisen, 19-21%, Palmerton, Pa., base	$36.00	$36.00	$36.00	$36.00	$36.00	$36.00	$36.00	$36.00	$36.00	$36.00	$36.00	$36.00

COAL TAR PRODUCTS

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Benzol, per gallon producers' plants, tank lots	15.00c	15.00c	15.00c	15.00c	15.00c	15.00c	15.00c	15.00c	15.00c	15.00c	15.00c	15.00c
Toluol, two degree, per gallon producers' plants, tank lots	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00
Solvent naphtha, per gallon producers' plants, tank lots	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00
Xylol, per gallon, producers' plants, tank lots	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00
Naphthalene, flakes and balls, per pound, producers' Plants bbls. to jobbers	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
Phenol, per pound, producers' plants, less than car lots	13.25	13.25	13.25	13.25	13.25	13.25	13.25	13.25	13.25	13.25	13.25	13.25
Sulphate of ammonia, per ton bulk f.o.b. Atlantic seaboard	$29.20	$29.20	$29.20	$29.20	$29.20	$29.20	$29.20	$29.20	$29.20	$29.20	$29.20	$29.20

NONFERROUS METALS

Prompt wholesale prices in cents per pound

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Tin Straits, spot New York	52.000	52.000	52.000	52.000	52.000	52.000	52.000	52.000	52.000	52.000	52.000	52.000
Copper, electrolytic, delivered, Connecticut	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000
Zinc, prime western, East St. Louis	8.250	8.250	8.250	8.250	8.250	8.250	8.250	8.250	8.250	8.250	8.250	8.250
Lead, open market, East St. Louis	6.350	6.350	6.350	6.350	6.350	6.350	6.350	6.350	6.350	6.350	6.350	6.350
Lead, open market, New York	6.500	6.500	6.500	6.500	6.500	6.500	6.500	6.500	6.500	6.500	6.500	6.500
Aluminum, ninety-nine per cent plus	15.000	15.000	15.000	15.000	15.000	15.000	15.000	15.000	15.000	15.000	15.000	15.000
Antimony, domestic, bulk, cl., f.o.b. Laredo, Tex.	14.500	14.500	14.500	14.500	14.500	14.500	14.500	14.500	14.500	14.500	14.500	14.500
Nickel, cathodes	35.000	35.000	35.000	35.000	35.000	35.000	35.000	35.000	35.000	35.000	35.000	35.000

Pig Iron and Steel Ingot Production

Steel Ingot Figures by American Iron and Steel Institute. Coke Pig Iron by STEEL

Pig Iron Production

Net Tons

	Stacks No.	Stacks In	Output Total 1929	Output Av. daily	Stacks No.	Stacks In	Output Total 1939	Output Av. daily	Stacks No.	Stacks In	Output Total 1940	Output Av. daily	Stacks No.	Stacks In	Output Total 1941	Output Av. daily
Jan.	328	202	3,844,991	124,031	237	118	2,436,474	78,596	233	177	4,024,556	129,825	229	205	4,666,233	150,524
Feb.	326	208	3,604,581	128,735	237	121	2,307,405	82,407	233	157	3,304,368	113,943	229	202	4,206,826	150,244
Mar.	326	213	4,154,660	134,021	237	123	2,680,446	86,465	233	152	3,270,575	105,502	229	205	4,702,905	151,707
Apr.	326	216	4,102,747	136,759	236	102	2,301,965	76,732	233	155	3,139,043	104,635	229	191	4,340,555	144,685
May	325	220	4,366,145	140,843	236	106	1,923,625	62,052	233	171	3,497,157	112,811	229	206	4,596,113	148,262
June	325	220	4,160,917	138,697	235	117	2,373,753	79,125	232	181	3,813,092	127,103	229	211	4,551,040	151,701
July	325	217	4,236,412	136,658	235	129	2,638,760	85,121	231	187	4,060,513	130,984	229	212	4,766,216	153,749
Aug.	325	209	4,195,742	135,346	235	138	2,979,774	96,122	231	190	4,234,576	136,599	229	215	4,784,639	154,343
Sept.	323	204	3,916,029	130,534	235	169	3,218,940	107,298	231	192	4,172,551	139,085	230	219	4,721,337	157,378
Oct.	318	203	4,018,724	129,637	235	188	4,062,670	131,053	231	196	4,437,725	143,152	230	216	4,860,033	156,775
Nov.	317	176	3,564,310	118,811	235	191	4,166,512	138,883	231	202	4,397,656	146,589	231	217	4,707,194	156,906
Dec.	316	156	3,177,347	102,495	233	191	4,219,718	136,119	231	202	4,542,864	146,544	232	218	5,014,995	161,774
Total			47,342,605	•129,705			35,310,042	•96,740			46,894,676	•128,128	Total		55,918,086	153,200
			••1942				••1943				••1944				••1945	
Jan.	...	...	5,061,380	.....	...	...	5,194,245	.....	...	...	5,281,464	.....	...	...	4,945,018	.....
Feb.	...	...	4,578,629	.....	...	...	4,766,001	.....	...	...	5,088,013	.....	...	...	4,562,744	.....
Mar.	...	...	5,134,009	.....	...	...	5,314,201	.....	...	...	5,439,240	.....	...	...	5,227,790	.....
Apr.	...	...	4,974,960	.....	...	...	5,035,178	.....	...	...	5,248,410	.....	...	...	4,785,659	.....
May	...	...	5,151,771	.....	...	...	5,177,728	.....	...	...	5,347,866	.....	...	...	5,016,060	.....
June	...	...	5,014,062	.....	...	...	4,836,283	.....	...	...	5,061,621	.....	...	...	4,605,012	.....
July	...	...	5,129,300	.....	...	...	5,022,745	.....	...	...	5,161,814	.....	...	...	4,812,419	.....
Aug.	...	...	5,087,235	.....	...	...	5,314,633	.....	...	...	5,215,222	.....	...	...	4,248,547	.....
Sept.	...	...	5,015,601	.....	...	...	5,225,516	.....	...	...	4,992,883	.....	...	...	4,226,752	.....
Oct.	...	...	5,314,759	.....	...	...	5,323,738	.....	...	...	5,200,175	.....	...	...	3,388,127	.....
Nov.	...	...	5,161,978	.....	...	...	5,333,303	.....	...	...	‡5,425,591	.....	...	...	‡3,700,000	.....
Dec.	...	...	5,279,580	.....	...	...	5,212,918	.....	...	...	‡5,403,899	.....	...	...	‡3,500,000	.....
Total			60,903,304	.....	...	...	61,777,296	.....	...	...	‡62,866,198	.....	...	...	‡53,018,128	.....

•Average. ••Figures by American Iron and Steel Institute. ‡Estimated.

Steel Ingot Production and Operating Rates

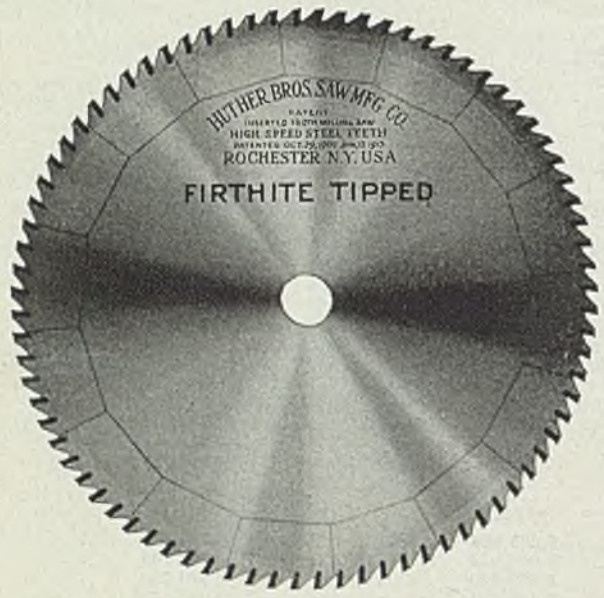
Net Tons

	1939 Total	1939 Weekly Av.	1939 % of Capacity	1940 Total	1940 Weekly Av.	1940 % of Capacity	1941 Total	1941 Weekly Av.	1941 % of Capacity
Jan.	3,578,663	807,870	52.83	5,764,723	1,301,292	83.4	6,922,352	1,562,608	96.8
Feb.	3,368,915	842,229	55.07	4,525,797	1,093,188	70.0	6,230,354	1,557,589	96.5
Mar.	3,839,127	866,620	56.67	4,389,183	990,786	63.5	7,124,003	1,608,127	99.6
Apr.	3,352,774	781,532	51.11	4,100,474	955,821	61.2	6,754,179	1,574,401	97.6
May	3,295,164	743,829	48.64	4,967,782	1,121,395	71.8	7,044,565	1,590,195	98.5
June	3,523,880	821,417	53.71	5,657,443	1,318,751	84.5	6,792,751	1,583,392	98.1
July	3,564,827	806,522	52.74	5,724,625	1,295,164	83.0	6,812,224	1,541,227	93.3
Aug.	4,241,994	957,561	62.62	6,186,383	1,396,475	89.5	6,997,494	1,579,570	95.6
Sept.	4,769,468	1,114,362	72.87	6,056,246	1,415,011	90.6	6,811,754	1,591,531	96.3
Oct.	6,080,177	1,372,500	89.75	6,644,542	1,499,897	96.1	7,236,068	1,633,424	98.9
Nov.	6,147,783	1,433,050	93.71	6,469,107	1,507,950	96.6	6,960,885	1,622,584	98.2
Dec.	5,822,014	1,317,198	86.13	6,495,357	1,469,538	94.1	7,150,315	1,617,718	97.9
Total	51,584,986	989,355	64.70	•66,981,662	1,281,210	82.1	•82,836,946	1,588,741	97.3

	1942 Total	1942 Weekly Av.	1942 % of Capacity	1943 Total	1943 Weekly Av.	1943 % of Capacity	1944 Total	1944 Weekly Av.	1944 % of Capacity	1945 Total	1945 Weekly Av.	1945 % of Capacity
Jan.	7,112,106	1,605,442	94.5	7,424,522	1,675,964	96.8	7,592,603	1,713,906	95.7	7,206,223	1,626,687	88.8
Feb.	6,512,535	1,628,134	95.9	6,824,604	1,706,151	98.5	7,194,009	1,737,683	97.0	6,654,589	1,663,647	90.8
Mar.	7,392,111	1,668,648	98.2	7,674,578	1,732,410	100.0	7,826,257	1,766,649	98.6	7,707,965	1,739,947	95.0
Apr.	7,121,291	1,659,975	97.7	7,373,703	1,718,812	99.3	7,593,688	1,770,090	98.8	7,291,926	1,699,750	92.8
May	7,382,578	1,666,496	98.1	7,549,691	1,704,219	98.4	7,702,576	1,738,730	97.1	7,451,752	1,682,111	91.8
June	7,015,302	1,635,269	96.3	7,039,353	1,640,875	94.8	7,234,257	1,686,307	94.1	6,842,290	1,594,939	87.1
July	7,144,958	1,616,506	94.5	7,407,876	1,675,990	96.2	7,498,387	1,696,468	94.3	6,987,008	1,580,771	86.3
Aug.	7,227,655	1,631,525	95.4	7,586,464	1,712,520	98.3	7,498,913	1,692,757	94.1	5,736,376	1,294,893	70.7
Sept.	7,057,519	1,648,953	96.4	7,514,339	1,755,687	100.7	7,235,111	1,690,446	94.0	5,983,361	1,397,982	76.3
Oct.	7,579,514	1,710,951	100.0	7,814,117	1,763,909	101.2	7,620,885	1,720,290	95.6	5,597,782	1,263,608	69.0
Nov.	7,179,812	1,673,616	97.8	7,371,975	1,718,409	98.6	7,278,719	1,696,671	94.3	6,246,759	1,456,121	79.5
Dec.	7,304,540	1,652,611	96.6	7,255,144	1,641,435	94.2	7,366,170	1,666,554	92.6	‡6,200,000	.....	....
Tot.	•86,029,921	1,649,979	96.8	88,836,366	1,703,804	98.1	89,641,575	1,714,644	95.5	‡79,906,031	.....	....

Compiled by American Iron and Steel Institute. ‡Beginning with 1927 the Institute excluded crucible and electric ingots, which totaled 756,138 net tons in 1927, 907,232 tons in 1928, 1,073,045 tons in 1929, 688,634 tons in 1930, 461,987 tons in 1931, 270,766 tons in 1932, 47,510 tons in 1933, 405,246 tons in 1934, 607,190 tons in 1935, 866,063 tons in 1936, 913,073 tons in 1937, 524,850 tons in 1938, 952,453 tons in 1939. •Includes electric steel ingots and steel castings. Crucible steel in 1940 was 1024 tons; in 1941 it was 2318 tons; in 1942 is was 2010 tons; in 1943 it was 146 tons; in 1944 it was 25 tons. ‡Estimated.

HUTHER SAWS



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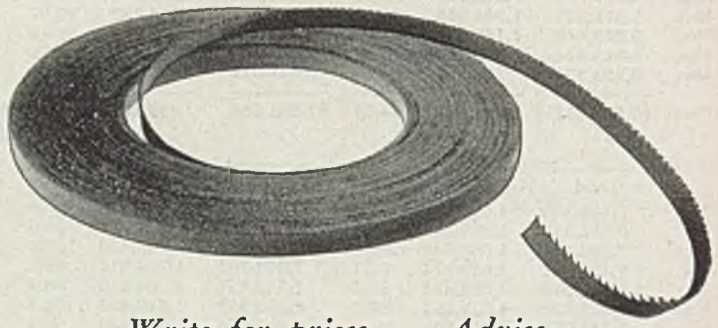

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MARKET SUMMARY

New Year Opens With Heavy Demand on Steel Mills

Government steps may delay strike action . . . Rumor union may hold off walkout. . . . Steelmaking back to high rate after holiday

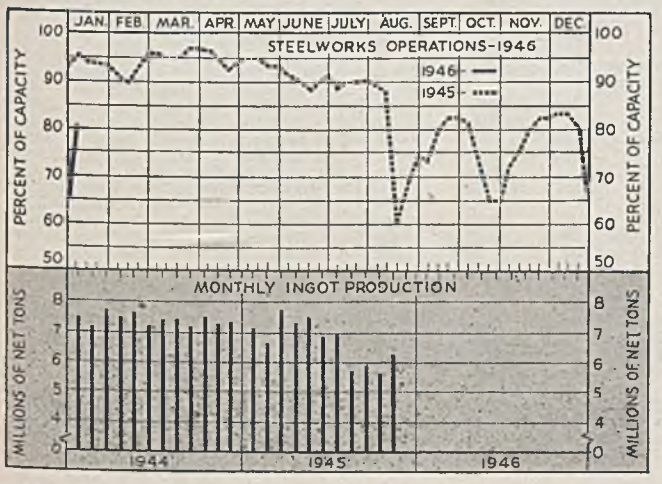
CONSUMERS of steel, as well as steelmakers, are heartened by efforts of the national administration to avert the strike of steelworkers set for Jan. 14, effects of which, if prolonged, would result in widespread economic paralysis.

Appointment of the fact-finding board and efforts to delay the actual walkout until Office of Price Administration can complete review of steel company earnings and decide definitely whether increased prices can be allowed are steps bearing directly on the crucial points and may provide a solution short of actual cessation of production.

Unconfirmed reports were current last week that the steelworkers' union wage policy committee may meet within the next few days to decide whether to postpone the strike date, pending completion of the OPA study. In connection with the latter, it was pointed out that despite OPA's recent position that price increases, if any, must depend on the industry's financial showing for fourth quarter of 1945, it was said some price relief may be made available through review of extra schedules, which have been under study for many months.

Steel producers foresee months of active operations when labor conditions are adjusted and have entered the year with heavy backlogs, extending six months or more in many instances. Light flat-rolled products continue in principal demand, with shapes, bars and some wire products also under heavy pressure and plates in greater demand than had been expected at the end of the war. Some plate tonnage is available for April but most producers are booked well into second quarter in spite of shipbuilding decline to almost nothing.

Contributing principally to activity in flat-rolled products are needs of automotive and household appliance manufacturers, with consumption in these lines expected to exceed all previous



DISTRICT STEEL RATES

(Percentage of Ingot Capacity Engaged in Leading Districts)

	Week Ended Jan.5	Change	Same Week 1945	Same Week 1944
Pittsburgh	76	+16	89	95
Chicago	87	+19.5	99.5	102.5
Eastern Pa.	73	+ 3	95	96
Youngstown	83	+16	90	89
Wheeling	95	+25	97.5	96
Cleveland	84	+16.5	75.5	90
Buffalo	81	+44	60	88
Birmingham	85	None	95	95
New England	80	None	87	95
Cincinnati	72	+17	90	87
St. Louis	68	None	75	85.5
Detroit	81	+19	88	92
Estimated national rate	81	+16	95.5	96.5

*Based on steelmaking capacities as of these dates.

levels when labor is stabilized. Tin plate requirements, domestic and export, are heavy.

Bar business reflects large needs of the automobile industry and expanding needs of railroads, highway builders and many miscellaneous users. Structural shape producers, already booked an average of four to five months, expect further expansion as soon as building constructioin is released from price uncertainties and lack of labor.

Railroad car builders enter the year with about 45,000 domestic cars on order and a moderate backlog of export business, which should be increased soon by placing of 36,500 cars for France. However, this will leave ample capacity for additional cars as commercial shops have facilities for building 160,000 cars per year and railroad shops more than 50,000 units. A buying flurry at the yearend brought domestic car orders for 1945 to about 45,000 cars, somewhat less than the 53,200 placed by American railroads in 1944.

Steelworks operations the first week of the year snapped back from the low rate of Christmas week, the estimated national rate being 81 per cent of capacity, an increase of 16 points from the prior week. Pittsburgh rose 16 points to 79 per cent, Chicago 19½ points to 87, Youngstown 16 points to 83, Cleveland 16½ points to 84, Wheeling 25 points to 95, Detroit 19 points to 81, Buffalo 44 points to 81, Cincinnati 17 points to 72 and eastern Pennsylvania 3 points to 73. Rates were unchanged at St. Louis, 68, Birmingham, 85 and New England, 80.

For the first time since 1940 prices of Lake Superior iron ore have been changed, Office of Price Administration as of Dec. 29 allowing an increase of 10 cents per ton on Mesabi bessemer and nonbessemer and 20 cents per ton on old range bessemer and nonbessemer; high phosphorus, manganiferous and siliceous ore also were given 20 cents additional. These higher prices apply retroactively to the entire 1945 ore season but only on ore mined for sale, which constitutes about 25 per cent of total tonnage. Ore mined by steelmakers for their own use is not affected.

Pig iron production in November recovered somewhat from the low tonnage of October, reaching 4,025,958 net tons, compared with 3,388,127 tons in October, when fuel scarcity caused banking of many stacks. In November, 1944, the total was 4,904,011 tons.

COMPOSITE MARKET AVERAGES

	Jan. 5	Dec. 29	Dec. 22	One Month Ago Dec. 1945	Three Months Ago Oct. 1945	One Year Ago Jan. 1945	Five Years Ago Jan. 1941
Finished Steel	$58.27	$58.27	$58.27	$58.27	$58.27	$56.73	$56.73
Semifinished Steel	37.80	37.80	37.80	37.80	37.80	36.00	36.00
Steelmaking Pig Iron	24.80	24.80	24.80	24.80	24.05	23.05	22.05
Steelmaking Scrap	19.17	19.17	19.17	19.17	19.17	18.95	21.00

Semifinished Steel Composite:—Average of industry-wide prices on billets, slabs, sheet bars, skelp and wire rods. Steelmaking Pig Iron Composite:—Average of basic pig iron prices at Bethlehem, Birmingham, Buffalo, Chicago, Cleveland, Neville Island, Granite City and Youngstown. Steelworks Scrap Composite:—Average of No. 1 heavy melting steel prices at Pittsburgh, Chicago and eastern Pennsylvania. Finished steel, net tons; other, gross tons.

COMPARISON OF PRICES

Representative Market Figures for Current Week; Average for last Month, Three Months and One Year Ago

Finished Material	Jan. 5, 1946	Dec., 1945	Oct., 1945	Jan., 1945
Steel bars, Pittsburgh	2.25c	2.25c	2.25c	2.15c
Steel bars, Philadelphia	2.57	2.57	2.57	2.47
Steel bars, Chicago	2.25	2.25	2.25	2.15
Shapes, Pittsburgh	2.10	2.10	2.10	2.10
Shapes, Philadelphia	2.215	2.215	2.215	2.215
Shapes, Chicago	2.10	2.10	2.10	2.10
Plates, Pittsburgh	2.25	2.25	2.25	2.10
Plates, Philadelphia	2.30	2.30	2.30	2.15
Plates, Chicago	2.25	2.25	2.25	2.10
Sheets, hot-rolled, Pittsburgh	2.20	2.20	2.20	2.10
Sheets, cold-rolled, Pittsburgh	3.05	3.05	3.05	3.05
Sheets, No. 24 galv., Pittsburgh	3.70	3.70	3.70	3.50
Sheets, hot-rolled, Gary	2.20	2.20	2.20	2.10
Sheets, cold-rolled, Gary	3.05	3.05	3.05	3.05
Sheets, No. 24 galv., Gary	3.70	3.70	3.70	3.50
Bright bess., basic wire, Pittsburgh	2.75	2.75	2.75	2.60
Tin plate, per base box, Pittsburgh	$5.00	$5.00	$5.00	$5.00
Wire nails, Pittsburgh	2.90	2.90	2.90	2.55

Semifinished Material				
Sheet bars, Pittsburgh, Chicago	$36.00	$36.00	$36.00	$34.00
Slabs, Pittsburgh, Chicago	36.00	36.00	36.00	34.00
Rerolling billets, Pittsburgh	36.00	36.00	36.00	34.00
Wire rods, No. 5 to ⅜-inch, Pitts.	2.15	2.15	2.15	2.00

Pig Iron	Jan. 5, 1946	Dec., 1945	Oct., 1945	Jan., 1945
Bessemer, del. Pittsburgh	$26.94	$26.94	$26.19	$25.19
Basic, Valley	25.25	25.25	24.50	23.50
Basic, eastern del. Philadelphia	27.09	27.09	26.34	25.34
No. 2 fdry., del. Pitts., N.&S. Sides	26.44	26.44	25.69	24.69
No. 2 foundry, Chicago	25.75	25.75	25.00	24.00
Southern No. 2, Birmingham	22.13	22.13	21.38	20.38
Southern No. 2 del. Cincinnati	26.05	26.05	25.30	24.30
No. 2 fdry., del. Philadelphia	27.59	27.59	26.84	25.84
Malleable, Valley	25.75	25.75	25.00	24.00
Malleable, Chicago	25.75	25.75	25.00	24.00
Lake Sup., charcoal del. Chicago	37.34	37.34	37.34	37.34
Gray forge, del. Pittsburgh	25.94	25.94	25.19	24.19
Ferromanganese, del. Pittsburgh	140.00	140.00	140.33	140.33

Scrap				
Heavy melting steel, No. 1, Pittsburgh	$20.00	$20.00	$20.00	$20.00
Heavy melt, steel, No. 2, E. Pa.	18.75	18.75	18.45	18.75
Heavy melting steel, Chicago	18.75	18.75	18.75	18.75
Rails for rolling, Chicago	22.25	22.25	22.25	22.25
No. 1 cast, Chicago	20.00	20.00	20.00	20.00

Coke				
Connellsville, furnace, ovens	$7.50	$7.50	$7.50	$7.00
Connellsville, foundry ovens	8.25	8.25	8.25	7.75
Chicago, by-product fdry., del.	13.35	13.75	13.75	13.35

STEEL, IRON, RAW MATERIAL, FUEL AND METALS PRICES

Following are maximum prices established by OPA Schedule No. 6 Issued April 16, 1941, revised June 20, 1941, Feb. 4, 1942 and May 21, 1945. The schedule covers all iron or steel ingots, all semifinished iron or steel products, all finished hot-rolled, cold-rolled iron or steel products and any iron or steel product which is further finished by galvanizing, plating, coating, drawing, extruding, etc., although only principal established basing points for selected products are named specifically. Seconds and off-grade products are also covered. Exceptions applying to individual companies are noted in the table. Finished steel quoted in cents per pound.

Semifinished Steel

Gross ton basis except wire rods, skelp.

Carbon Steel Ingots: F.o.b. mill base, rerolling qual., stand. analysis, $31.00.

(Empire Sheet & Tin Plate Co., Mansfield, O. may quote carbon steel ingots at $33 gross ton, f.o.b. mill.

Alloy Steel Ingots: Pittsburgh, Chicago, Buffalo, Bethlehem, Canton, Massillon; uncrop, $45.

Rerolling Billets, Blooms, Slabs: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Sparrows Point, Birmingham, Youngstown, $36; Detroit, del. $38; Duluth (bil) $38; Pac. Ports, (bil) $48. (Andrews Steel Co., carbon slabs $41; Continental Steel Corp., billets $34, Kokomo, to Acme Steel Co.; Northwestern Steel & Wire Co., $41, Sterling, Ill.; Laclede Steel Co., $34 Alton or Madison, Ill.; Wheeling Steel Corp. $36 base, billets for lend-lease, $34, Portsmouth, O., on slabs on WPB directives. Granite City Steel Co. $47.50 gross ton slabs from D.P.C. mill. Geneva Steel Co. $58.64, Pac. ports.)

Forging Quality Blooms, Slabs, Billets: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham, Youngstown, $42, Detroit, del. $44; Duluth, billets, $44; forg. bil. f.o.b. Pac. ports, $54.

(Andrews Steel Co. may quote carbon forging billets $50 gross ton at established basing points; Follansbee Steel Corp., $49.50 f.o.b. Toronto, O. Geneva Steel Co. $64.64, Pacific ports.)

Open Hearth Shell Steel: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Youngstown, Birmingham, base 1000 tons one size and section; 3-12 in., $52; 12-18 in., excl., $54.00; 18-in. and over $56. Add $2.00 del. Detroit; $3.00 del. Eastern Mich.

Alloy Billets, Slabs, Blooms: Pittsburgh, Chicago, Buffalo, Bethlehem, Canton, Massillon, $54, del. Detroit $56, Eastern Mich. $57.

Sheet Bars: Pittsburgh, Chicago, Cleveland, Buffalo, Canton, Sparrows Point, Youngstown, $36. (Wheeling Steel Corp. $37 on lend-lease sheet bars, $38 Portsmouth, O., on WPB directives; Empire Sheet & Tin Plate Co., Mansfield, O., carbon sheet bars, $39, f.o.b. mill.)

Skelp: Pittsburgh, Chicago, Sparrows Point, Youngstown, Coatesville, lb., 1.90c.

Wire Rods: Pittsburgh, Chicago, Cleveland, Birmingham, 5—⅜ in. inclusive, per 100 lbs., $2.15 Do., over ⅜—41-in., incl., $2.30; Galveston, base, $2.25 and $2.40 respectively. Worcester add $0.10; Pacific ports $0.50 (Pittsburgh Steel Co., $0.05 higher.)

Bars

Hot-Rolled Carbon Bars and Bar-Size Shapes under 3: Pittsburgh, Youngstown, Chicago Gary, Cleveland, Buffalo, Birmingham base 20 tons one size, 2.25c; Duluth, base 2.35c; Detroit, del. 2.35c; Eastern Mich. 2.40c; New York del. 2.59c; Phila. del. 2.57c; Gulf Ports, dock 2.62c; Pac. ports, dock 2.90c, (Calumet Steel Division. Borg-Warner Corp., and Joslyn Mfg. & Supply Co., may quote 2.55c, Chicago base; Sheffield Steel Corp., 2.75c, f.o.b. St. Louis.)

Rail Steel Bars: Same prices as for hot-rolled carbon bars except base is 5 tons.

(Sweet's Steel Co., Williamsport, Pa., may quote rail steel merchant bars 2.33c f.o.b. mill.)

Hot-Rolled Alloy Bars: Pittsburgh, Youngstown, Chicago, Canton, Massillon, Buffalo, Bethlehem, base 20 tons one size, 2.70c; Detroit del., 2.80c. (Texas Steel Co. may use Chicago base price as maximum f.o.b. Fort Worth, Tex., price on sales outside Texas, Oklahoma.)

AISI Series	(*Basic O-H)	AISI Series	(*Basic O-H)
1300	$0.10	4100 (.15-.25 Mo)	0.70
		4100 (.20-.30 Mo)	0.75
2300	1.70	4300	1.70
2500	2.55	4600	1.20
3000	0.50	4800	2.15
3100	0.85	5100	0.35
3200	1.35	5130 or 5152	0.45
3400	3.20	6120 or 6152	0.95
4000	0.45-0.55	6145 or 6150	1.20

* Add 0.25 for acid open-hearth; 0.50 electric.

Cold-Finished Carbon Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, base 20,000-39,999 lbs., 2.75c; Detroit 2.80c; Toledo 2.90c. (Keystone Drawn Steel Co. may sell outside its usual market area on Proc. Div., Treasury Dept. contracts at 2.65c, Spring City, Pa., plus freight on hot-rolled bars from Pittsburgh to Spring City, New England Drawn Steel Co. may sell outside New England on WPB directives at 2.65c, Mansfield, Mass., plus freight on hot-rolled bars from Buffalo to Mansfield.)

Cold-Finished Alloy Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, base 3.35c; Detroit, del. 3.45c; Eastern Mich. 3.50c.

Reinforcing Bars (New Billet): Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Sparrows Point, Buffalo, Youngstown, base 2.15c; Detroit del. 2.25c; Eastern Mich. and Toledo 2.30c; Gulf ports, dock 2.50c; Pacific ports, dock 2.55c.

Reinforcing Bars (Rail Steel): Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Buffalo base 2.15c; Detroit, del. 2.25c; Eastern Mich. and Toledo 2.30c; Gulf ports, dock 2.50c.

Iron Bars: Single refined, Pitts. 4.40c; double refined 5.40c; Pittsburgh, staybolt, 5.75c; Terre Haute, single ref., 5.00, double ref., 6.25c.

Sheets, Strip

Hot-Rolled Sheets: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Buffalo, Youngstown, Sparrows Pt., Middletown, base 2.20c; Granite City, base 2.30c; Detroit del. 2.30c; Eastern Mich. 2.35c; Phila. del. 2.37c; New York del. 2.44c; Pacific ports 2.75c.

(Andrews Steel Co. may quote hot-rolled sheets for shipment to Detroit and the Detroit area on the Middletown, O., base; Alan Wood Steel Co., Conshohocken, Pa., may quote 2.35c on hot carbon sheets, nearest eastern basing point.)

Cold-Rolled Sheets: Pittsburgh, Chicago, Cleveland, Gary, Buffalo, Youngstown, Middletown, base, 3.05c; Granite City, base 3.15c; Detroit del. 3.15c; Eastern Mich. 3.20c; New York del. 3.39c; Phila. del. 3.37c; Pacific ports 3.70c.

Galvanized Sheets, No. 24: Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Youngstown, Sparrows Point, Middletown, base 3.70c; Granite City, base 3.80c; New York del. 3.94c; Phila. del. 3.78c; Pacific ports 4.25c.

(Andrews Steel Co. may quote galvanized sheets 3.75c at established basing points.)

Corrugated Galv. Sheets: Pittsburgh, Chicago, Gary, Birmingham, 29 gage, per square 3.36c.

Culvert Sheets: Pittsburgh, Chicago, Gary, Birmingham, 16 gage not corrugated, copper alloy 3.60c; Granite City 3.70c; Pacific ports 4.25c; copper iron, 3.90c; pure iron 3.95c; zinc-coated, hot-dipped, heat-treated, No. 24, Pittsburgh, 4.25c.

Enameling Sheets: 10-gage; Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Middletown, base 2.85c; Granite City, base 2.95c; Detroit, del. 2.95c; eastern, Mich. 3.00c; Pacific ports 3.50c; 20 gage; Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Middletown, base 3.45c; Detroit del. 3.55c; eastern Mich. 3.60c; Pacific ports 4.10c.

Electrical Sheets No. 24:

	Pittsburgh Base	Pacific Ports	Granite City
Field grade	3.30c	4.05c	3.30c
Armature	3.65c	4.40c	3.75c
Electrical	4.15c	4.90c	4.25c
Motor	5.05c	5.80c	5.15c
Dynamo	5.75c	6.50c	5.85c
Transformer			
72	6.25c	7.00c	....
65	7.25c	8.00c	....
58	7.75c	8.50c	....
52	8.55c	9.30c	....

Hot-Rolled Strip: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Middletown, base 1 ton and over, 12 inches wide and less 2.10c; Detroit del. 2.20c; Eastern Mich. 2.25c; Pacific ports 2.75c.

Cold Rolled Strip: Pittsburgh, Cleveland, Youngstown, 0.25 carbon and less 2.80c; Chicago, base 2.90c; Detroit, del. 2.90c; Eastern Mich. 2.95c; Worcester base 3.00c.

Commodity C. R. Strip: Pittsburgh, Cleveland, Youngstown, base 3 tons and over, 2.95c; Chicago 3.05c; Detroit del. 3.05c; Eastern Mich. 3.10c; Worcester base 3.25c.

Cold Finished Spring Steel: Pittsburgh, Cleveland bases, add 20c for Worcester; .26-.50 Carb., 2.80c; .51-.75 Carb., 4.80c; .76-1.00 Carb., 6.15c; over 1.00 Carb., 8.35c.

Tin, Terne Plate

Tin Plate: Pittsburgh, Chicago, Gary, 100-lb. base box, $5.00; Granite City $5.10.

Electrolytic Tin Plate: Pittsburgh, Gary, 100-lb. base box, 0.25 lb. tin, $4.35; 0.50 lb. tin, $4.50; 0.75 lb. tin $4.65; Granite City, $4.45, $4.60, $4.75, respectively.

Tin Mill Black Plate: Pittsburgh, Chicago, Gary, base 29 gage and lighter, 3.05c; Granite City, 3.15c; Pacific ports, boxed, .450c.

Long Ternes: Pittsburgh, Chicago, Gary, No. 24 unassorted 3.80c; Pacific ports 4.55c.

Manufacturing Ternes: (Special Coated) Pittsburgh, Chicago, Gary, 100-base box $4.30; Granite City $4.40.

Plates

Roofing Ternes: Pittsburgh base per package 112 sheets; 20 x 28 in., coating I.C. 8-lb. 12.00; 15-lb. $14.00; 20-lb. $15.00; 25-lb. $16; 30-lb. $17.25; 40-lb. $19.50.

Carbon Steel Plates: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Sparrows Point, Coatesville, Claymont, 2.25c; New York, del. 2.44c; Phila., del. 2.30c; St. Louis, 2.49c; Boston, del. 2.57-82c; Pacific ports, 2.80c; Gulf ports, 2.60c.

(Granite City Steel Co. may quote carbon plates 2.35c f.o.b. mill; 2.65c f.o.b. D.P.C. mill; Central Iron & Steel Co. 2.50c f.o.b. basing points; Geneva Steel Co., Provo, Utah, 3.20c, f.o.b. Pac. ports.)

Floor Plates: Pittsburgh, Chicago, 3.50c; Pacific ports, 4.15c; Gulf ports, 3.85c.

Open-Hearth Alloy Plates: Pittsburgh, Chicago, Coatesville, 3.50c; Gulf ports 3.95c; Pacific ports 4.15c.

Shapes

Structural Shapes: Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Bethlehem, 2.10c; New York, del. 2.27c; Phila., del. 2.215c; Pacific ports. 2.75c; Gulf ports, 2.45c.

(Phoenix Iron Co., Phoenixville, Pa., may quote the equivalent of 2.45c, Bethlehem, Pa., on the general range and 2.25c on beams and channels from 4t o 10 inches.)

Steel Piling: Pittsburgh, Chicago, Buffalo, 2.40c; Pacific ports, 2.95c.

Wire Products. Nails

Wire: Pittsburgh, Chicago, Cleveland, Birmingham to manufacturers in carloads.

Bright, basic, bessemer wire ..... °$2.75

Spring wire ..... °†$3.35

Wire Products to the Trade:

Standard and cement-coated wire nails, and staples, 100-lb. keg, Pittsburgh, Chicago, Birmingham, Cleveland, $2.90; Pac. ports, $3.40;—galvanized, $2.55 and $3.05, resp.

Annealed Merchant quality wire, 100-lb., Pittsburgh, Chicago, Cleveland, Birmingham ..... ††$3.20

Galvanized Merchant quality wire, 100-lb., Pittsburgh, Chicago, Cleveland, Birmingham ..... ††$3.55

Woven fence, 15½ gage and heavier, per base column 67

Barbed wire, 80-rod spool, Pittsburgh, Chicago, Cleveland, Birmingham, column 72; twisted barbless wire, column 72.

°Add $0.10 for Worcester, $0.05 for Duluth; add $0.50 for bright, annealed, aglvanized and $0.70 for other finishes for Pacific ports.

† Same bases as for bright basic except Birmingham.

†† Add 10 cents for Worcester; 50 cents for annealed, bright basic and 70 cents for all other finishes for Pacific ports.

Tubular Goods

Welded Pipe: Base price in carloads, threaded and coupled to consumers about $200 per net ton. Base discounts on steel pipe Pittsburgh and Lorain, O.; Gary, Ind. 2 points less on lap weld, 1 point less on butt weld. Pittsburgh base only on wrought iron pipe.

Butt Weld

In.	Steel Blk.	Steel Galv.	In.	Iron Blk.	Iron Galv.
⅛	56	33	½	24	3½
¼ & ⅜	59	40½	¾	30	10
½	63½	51	1-1¼	34	16
¾	66½	55	1½	38	18½
1-3	68½	57½	2	37½	18

Lap Weld

In.	Steel Blk.	Steel Galv.	In.	Iron Blk.	Iron Galv.
2	61	49½	1¼	23	3½
2½-3	64	54½	1½	28½	10
3½-6	66	54½	2	30½	12
7-8	65	52½	2½-3½	31½	14½
9-10	64½	52	4	33½	18
11-12	63½	51	4½-8	32½	17
			9-12	28½	12

Boiler Tubes: Net base prices per 100 feet f.o.b.f.o.b. Pittsburgh in carload lots, minimum wall, cut lengths 4 to 24 feet, inclusive.

O.D. Sizes	B.W.G.	—Seamless— Hot Rolled	Cold Drawn	—Lap Weld— Steel	Charcoal Iron
1"	13	$ 7.82	$ 9.01	.....	.....
1¼"	13	9.26	10.67	.....	.....
1½"	13	10.23	11.72	$ 9.72	$23.71
1¾"	13	11.64	13.42	11.06	22.93
2"	13	13.04	15.03	12.38	19.35
2¼"	13	14.54	16.76	13.79	21.63
2¼"	12	16.01	18.45	15.16	.....
2½"	12	17.54	20.21	16.58	26.57
2¾"	12	18.59	21.42	17.54	29.00
3"	12	19.50	22.48	18.35	31.38
3½"	11	24.63	28.37	23.15	39.81
4"	10	30.54	35.20	28.66	49.90
4½"	10	37.35	43.04	35.22	.....
5"	9	46.87	54.01	44.25	73.93
6"	7	71.96	82.93	68.14	.....

Rails, Supplies

Standard rails, over 60-lb., .f.o.b. mill, gross ton, $43.00. Light rails (billet), Pittsburgh, Chicago, Birmingham, gross ton, $45.00.

°Relaying rails, 35 lbs. and over, f.o.b. railroad and basing points, $31-$33.

Supplies: Track bolts, 4.75c; heat treated, 5.00c. Tie plates $46 net ton, base, Standard spikes, 3.25c.

°Fixed by OPA Schedule No. 46, Dec. 15, 1941.

Tool Steels

Tool Steels: Pittsburgh, Bethlehem, Syracuse, Canton, O., Dunkirk, N. Y., base, cents per lb.; Reg. carbon 14.00c; extra carbon 18.00c; special carbon 22.00c; oil-hardening 24.00c; high car.-chr. 43.00c.

Tung.	Chr.	Van.	Moly.	Base, per lb.
18.00	4	1	...	67.00c
1.5	4	1	8.5	54.00c
.....	4	2	3	54.00c
6.40	4.15	1.90	5	57.50c
5.50	4.50	4	4.50	70.00c

Stainless Steels

Base, Cents per lb.

Type	Bars	Plates	Sheets	H. R. Strip	C. R. Strip
CHROMIUM NICKEL STEEL					
302	24.00c	27.00c	34.00c	21.50c	28.00c
303	26.00	29.00	36.00	27.00	33.00
304	25.00	29.00	36.00	23.50	30.00
308	29.00	34.00	41.00	28.50	35.00
309	36.00	40.00	47.00	37.00	47.00
310	49.00	52.00	53.00	48.75	56.00
312	36.00	40.00	49.00	.....	.....
°316	40.00	44.00	48.00	40.00	48.00
‡321	29.00	34.00	41.00	29.25	38.00
‡347	33.00	38.00	45.00	33.00	42.00
431	19.00	22.00	29.00	17.50	22.50
STRAIGHT CHROMIUM STEEL					
403	21.50	24.50	29.50	21.25	27.00
°°410	18.50	21.50	26.50	17.00	22.00
416	19.00	22.00	27.00	18.25	23.50
††420	24.00	28.50	33.50	23.75	36.50
430	19.00	22.00	29.00	17.50	22.50
‡‡430F	19.50	22.50	29.50	18.75	24.50
440A	24.00	28.50	33.50	23.75	36.50
442	22.50	25.50	32.50	24.00	32.00
443	22.50	25.50	32.50	24.00	32.00
446	27.50	30.50	36.50	35.00	52.00
501	8.00	12.00	15.75	12.00	17.00
502	9.00	13.00	16.75	13.00	18.00
STAINLESS CLAD STEEL (20%)					
304	.....	§§18.00	19.00	.....	.....

°With 2-3% moly. §With titanium. ‡With columbium. °°Plus machining agent. ‡‡High carbon. ††Free machining. §§Includes annealing and pickling.

Rivets, Washers

Birmingham

F.o.b. Pittsburgh, Cleveland, Chicago

Structural 3.75c

⅛-inch and under ..... 65-5 off

Wrought, Washers, Pittsburgh, Chicago, Philadelphia, to jobbers and large nut, bolt manufacturers l.c.l. ..$2.75-3.00 off

Bolts, Nuts

F.o.b. Pittsburgh, Cleveland, Birmingham, Chicago. Discounts for carloads additional 5%, full containers, add 10%

Carriage and Machine

½ x 6 and smaller ..... 65½ off

Do., ⅜ and ⅝ x 6-in. and shorter .. 63½ off

Do., ¾ to 1 x 6-in. and shorter ... 61 off

1⅛ and larger, all lengths ..... 59 off

All diameters, over 6-in. long ..... 59 off

Tire bolts ..... 50 off

Step bolts ..... 56 off

Plow bolts ..... 65 off

Stove Bolts

In packages with nuts separate 71-10 off; bulk 80 off on 15,000 of 3-inch and shorter, or 5000 over 3-in.

Nuts

Semifinished hex	U.S.S.	S.A.E.
⅞-inch and less	62	64
1-1-inch	59	60
1⅛-1½-inch	57	58
1⅝ and larger	56	..

Hexagon Cap Screws

Upset 1-in., smaller ..... 64 off

Milled 1-in., smaller ..... 60 off

Square Head Set Screws

Upset, 1-in., smaller ..... 71 off

Headless, ¼-in., larger ..... 60 off

No. 10, smaller ..... 70 off

Basing Point Prices are (1) those announced by U. S. Steel Corp. subsidiaries for first quarter of 1941 or in effect April 16, 1941 at designated basing points or (2) those prices announced or customarily quoted by other producers at the some designated points. Base prices under (2) cannot exceed those under (1) except to the extent prevailing in third quarter of 1940.

Extra mean additions or deductions from **Extra** mean additions or deductions from base prices in effect April 16, 1941.

Delivered prices applying to Detroit, Eastern Michigan, Gulf and Pacific Coast points are deemed basing points except in the case of the latter two areas when water transportation is not available, in which case nearest basing point price plus all-rail freight may be charged.

Domestic Ceiling prices are the aggregate of (1) governing basing point price, (2) extras and (3) transportation charges to the point of delivery as customarily computed. **Governing basing point** is basing point nearest the consumer providing the lowest delivered price.

Seconds, maximum prices: flat-rolled rejects 75% of prime prces, wasters 75%, waste-wasters 65% except plates, which take waster prices; tin plate $2.80 per 100 lbs.; terns plate $2.25; semifinished 85% of primes; other grades limited to new material ceilings.

Export ceiling prices may be either the aggregate of (1) governing basing point or emergency basing point (2) export extras (3) export transportation charges provided they are the f.a.s. seaboard quotations of the U. S. Steel Export Co. on April 16, 1941.

Metallurgical Coke

Price Per Net Ton

Beehive Ovens

Connellsville, furnace	°7.50
Connellsville, foundry	8.00- 8.50
New River, foundry	9.00- 9.25
Wise county, foundry	7.75- 8.25
Wise county, furnace	7.25- 7.75
By-Product Foundry	
Kearney, N. J., ovens	13.05
Chicago, outside delivered	13.00
Chicago, delivered	13.75
Terre Haute, delivered	13.50
Milwaukee, ovens	13.75
New England, delivered	14.65
St. Louis, delivered	†18.75
Birmingham, delivered	10.90
Indianapolis, delivered	13.50
Cincinnati, delivered	13.25
Cleveland, delivered	13.20
Buffalo, delivered	13.40
Detroit, delivered	13.75
Philadelphia, delivered	13.28

°Operators of hand-drawn ovens using trucked coal may charge $8.00; effective May 26, 1945.

†14.25 from other than Ala., Mo., Tenn.

Coke By-Products

Spot, gal., freight allowed east of Omaha

Pure and 90% benzol	15.00c
Toluol, two degree	28.00c
Solvent naphtha	27.00c
Industrial xylol	27.00c
Per lb. f.o.b. works	
Phenol (car lots, returnable drums)	12.50c
Do., less than car lots	13.23c
Do., tank cars	11.50c
Eastern Plants, per lb.	
Naphthalene flakes, balls, bbls., to jobbers	8.00c
Per ton, bulk, f.o.b. port	
Sulphate of ammonia	$20.00

WAREHOUSE STEEL PRICES

Base delivered price, cents per pound, for delivery within switching limits, subject to established extras.

	Hot rolled bars	Structural shapes	Plates	Floor plates	Hot rolled sheets (10 gage base)	Hot rolled bands (12 gage and heavier)	Hot rolled hoops (14 gage and lighter)	Galvanized flat sheets (24 gage base)	Cold-rolled sheets (17 gage base)	Cold finished bars	Cold-rolled strip	NE hot bars 8600 series	NE hot bars 9400 series
Boston	4.044[1]	3.912[1]	3.912[1]	5.727[1]	3.774[1]	4.106[1]	5.106[1]	5.224[14]	4.744[14]	4.244[11]	4.715	6.012[23]	6.012[23]
New York	3.853[1]	3.758[1]	3.768[1]	5.574[1]	3.590[1]	3.974[1]	3.974[1]	5.010[12]	4.613[14]	4.203[21]	4.774	.....	.....
Jersey City	3.853[1]	3.747[1]	3.768[1]	5.574[1]	3.590[1]	3.974[1]	3.974[1]	5.010[12]	4.613[14]	4.203[21]	4.774	.....	.....
Philadelphia	3.822[1]	3.666[1]	3.605[1]	5.272[1]	3.518[1]	3.922[1]	4.272[1]	5.018[15]	4.872[25]	4.172[21]	4.772	5.816[23]	5.860[23]
Baltimore	3.802[1]	3.759[1]	3.594[1]	5.252[1]	3.394[1]	3.902[1]	4.252[1]	4.894[1]	4.852[25]	4.152[21]	.....	.....	.....
Washington	3.941[1]	3.930[1]	3.796[1]	5.341[1]	3.596[1]	4.041[1]	4.391[1]	5.196[17]	4.841[20]	4.141[21]	.....	.....	.....
Norfolk, Va.	4.065[1]	4.002[1]	3.971[1]	5.465[1]	3.771[1]	4.165[1]	4.515[1]	5.371[17]	4.965[24]	4.265[21]	.....	.....	.....
Bethlehem, Pa.[a]	.....	3.45[1]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Claymont, Del.[a]	.....	.....	3.45[1]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Coatesville, Pa.[a]	.....	.....	3.45[1]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Buffalo (city)	3.35[1]	3.40[1]	3.63[1]	5.26[1]	3.35[1]	3.819[1]	3.819[1]	4.75[16]	4.40[10]	3.85[21]	4.669	5.60[23]	5.75[23]
Buffalo (country)	3.25[1]	3.30[1]	3.30[1]	4.90[1]	3.25[1]	3.81[1]	3.50[1]	4.65[15]	4.30[10]	3.75[21]	4.35	5.60[23]	5.75[23]
Pittsburgh (city)	3.35[1]	3.40[1]	3.40[1]	5.00[1]	3.35[1]	3.60[1]	3.60[1]	4.75[12]	4.40[24]	3.85[21]	.....	.....	.....
Pittsburgh (country)	3.25[1]	3.30[1]	3.30[1]	4.90[1]	3.25[1]	3.50[1]	3.50[1]	4.65[12]	4.30[24]	3.75[21]	.....	.....	.....
Cleveland (city)	3.35[1]	3.588[1]	3.40[1]	5.188[1]	3.35[1]	3.60[1]	3.60[1]	4.877[13]	4.40[24]	3.85[21]	4.45[21]	5.60[23]	5.65[23]
Cleveland (country)	3.25[1]	.....	3.30[1]	.....	3.25[1]	3.50[1]	3.50[1]	.....	4.30[24]	3.75[21]	4.35[21]	.....	.....
Detroit	3.450[1]	3.661[1]	3.609[1]	5.281[1]	3.450[1]	3.700[1]	3.700[1]	5.000[12]	4.500[24]	3.900[21]	4.659	5.93[23]	5.93[23]
Omaha (city, delivered)	4.043[1]	4.043[1]	4.093[1]	5.693[1]	3.793[1]	4.143[1]	4.215[1]	5.615[12]	5.443[24]	4.543[12]	.....	.....	.....
Omaha (country, base)	3.943[1]	3.993[1]	3.993[1]	5.593[1]	3.693[1]	4.043[1]	4.115[1]	5.515[12]	.....	.....	.....	.....	.....
Cincinnati	3.611[1]	3.691[1]	3.661[1]	5.291[1]	3.425[1]	3.675[1]	3.675[1]	4.825[12]	4.475[24]	4.111[21]	4.711	6.10	6.20
Youngstown, O.[a]	.....	.....	.....	.....	.....	.....	.....	4.40[12]	.....	.....	.....	.....	.....
Middletown, O.[a]	.....	.....	.....	.....	3.25[1]	3.50[1]	3.50[1]	4.65[16]	.....	.....	.....	.....	.....
Chicago (city)	3.50[1]	3.55[1]	3.55[1]	5.15[1]	3.25[1]	3.60[1]	3.60[1]	5.231[15]	4.20[24]	3.85[21]	4.65	5.75[23]	5.85[23]
Milwaukee	3.637[1]	3.687[1]	3.687[1]	5.287[1]	3.387[1]	3.737[1]	3.737[1]	5.272[15]	4.337[24]	3.987[21]	4.787	5.987[23]	6.087[23]
Indianapolis	3.58[1]	3.63[1]	3.63[1]	5.23[1]	3.518[1]	3.768[1]	3.768[1]	4.918[15]	4.568[24]	4.08[21]	4.78	6.08[23]	6.18[23]
St. Paul	3.76[2]	3.81[2]	3.81[2]	5.41[2]	3.51[2]	3.86[2]	3.86[2]	5.257[15]	4.46[24]	4.461[21]	5.102	6.09[22]	6.19[26]
St. Louis	3.647[1]	3.697[1]	3.697[1]	5.297[1]	3.397[1]	3.747[1]	3.747[11]	5.172[15]	4.347[24]	4.131[21]	4.931	6.131[23]	6.281[23]
Memphis, Tenn.	4.015[5]	4.065[5]	4.065[5]	5.78[5]	3.965[5]	4.215[5]	4.215[5]	5.265[15]	4.78[24]	4.43[21]	.....	.....	.....
Birmingham	3.50[1]	3.55[1]	3.55[1]	5.903[1]	3.45[1]	3.70[1]	3.70[1]	4.75[13]	4.852[24]	4.64	5.215	.....	.....
New Orleans (city)	4.10[4]	3.90[4]	3.90[4]	5.85[4]	4.058[4]	4.20[4]	4.20[4]	5.25[20]	5.079[10]	4.70[21]	5.429	.....	.....
Houston, Tex.	3.75[3]	4.25[3]	4.25[3]	5.50[3]	3.763[3]	4.313[3]	4.313[3]	5.313[20]	4.10[10]	3.75[23]	.....	.....	.....
Los Angeles	4.40[4]	4.65[4]	4.95[4]	7.20[1]	5.00[4]	4.95[4]	6.75[4]	6.00[12]	7.20[6]	5.683[22]	5.613	5.85[23]	5.95[26]
San Francisco	4.15[7]	4.35[7]	4.65[7]	6.35[7]	4.55[7]	4.50[7]	5.75[7]	6.35[15]	7.30[15]	5.433[21]	7.333	8.304[23]	8.404[26]
Portland, Oreg.	4.45[27]	4.45[27]	4.75[27]	6.50[27]	4.65[27]	4.75[27]	6.30[27]	5.75[15]	6.60[15]	5.633[15]	.....	.....	.....
Tacoma	4.35[6]	4.45[6]	4.75[6]	6.50[6]	4.65[6]	4.25[6]	5.45[6]	5.95[15]	7.60[15]	5.883[21]	.....	.....	8.00[23]
Seattle	4.35[6]	4.45[6]	4.75[6]	6.50[6]	4.65[6]	4.25[6]	5.45[6]	5.95[15]	7.05[15]	5.883[21]	.....	.....	8.00[26]

[a]Basing point cities with quotations representing mill prices, plus warehouse spread.
NOTE—All prices fixed by Office of Price Administration in Amendments Nos. 10 to 33 to Revised Price Schedule No. 49. Deliveries outside above cities computed in accordance with regulations.

BASE QUANTITIES

[1]400 to 1999 pounds; [2]—400 to 14,999 pounds; [3]—any quantity; [4]—300 to 1999 pounds; [5]—400 to 8999 pounds; [6]—300 to 9999 pounds; [7]—400 to 39,999 pounds; [8]—under 2000 pounds; [9]—under 4000 pounds; [10]—500 to 1499 pounds; [11]—one bundle to 39,999 pounds; [12]—150 to 2249 pounds; [13]—150 to 1499 pounds; [14]—three to 24 bundles; [15]—450 to 1499 pounds; [16]—one bundle to 1499 pounds; [17]—one to nine bundles; [18]—one to six bundles; [19]—100 to 749 pounds; [20]—300 to 1999 pounds; [21]—1500 to 39,999 pounds; [22]—1500 to 1999 pounds; [23]—1000 to 39,999 pounds; [24]—400 to 1499 pounds; [25]—1000 to 1999 pounds; [26]—under 25 bundles. Cold-rolled strip, 2000 to 39,999 pounds, base; [27]—300 to 4999 pounds.

Ores

Lake Superior Iron Ore

Gross ton, 51½% (Natural) Lower Lake Ports

Old range bessemer	$4.95
Mesabi nonbessemer	4.55
High phosphorus	4.55
Mesabi bessemer	4.70
Old range nonbessemer	4.80

Eastern Local Ore

Cents, units, del. E. Pa.

Foundry and basic 56-63% contract	13.00

Foreign Ore

Cents per unit, c.i.f. Atlantic ports

Manganiferous ore, 45-55% Fe., 6-10% Mang.	Nom.
N. African low phos.	Nom.
Spanish, No. African basic, 50 to 60%	Nom.
Brazil iron ore, 68-69% f.o.b. Rio de Janeiro	7.50-8.00

Tungsten Ore

Chinese Wolframite, per short ton unit, duty paid	$24.00

Chrome Ore

(Equivalent OPA schedules):

Gross ton f.o.b. cars, New York, Philadelphia, Baltimore, Charleston, S. C., Portland, Ore., or Tacoma, Wash.

(S S paying for discharge; dry basis, subject to penalties if guarantees are not met.)

Indian and African

48% 2.8:1	$41.00
48% 3:1	43.50
48% no ratio	31.00

South African (Transvaal)

44% no ratio	$27.40
45% no ratio	28.30
48% no ratio	31.00
50% no ratio	32.80

Brazilian—nominal

44% 2.5:1 lump	33.65
48% 3:1 lump	43.50

Rhodesian

45% no ratio	28.30
48% no ratio	31.00
48% 3:1 lump	43.50

Domestic (seller's nearest rail)

48% 3:1	52.80
less $7 freight allowance	

Manganese Ore

Sales prices of Metals Reserve Co., cents per gross ton unit, dry, 48%, at New York, Philadelphia, Baltimore, Norfolk, Mobile and New Orleans, 85.0c; Fontana, Calif., Provo, Utah, and Pueblo, Colo., 91.0c; prices include duty on imported ore and are subject to premiums, penalties and other provisions of amended M.P.R. No. 248, effective as of May 15. Price at basing points which are also points of discharge of imported manganese ore is f.o.b. cars, shipside, at dock most favorable to the buyer.

Molybdenum

Sulphide conc., lb., Mo. cont., mines	$0.75

NATIONAL EMERGENCY STEELS (Hot Rolled)

(Extras for alloy content)

Designation	Chemical Composition Limits, Per Cent — Carbon	Mn.	Si.	Cr.	Ni.	Mo.	Basic open-hearth Electric furnace: Bars per 100 lb.	Billets per GT	Bars per 100 lb.	Billets per GT
NE 8612	.10-.15	.70-.90	.20-.35	.40-.60	.40-.70	.15-.25	$0.65	$13.00	$1.15	$23.00
NE 8720	.18-.23	.70-.90	.20-.35	.40-.60	.40-.70	.20-.30	.70	14.00	1.20	24.00
NE 9415	.13-.18	.80-1.10	.20-.35	.30-.50	.30-.60	.08-.15	.75	15.00	1.25	25.00
NE 9425	.23-.28	.80-1.20	.20-.35	.30-.50	.30-.60	.08-.15	.75	15.00	1.25	25.00
NE 9442	.40-.45	1.00-1.30	.20-.35	.30-.50	.30-.60	.08-.15	.80	16.00	1.30	26.00
NE 9722	.20-.25	.50-.80	.20-.35	.10-.25	.40-.70	.15-.25	.65	13.00	1.15	23.00
NE 9830	.28-.33	.70-.90	.20-.35	.70-.90	.85-1.15	.20-.30	1.30	26.00	1.80	36.00
NE 9912	.10-.15	.50-.70	.20-.35	.40-.60	1.00-1.30	.20-.30	1.20	24.00	1.55	31.00
NE 9920	.18-.23	.50-.70	.20-.35	.40-.60	1.00-1.30	.20-.30	1.20	24.00	1.55	31.00

Extras are in addition to a base price of 2.70c, per pound on finished products and $54 per gross ton on semifinished steel major basing points and are in cents per pound and dollars per gross ton. No prices quoted on vanadium alloy.

Pig Iron

Prices (in gross tons) are maximum fixed by OPA Price Schedule No. 10, effective June 10, 1941, amended Feb. 14, and Oct. 22, 1945. Exceptions indicated in footnotes. Base prices bold face, delivered light face. Federal tax on freight charges, effective Dec. 1, 1942, not included.

	Foundry	Basic	Bessemer	Malleable
Bethlehem, Pa., base	$26.75	$26.25	$27.75	$27.25
Newark, N. J., del.	28.28	27.78	29.28	28.78
Brooklyn, N. Y., del.	29.25	.....	.....	29.75
Birdsboro, Pa., base	26.75	26.25	27.75	27.25
Birmingham, base	22.13	20.75	26.75	.....
Baltimore, del.	27.36	.....	.....	.....
Boston, del.	26.89	.....	.....	.....
Chicago, del.	25.97	.....	.....	.....
Cincinnati, del.	25.81	24.48	.....	.....
Cleveland, del.	25.87	24.99	.....	.....
Newark, N. J.	27.90	.....	.....	.....
Philadelphia, del.	27.21	26.71	.....	.....
St. Louis, del.	25.87	24.99	.....	.....
Buffalo, base	25.75	24.75	26.75	26.25
Boston, del.	27.25	26.75	28.25	27.75
Rochester, del.	27.28	.....	28.28	27.78
Syracuse, del.	27.83	.....	28.83	28.33
Chicago, base	25.75	25.25	26.25	25.75
Milwaukee, del.	26.85	26.35	27.35	26.85
Muskegon, Mich., del.	28.94	.....	.....	28.94
Cleveland, base	25.75	25.25	26.25	25.75
Akron, Canton, del.	27.14	26.64	27.64	27.14
Detroit, base	25.75	25.25	26.25	25.75
Saginaw, Mich., del.	28.06	27.56	28.56	28.06
Duluth, base	26.25	25.75	26.75	26.25
St. Paul, del.	28.38	27.88	28.88	28.38
Erie, Pa., base	25.75	25.25	26.75	26.25
Everett, Mass., base	26.75	26.25	27.75	27.25
Boston, del.	27.25	26.75	28.25	27.75
Granite City, Ill., base	25.75	25.25	26.25	25.75
St. Louis, del.	26.25	25.75	.....	26.25
Hamilton, O., base	25.75	25.25	.....	25.75
Cincinnati, del.	26.19	26.36	.....	26.86
Neville Island, Pa., base	25.75	25.25	26.25	25.75
§Pittsburgh, del. No. & So. sides	26.44	25.94	26.94	26.44
Provo, Utah, base	23.75	23.25	.....	.....
Sharpsville, Pa., base	25.75	25.25	26.25	25.75
Sparrows Point, base	26.75	26.25	.....	.....
Baltimore, del.	27.74	.....	.....	.....
Steelton, Pa., base	.....	26.25	.....	27.25
Swedeland, Pa., base	26.75	26.25	27.75	27.25
Philadelphia, del.	27.59	27.09	.....	28.09
Toledo, O., base	25.75	25.25	26.25	25.75
Youngstown, O., base	25.75	25.25	26.25	25.75
Mansfield, O., del.	27.69	27.19	28.19	27.69

Base grade, silicon 1.75-2.25%; add 50 cents for each additional 0.25% silicon, or portion thereof; deduct 50 cents for silicon below 1.75% on foundry iron. § For McKees Rocks, Pa., add .55 to Neville Island base; Lawrenceville, Homestead, McKeesport, Ambridge, Monaco, Aliquippa, .84; Monessen, Monongahela City .97 (water); Oakmont, Verona 1.11; Brackenbridge 1.24.

Note: Add 50 cents per ton for each 0.50% manganese or portion thereof over 1.00%.

Nickel differentials: Under 0.50%, no extra; 0.50% to 0.74% incl., $2 per ton; for each additional 0.25% nickel, $1 per ton.

High Silicon, Silvery

6.00-6.50 per cent (base) $31.25

6.51-7.00	$32.25	9.01- 9.50	37.25
7.01-7.50	33.25	9.51-10.00	38.25
7.51-8.00	34.25	10.01-10.50	39.25
8.01-8.50	35.25	10.51-11.00	40.25
8.51-9.00	36.25	11.01-11.50	41.25

F.o.b. Jackson county, O., per gross ton. Buffalo base $1.25 higher, whichever is most favorable to buyer. Prices subject to additional charge of 50 cents a ton for each 0.50% manganese in excess of 1.00%.

Electric Furnace Ferrosilicon: Sil. 14.01 to 14.50%, $45.50; each additional .50% silicon up to and including 18% add $1; low impurities not exceeding 0.05 Phos., 0.40 Sulphur, 1.0% Carbon, add $1.

Bessemer Ferrosilicon

Prices same as for high silicon silvery iron, plus $1 per gross ton.

Charcoal Pig Iron

Northern

Lake Superior Furn. $34.00
Chicago, del. 37.34

Southern

Semi-cold blast, low phos., f.o.b. furnace, Lyles, Tenn. $33.00 (For higher silicon irons a differential over and above the price of base grade is charged as well as for the hard chilling iron, Nos. 5 and 6.)

Gray Forge

Neville Island, Pa. $25.25
Valley base 25.25

Low Phosphorus

Basing points: Birdsboro, Pa., Steelton, Pa., and Buffalo, N. Y., $31.25 base; $32.49, del. Philadelphia. Intermediate phos., Central Furnace, Cleveland, $28.25.

Switching Charges: Basing Point prices are subject to an additional charge for delivery within the switching limits of the respective districts.

Silicon Differential: Basing point prices are subject to an additional charge not to exceed 50 cents a ton for each 0.25 silicon in excess of base grade (1.75 to 2.25%).

Phosphorus Differential: Basing point prices are subject to a reduction of 38 cents a ton for phosphorus content of 0.70% and over.

Ceiling Prices are the aggregate of (1) governing basing point (2) differentials (3) transportation charges from governing basing point to point of delivery as customarily computed. Governing basing point is the one resulting in the lowest delivered price for the consumer.

Exceptions to Ceiling Prices: Struthers Iron & Steel Co. may charge 50 cents a ton in excess of basing point prices for No. 2 Foundry, Basic, Bessemer and Malleable. Mystic Iron Works, Everett, Mass., may exceed basing point prices by $1 per ton.

Refractories

Per 1000 f.o.b. Works, Net Prices

Fire Clay Brick

Super Duty

Pa., Mo., Ky. $68.50

First Quality

Pa., Ill., Md., Mo., Ky.	54.40
Alabama, Georgia	54.40
New Jersey	50.35
Ohio	47.70

Second Quality

Pa., Ill., Md., Mo., Ky.	49.35
Alabama, Georgia	49.30
New Jersey	52.00
Ohio	38.15

Malleable Bung Brick

All bases 63.45

Silica Brick

Pennsylvania	54.40
Joliet, E. Chicago	62.45
Birmingham, Ala.	54.40

Ladle Brick

(Pa., O., W. Va., Mo.) Dry Press	32.90
Wire Cut	30.80

Magnesite

Domestic dead-burned grains, net ton f.o.b. Chewelah, Wash., net ton, bulk	22.00
net ton, bags	26.00

Basic Brick

net ton, f.o.b. Baltimore, Plymouth Meeting, Chester, Pa.

Chrome brick	54.00
Chem. bonded chrome	54.00
Magnesite brick	76.00
Chem. bonded Magnesite	65.00

Fluorspar

Metallurgical grade, f.o.b. Ill., Ky., net tons, carloads, CaF_2 content, 70% or more, $33; 65 but less than 70%, $32; 60 but less than 65% $31; less than 60%, $30. After Aug. 29 base price any grade $30.00 war chemicals.

Ferroalloy Prices

Ferromanganese (standard) 78-82% c.l. gross ton, duty paid, $135 f.o.b. cars, Baltimore, Philadelphia or New York, whichever is most favorable to buyer; Rockdale or Rockwood, Tenn.; where Tennessee Products Co. is producer; Birmingham, Ala., where Sloss-Sheffield Steel & Iron Co. is producer; $140 f.o.b. cars, Pittsburgh, where Carnegie-Illinois Steel Corp. is producer; add $6 for packed c.l., $10 for ton, $13.50 for less ton; $1.70 for each 1%, or fraction contained manganese over 82% or under 78%.

Ferromanganese (Low and Medium Carbon); per lb. contained manganese; eastern zone, low carbon, bulk, c.l., 23c; 2000 lb. to c.l., 23.40c; medium, 14.50c and 15.20c; central, low carbon, bulk, c.l., 23.30c; 2000 lb. to c.l., 24.40c; medium 14.80c and 16.20c; western, low carbon, bulk, c.l., 24.50c, 2000 lb. to c.l., 25.40c; medium, 15.75c and 17.20c; f.o.b. shipping point, freight allowed.

Spiegeleisen: 19-21% carlots per gross ton, Palmerton, Pa., $36; Pittsburgh, $40.50; Chicago, $40.60.

Electrolytic Manganese: 99.9% plus, less ton lots, per lb. 37.6 cents.

Chromium Metal: 97% min. chromium, max. .50% carbon, eastern zone, per lb. contained chromium bulk, c.l., 79.50c, 2000 lb. to c.l. 80c; central 81c and 82.50c; western 82.25c and 84.75c; f.o.b. shipping point, freight allowed.

Ferrocolumbium: 50-60%, per lb. contained columbium in gross ton lots, contract basis, R. R. freight allowed, eastern zone, $2.25; less-ton lots $2.30. Spot prices 10 cents per lb. higher.

Ferrochrome: High carbon, eastern zone, bulk, c.l., 13c, 2000 lb. to c.l. 13.90c; central, add .40c and .65c; western, add 1c and 1.85c—high nitrogen, high carbon ferrochrome; Add 5c to all high carbon ferrochrome prices; all zones; low carbon eastern, bulk, c.l. max. 0.06% carbon, 23c, 0.10% 22.50c, 0.15% 22c, 0.20% 21.50c, 0.50% 21c, 1.00% 20.50c, 2.00% 19.50c; 2000 lb. to c.l., 0.06% 24c, 0.10% 23.50c, 0.15% 23c, 0.20% 22.50c, 0.50% 22c, 1.00% 21.50c, 2.00% 20.50c; central, add .4c for bulk, c.l. and .65 for 2000 lb. to c.l.; western, add 1c for bulk, c.l. and 1.85c for 2000 lb. c.l.; carload packed differential .45c; f.o.b. shipping point, freight allowed. Prices per lb. contained Cr high nitrogen, low carbon ferrochrome: Add 2c to low carbon ferrochrome prices; all zones. For higher nitrogen carbon add 2c for each .25% of nitrogen over 0.75%.

Special Foundry ferrochrome: (Chrom. 62-66%, car. approx. 5-7%) Contract, carload, bulk 13.50c, packed 13.95c, ton lots 14.40c, less, 14.90c, eastern, freight allowed, per pound contained chromium; 13.90c, 14.35c, 15.05c and 15.55c central; 14.50c, 14.95c, 16.25c and 16.75c, western; spot up .25c.

S.M. Ferrochrome, high carbon: (Chrom: 60-65%, sil. 4-6%, mang. 4-6% and carbon 4-6%.) Contract, carlot, bulk, 14.00c, packed 14.45c, ton lots 14.90c, less 15.40c, eastern, freight allowed; 14.40c, 14.85c, 15.55c and 16.05c, central; 15.00c, 15.45c, 16.75c and 17.25c, western; spot up .25c; per pound contained chromium.

S.M. Ferrochrome, low carbon: (Chrom. 62-66%, sil. 4-6%, mang. 4-6% and carbon 1.25% max.) Contract, carlot, bulk, 20.00c, packed 20.45c, ton lots 21.00c, less ton lots 22.00c, eastern, freight allowed, per pound contained chromium, 20.40c, 20.85c, 21.65c and 22.65c, central; 21.00c, 21.45c, 22.85c and 23.85c, western; spot up .25c.

SMZ Alloy: (Silicon 60-65%, Mang. 5-7%, zir. 5-7% and iron approx. 20%) per lb. of alloy contract carlots 11.50c, ton lots 12.00c, less 12.50c, eastern zone, freight allowed; 12.00c, 12.85c and 13.35c central zone; 14.05c, 14.60c and 15.10c, western; spot up .25c.

Silcaz Alloy: (Sil. 35-40%, cal. 9-11%, alum. 6-8%, zir. 3-5%, tit. 9-11% and boron 0.55-0.75%), per lb. of alloy contract, carlots 25.00c, ton lots 26.00c, less ton lots 27.00c, eastern, freight allowed, 25.50c, 26.75c and 27.75c, central; 27.50c, 28.90c and 29.90c, western; spot up .25c.

Silvaz Alloy: (Sil. 35-40%, van. 9-11%, alum. 5-7%, zir. 5-7%, tit. 9-11% and boron 0.55-0.75%), per lb. of alloy. Contract, carlots 58.00c, ton lots 59.00c, less 60.00c, eastern, freight allowed; 58.50c, 59.75c and 60.75c, central; 60.50c, 61.90c and 62.90c, western; spot up ¼c.

CMSZ Alloy 4: (Chr. 45-49%, mang. 4-6%, sil. 18-21%, zir. 1.25-1.75%, and car. 3.00-4.50%). Contract carlots, bulk, 11.00c and packed 11.50c; ton lots 12.00c; less 12.50c, eastern, freight allowed; 11.50c and 12.00c, 12.75c, 13.25c, central; 13.50c and 14.00c, 14.75c, 15.25c, western; spot up .25c.

CMSZ Alloy 5: (Chr. 50-56%, mang. 4-6%, sil. 13.50-16.00%, zir. .75-1.25%. car. 3.50-5.00%) per lb. of alloy. Contract, carlots, bulk, 10.75c, packed 11.25c, ton lots 11.75c, less 12.25c, eastern, freight allowed; 11.25c, 11.75c and 12.50c, central; 13.25c and 13.75c, 14.50c and 15.00c, western; spot up .25c.

Ferro-Boron: (Bor. 17.50% min., sil. 1.50% max., alum. 0.50% max. and car. 0.50% max.) per lb. of alloy contract ton lots, $1.20, less ton lots $1.30, eastern, freight allowed; $1.2075 and $1.3075 central; $1.229 and $1.329, western; spot add 5c.

Manganese-Boron: (Mang. 75% approx., boron 15-20%, iron 5% max. sil. 1.50% max. and carbon 3% max.), per lb. of alloy. Contract ton lots, $1.89, less $2.01, eastern; freight allowed; $1.903 and $2.623, central, $1.935 and $2.055 western; spot up 5c.

Nickel-Boron: (Bor. 15-18%, alum. 1% max., sil. 1.50% max., car. 0.50% max., iron 3% max., nickel, balance), per lb. of alloy. Contract, 5 tons or more, $1.90, 1 ton to 5 tons, $2.00, less than ton $2.10, eastern, freight allowed; $1.9125, $2.0125 and $2.1125, central; $1.9445, $2.0445 and $2.1445, western; spot same as contract.

Chromium-Copper: (Chrom. 8-11%, cu. 88-90%, iron 1% max. sil. 0.50% max.) contract, any quantity, 45c, eastern, Niagara Falls, N. Y., basis, freight allowed to destination, except to points taking rate in excess of St. Louis rate to which equivalent of St. Louis rate will be allowed; spot up 2c.

Vanadium Oxide: (Fused: Vanadium oxide 85-88%, sodium oxide approx. 10% and calcium oxide, approx. 2%, or Red Cake; Vanadium oxide 85% approx., sodium oxide, approx. 9% and water approx.

2.5%) Contract, any quantity, $1.10 eastern, freight allowed per pound vanadium oxide contained; contract carlots, $1.105, less carlots, $1.108, central; $1.118 and $1.133, western; spot add 5c to contracts in all cases.

Calcium metal; cast: Contract ton lots or more $1.80, less, $2.30, eastern zone, freight allowed, per pound of metal; $1.809 and $2.309 central, $1.849 and $2.349, western; spot up 5c.

Calcium-Manganese-Silicon: (Cal. 16-20% mang. 14-18% and sil. 53-59%), per lb. of alloy. Contract, carlots, 15.50c, ton lots 16.50c and less 17.00c, eastern, freight allowed; 16.00c, 17.35c, and 17.85c, central; 18.05c, 19.10c and 19.60c western; spot up .25c.

Calcium-Silicon: (Cal. 30-35%, sil. 60-65% and iron 3.00% max.), per lb. of alloy. Contract, carlot, lump 18.00c, ton lots 14.50c, less 15.50c, eastern, freight allowed; 13.50c, 15.25c and 16.25c central; 15.55c, 17.40c and 18.40c, western; spot up .25c.

Briquets, Ferromanganese: (Weight approx. 3 lbs. and containing exactly 2 lbs. mang.) per lb. of briquets. Contract, carlots, bulk .0605c, packed .063c, tons .0655c, less .068c eastern freight allowed; .063c, .0655c, .0755c and .078c, central; .066c, .0685c, .0855c, and .088c, western; spot up .25c.

Briquets: Ferrochrome, containing exactly 2 lb. cr., eastern zone, bulk, c.l., 8.25c per lb. of briquets, 2000 lb. to c.l., 8.75c; central, add .3c for c.l. and .5c for 2000 lb. to c.l.; western, add .70c for c.l., and .2c for 2000 lb. to c.l.; **silicomanganese,** eastern, containing exactly 2 lb. manganese and approx. ½ lb. silicon, bulk, c.l., 5.80c, 2000 lbs. to c.l., 6.30c; central, add .25c for c.l. and 1c for 2000 lb. to c.l.; western, add .5c for c.l., and 2c for 2000 lb. to c.l.; **ferrosilicon,** eastern, approx. 5 lb., containing exactly 2 lb. silicon, or weighing approx. 2½ lb. and containing exactly 1 lb. of silicon, bulk, c.l., 3.35c, 2000 lb. to c.l., 3.80c; central, add 1.50c for c.l., and .40c for 2000 lb. to c.l.; western, add 3.0c for c.l. and .45c for 2000 to c.l.; f.o.b. shipping point, freight allowed.

Ferromolybdenum: 55-75% per lb. contained molybdenum f.o.b. Langeloth and Washington, Pa., furnace, any quantity 95.00c.

Ferrophosphorus: 17-19%, based on 18% phosphorus content, with unitage of $3 for each 1% of phosphorus above or below the base; gross tons per carload f.o.b. sellers' works, with freight equalized with Rockdale, Tenn.; contract price $58.50, spot $62.25.

Ferrosilicon: Eastern zone, 90-95%, bulk, c.l., 11.05c, 2000 lb. to c.l., 12.30c; 80-90%, bulk c.l., 8.90c, 2000 lb. to c.l., 9.95c; 75%, bulk, c.l., 8.05c, 2000 lb. to c.l., 9.05c; 50%, bulk c.l., 6.65c and 2000 lb. to c.l., 7.85c; central 90-95%, bulk, c.l., 11.20c, 2000 lb. to c.l., 12.80c; 80-90%, bulk, c.l., 9.05c, 2000 to c.l., 10.45c; 75%, bulk, c.l., 8.20c, 2000 lb. to c.l., 9.65c; 50% bulk, c.l., 7.10c, 2000 lb. to c.l., 9.70c; western, 90-95%, bulk, c.l., 11.65c, 2000 lb. to c.l., 15.60c; 80-90%, bulk, c.l., 9.55c, 2000 lb. to c.l., 13.50c; 75%, bulk, c.l., 8.75c, 2000 to c.l., 13.10c; 50%, bulk, c.l., 7.25c, 2000 to c.l., 8.75c; f.o.b. shipping point, freight allowed. Prices per lb. contained silicon.

Grainal: Vanadium Grainal No. 1 87.5c; No. 6, 60c; No. 79, 45c; all f.o.b. Bridgeville, Pa., usual freight allowance.

Silicon Metal: Min. 97% silicon and max. 1% iron, eastern zone, bulk, c.l., 12.90c; 2000 lb. to c.l., 13.45c; central, 13.20c and 13.90c; western, 13.85c and 16.80c; min. 96% silicon and max. 2% iron, eastern, bulk, c.l., 12.50c, 2000 lb. to c.l., 13.10c; central, 12.80c and 13.55c; western, 13.45c and 16.50c f.o.b. shipping point, freight allowed. Price per lb. contained silicon.

Manganese Metal: (96% min. manganese, max. 2% iron), per lb. of metal, eastern zone, bulk, c.l., 30c, 2000 lb. to c.l., 32c, central, 30.25c, and 33c; western 30.55c and 35.05c.

Ferrotungsten: Spot, carlots, per lb. contained tungsten, $1.90; freight allowed as far west as St. Louis.

Tungsten Metal Powder: Spot, not less than 97 per cent, $2.50-$2.60; freight allowed as far west as St. Louis.

Ferrotitanium: 40-45%, R.R. freight allowed, per lb. contained titanium; ton lots $1.23; less-ton lots $1.25; eastern. Spot up 5 cents per lb.

Ferrotitanium: 20-25%, 0.10 maximum carbon; per lb. contained titanium; ton lots $1.35; less-ton lots $1.40 eastern. Spot 5 cents per lb. higher.

High-Carbon Ferrotitanium: 15-20% contract basis, per net ton, f.o.b. Niagara Falls, N. Y., freight allowed to destination east of Mississippi River and North of Baltimore and St. Louis, 6.8% carbon $142.50; 3-5% carbon $157.50.

Carbortam: Boron 0.90 to 1.15% net ton to carload, 8c lb. f.o.b. Suspension Bridge, N. Y., frt. allowed same as high-carbon ferrotitanium.

Bortam: Boron 1.5-1.9%, ton lots 45c lb., less ton lots 50c lb.

Ferrovanadium: 35-55%, contract basis, per lb. contained vanadium, f.o.b. producers plant with usual freight allowances; open-hearth grade $2.70; special grade $2.80; highly-special grade $2.90.

Zirconium Alloys: 12-15%, per lb. of alloy, eastern contract, carlots, bulk, 4.60c, packed 4.80c, ton lots 4.80c, less tons 5c, carloads, bulk, per gross ton $102.50; packed $107.50; ton lots $108; less-ton lots $112.50. Spot ¼c per ton higher.

Zirconium Alloy: 35-40%, Eastern, contract basis, carloads in bulk or package, per lb. of alloy 14.00c; gross ton lots 15.00c; less-ton lots 16.00c. Spot ¼ cent higher.

Alsifer: (Approx. 20% aluminum, 40% silicon, 40% iron) contract basis f.o.b. Niagara Falls, N. Y., per lb. 5.75c; ton lots 6.50c. Spot ½ cent higher.

Simanal: (Approx. 20% each Si., Mn., Al.) Contract, frt. all. not over St. Louis rate, per lb. alloy; carlots 8c; ton lots 8.75c; less ton lots 9.25c.

Borosil: 3 to 4% boron, 40 to 45% Si., $6.25 lb. cont. Bo., f.o.b. Philo, O., freight not exceeding St. Louis rate allowed.

OPEN MARKET PRICES, IRON AND STEEL SCRAP

Following prices are quotations developed by editors of STEEL in the various centers. For complete OPA ceiling price schedule refer to page 156 of Sept. 4, 1944, issue of STEEL. Quotations are on gross tons.

PHILADELPHIA:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$18.75
No. 2 Heavy Melt. Steel	18.75
No. 2 Bundles	18.75
No. 3 Bundles	16.75
Mixed Borings, Turnings	13.75
Machine Shop Turnings	13.75
Billet, Forge Crops	23.75
Bar Crops, Plate Scrap	21.25
Cast Steel	21.25
Punchings	21.25
Elec. Furnace Bundles	19.75
Heavy Turnings	18.25

Cast Grades

(F.o.b. Shipping Point)

Heavy Breakable Cast	16.50
Charging Box Cast	19.00
Cupola Cast	20.00
Unstripped Motor Blocks	17.50
Malleable	22.00
Chemical Borings	16.51

NEW YORK:

(Dealers' buying prices)

No. 1 Heavy Melt. Steel	$15.33
No. 2 Heavy Melt. Steel	15.33
No. 2 Hyd. Bundles	15.33
No. 3 Hyd. Bundles	13.33
Chemical Borings	14.33
Machine Turnings	10.33
Mixed Borings, Turnings	10.33
No. 1 Cupola	20.00
Charging Box	19.00
Heavy Breakable	16.50
Unstrip Motor Blocks	17.50
Stove Plate	19.00

CLEVELAND:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$19.50
No. 2 Heavy Melt. Steel	19.50
No. 1 Comp. Bundles	19.50
No. 2 Comp. Bundles	19.50
No. 1 Busheling	19.50
Mach. Shop Turnings	14.50
Short Shovel Turnings	16.50
Mixed Borings, Turnings	14.50
No. 1 Cupola Cast	20.00
Heavy Breakable Cast	16.50
Cast Iron Borings	13.50-14.00
Billet, Bloom Crops	24.50
Sheet Bar Crops	22.00
Plate Scrap, Punchings	22.00
Elec. Furnace Bundles	20.50

BOSTON:

(F.o.b. shipping points)

No. 1 Heavy Melt. Steel	$14.06
No. 2 Heavy Melt. Steel	14.06
No. 1 Bundles	14.06
No. 2 Bundles	14.06
No. 1 Busheling	14.06
Machine Shop Turnings	9.06
Mixed Borings, Turnings	9.06
Short Shovel Turnings	11.06
Chemical Borings	13.31
Low Phos. Clippings	16.56
No. 1 Cast	20.00
Clean Auto Cast	20.00
Stove Plate	19.00
Heavy Breakable Cast	16.50

Boston Differential 99 cents higher, steel-making grades; Providence $1.09 higher.

PITTSBURGH:

(Delivered consumer's plant)

Railroad Heavy Melting	$21.00
No. 1 Heavy Melt. Steel	20.00
No. 2 Heavy Melt. Steel	20.00
No. 1 Comp. Bundles	20.00
No. 2 Comp. Bundles	20.00
Short Shovel Turnings	17.00
Mach. Shop Turnings	15.00
Mixed Borings, Turnings	15.00
No. 1 Cupola Cast	20.00
Heavy Breakable Cast	16.50
Cast Iron Borings	16.00
Billet, Bloom Crops	25.00
Sheet Bar Crops	22.50
Plate Scrap, Punchings	22.50
Railroad Specialties	24.50
Scrap Rail	21.50
Axles	26.00
Rail 3 ft. and under	23.50
Railroad Malleable	22.00

VALLEY:

(Delivered consumer's plant)

No. 1 R.R. Heavy Melt.	$21.00
No. 1 Heavy Melt. Steel	20.00
No. 1 Comp. Bundles	20.00
Short Shovel Turnings	17.00
Cast Iron Borings	16.00
Machine Shop Turnings	15.00
Low Phos. Plate	22.50

MANSFIELD, O:

(Delivered consumer's plant)

Machine Shop Turnings	15.00

BIRMINGHAM:

(Delivered consumer's plant)

Billet Forge Crops	$22.00
Structural, Plate Scrap	19.00
Scrap Rails Random	18.50
Rerolling Rails	20.50
Angle Splice Bars	20.50
Solid Steel Axles	24.00
Cupola Cast	20.00
Stove Plate	19.00
Long Turnings	8.50- 9.00
Cast Iron Borings	8.50- 9.00
Iron Car Wheels	16.50-17.00

CHICAGO:

(Delivered consumer's plant)

No. 1 R.R. Heavy Melt.	$19.75
No. 1 Heavy Melt. Steel	18.75
No. 2 Heavy Melt. Steel	18.75
No. 1 Ind. Bundles	18.75
No. 2 Dlr. Bundles	18.75
Baled Mach. Shop Turn	18.75
No. 3 Galv. Bundles	16.75
Machine Turnings	13.75
Mix. Borings, Sht. Turn.	13.75
Short Shovel Turnings	15.75
Cast Iron Borings	14.75
Scrap Rails	20.25
Cut Rails, 3 feet	22.25
Cut Rails, 18-inch	23.50
Angles, Splice Bars	22.25
Plate Scrap, Punchings	21.25
Railroad Specialties	22.75
No. 1 Cast	20.00
R.R. Malleable	22.00

(Cast grades f.o.b. shipping point, railroad grades f.o.b. tracks)

BUFFALO:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$19.25
No. 2 Heavy Melt. Steel	19.25
No. 1 Bundles	19.25
No. 2 Bundles	19.25
No. 1 Busheling	19.25
Machine Turnings	14.25
Short Shovel Turnings	16.25
Mixed Borings, Turn.	14.25
Cast Iron Borings	15.25
Low Phos.	21.75

DETROIT:

(Dealers' buying prices)

Heavy Melting Steel	$17.32
No. 1 Busheling	17.32
Hydraulic Bundles	17.32
Flashings	17.32
Machine Turnings	12.32
Short Shovel, Turnings	14.32
Cast Iron Borings	13.32
Low Phos. Plate	19.82
No. 1 Cast	20.00
Heavy Breakable Cast	16.50

ST. LOUIS:

(Delivered consumer's plant)

Heavy Melting	17.50
No. 1 Locomotive Tires	20.00
Misc. Rails	19.00
Railroad Springs	22.00
Bundled Sheets	17.50
Axle Turnings	17.00
Machine Turnings	10.50
Shoveling Turnings	12.50
Rerolling Rails	21.00
Steel Car Axles	21.50-22.00
Steel Rails, 3 ft.	21.50
Steel Angle Bars	21.00
Cast Iron Wheels	20.00
No. 1 Machinery Cast	20.00
Railroad Malleable	22.00
Breakable Cast	16.50
Stove Plate	19.00
Grate Bars	15.25
Brake Shoes	15.25

(Cast grades f.o.b. shipping point)

Stove Plate	18.00

CINCINNATI:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$18.50
No. 2 Heavy Melt. Steel	18.50
No. 1 Comp. Bundles	18.50
No. 2 Comp. Bundles	18.50
Machine Turnings	9.50-10.00
Shoveling Turnings	11.50-12.00
Cast Iron Borings	11.00-11.50
Mixed Borings, Turnings	10.50-11.00
No. 1 Cupola Cast	20.00
Breakable Cast	16.50
Low Phosphorus	21.00-21.50
Scrap Rails	20.50-21.00
Stove Plate	16.00-16.50

LOS ANGELES:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$14.00
No. 2 Heavy Melt. Steel	13.00
No. 1, 2 Deal. Bundles	12.00
Machine Turnings	4.50
Mixed Borings, Turnings	4.00
No. 1 Cast	20.00

SAN FRANCISCO:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$15.50
No. 2 Heavy Melt. Steel	14.50
No. 1 Busheling	15.50
No. 1, No. 2 Bundles	13.50
No. 3 Bundles	9.00
Machine Turnings	7.00
Billet, Forge Crops	15.50
Bar Crops, Plate	15.50
Cast Steel	15.50
Cut, Structural, Plate, 1", under	18.00
Alloy-free Turnings	7.00
Tin Can Bundles	14.50
No. 2 Steel Wheels	15.50
Iron, Steel Axles	23.00
No. 2 Cast Steel	15.50
Uncut Frogs, Switches	15.50
Scrap Rails	15.50
Locomotive Tires	15.50

NONFERROUS METAL PRICES

Copper: Electrolytic or Lake from producers in carlots 12.00c, Del. Conn., less carlots 12,12½c, refinery; dealers may add ¾c for 5000 lbs. to carload; 1000-4999 lbs. 1c; 500-999 1½c; 0-499 2c. Casting, 11.75c, refinery for 20,000 lbs., or more. 12.00c less than 20,000 lbs.

Brass Ingot: Carlot prices, including 25 cents per hundred freight allowance; add ¼c for less than 20 tons; 85-5-5-5 (No. 115) 13.00c; 88-10-2 (No. 215) 16.50c; 80-10-10 (No. 305) 15.75c; Navy G (No. 225) 16.75c; Navy M (No. 245) 14.75c; No. 1 yellow (No. 405) 10.00c; manganese bronze (No. 420) 12.75c.

Zinc: Prime western 8.25c, select 8.35c, brass special 8.50c, intermediate 8.75c, E. St. Louis, for carlots. For 20,000 lbs. to carlots add 0.15c; 10,000-20,000 0.25c; 2000-10,000 0.40c; under 2000 0.50c.

Lead: Common 6.35c, chemical, 6.45c, corroding, 6.45c, E. St. Louis for carloads; add 5 points for Chicago, Minneapolis-St. Paul, Milwaukee-Kenosha districts; add 15 points for Cleveland-Akron-Detroit area, New Jersey, New York state, Texas, Pacific Coast, Richmond, Indianapolis-Kokomo; add 20 points for Birmingham, Connecticut, Boston-Worcester, Springfield, New Hampshire, Rhode Island.

Primary Aluminum: 99% plus, ingots 15.00c del., pigs 14.00c del.; metallurgical 94% min. 13.50c del. Base 10,000 lbs. and over; add ½c 2000-9999 lbs.; 1c less through 2000 lbs.

Secondary Aluminum: All grades 12.50c per lb. except as follows: Low grade piston alloy (No. 122 type) 10.50c; No. 12 foundry alloy (No. 2 grade) 10.50c; chemical warfare service ingot (92½% plus) 10.00c; steel deoxidizers in notch bars, granulated or shot, Grade 1 (95-97½%) 11.00c, Grade 2 (92-95%) 9.50c to 9.75c, Grade 3 (90-92%) 8.00c to 8.25c, Grade 4 (85-90%) 7.75c; any other ingot containing over 1% iron, except PM 754 and hardeners, 12.00c. Above prices for 30,000 lb. or more; add ¼c 10,000-30,000 lb.; ½c 1000-10,000 lbs.; 1c less than 1000 lbs. Prices include freight at carload rate up to 75 cents per hundred.

Magnesium: Commercially pure (99.8%) standard ingots (4-notch, 17 lbs.) 20.50c lb., add 1c for special shapes and sizes. Alloy ingots, incendiary bomb alloy, 23.40c; 50-50 magnesium-aluminum, 23.75c; ASTM B93-41T, Nos. 2, 3, 4, 12, 13, 14, 17, 23.00c; Nos. 4X, 11, 13X, 17X, 25.00c; ASTM B-107-41T, or B-90-41T, No. 8X, 23.00c; No. 18, 23.50c; No. 18X, 25.00c. Selected magnesium crystals, crowns, and muffs, including all packing screening, barrelling, handling, and other preparation charges, 23.50c. Price for 100 lbs. or more; for 25-100 lbs., add 10c; for less than 25 lbs., 20c. Incendiary bomb alloy, f.o.b. plant, any quantity; carload freight allowed all other alloys for 500 lbs. or more.

Tin: Prices ex-dock, New York in 5-ton lots. Add 1 cent for 2240-11,199 lbs., 1½c 1000-2239, 2½c 500-999, 3c under 500. Grade A, 99.8% or higher (includes Straits), 52.00c; Grade B, 99.8% or higher, not meeting specifications for Grade A, with 0.05 per cent maximum arsenic, 51.87½c; Grade C, 99.65-99.79% incl. 51.62½c; Grade D, 99.50-99.64% incl., 51.50c; Grade E, 99-99.49% incl. 51.12½c; Grade F, below 99% (for tin content), 51.00c.

Antimony: American bulk carlots f.o.b. Laredo, Tex., 99.0% to 99.8% and 99.8% and over but not meeting specifications below, 14.50c; 99.8% and over (arsenic, 0.05%, max. and other impurities, 0.1%, max.) 15.00c. On producers' sales add ¼c for less than carload to 10,000 lb.; ½c for 9999-224 lb.; and 2c for 223 lb. and less; on sales by dealers, distributors and jobbers add ½c, 1c, and 3c, respectively.

Nickel: Electrolytic cathodes, 99.5%, f.o.b. refinery 35.00c lb.; pig and shot produced from electrolytic cathodes 36.00c; "F" nickel shot or ingot for additions to cast iron, 34.00c; Monel shot 28.00c.

Mercury: Open market, spot, New York, $108-$110 per 76-lb. flask.

Arsenic: Prime, white, 99%, carlots, 4.00c lb.

Beryllium-Copper: 3.75-4.25% Be., $17 lb. contained Be.

Cadmium: Bars, ingots, pencils, pigs, plates, rods, slabs, sticks, and all other "regular" straight or flat forms 90.00c lb., del.; anodes, balls, discs and all other special or patented shapes 95.00c lb. del.

Cobalt: 97-99%, $1.50 lb. for 550 lb. (bbl.); $1.52 lb. for 100 lb. (case); $1.57 lb. under 100 lb.

Indium: 99.9%, $7.50 per troy ounce.

Gold: U. S. Treasury, $35 per ounce.

Silver: Open market, N. Y. 70.625c per ounce.

Platinum: $35 per ounce.

Iridium: $165 per troy ounce.

Palladium: $24 per troy ounce.

Rolled, Drawn, Extruded Products

(Copper and brass product prices based on 12.00c, Conn., for copper. Freight prepaid on 100 lbs. or more.)

Sheet: Copper 20.87c; yellow brass 19.48c; commercial bronze, 90% 21.07c, 95% 21.28c; red brass 80% 20.15c, 85% 20.36c; phosphor bronze, Grades A and B 5% 36.25c; Everdur, Herculoy, Duronze or equiv. 26.00c; naval brass 24.50c; manganese bronze 28.00c; Muntz metal 22.75c; nickel silver 5% 26.50c.

Rods: Copper, hot-rolled 17.37c, cold-rolled 18.37c; yellow brass 15.01c; commercial bronze 90% 21.32c, 95% 21.53c; red brass 80% 20.48c, 85% 20.61c; phosphor bronze Grade A, B 5% 36.50c; Everdur, Herculoy, Duronze or equiv. 25.50c; Naval brass 19.12c; manganese bronze 22.50c; Muntz metal 18.87c; nickel silver 5% 26.50c.

Seamless Tubing: Copper 21.37c; yellow brass 22.23c; commercial bronze 90% 23.47c; red brass 80% 22.80c, 85% 23.01c.

Extruded Shapes: Copper 20.87c; architectural bronze 19.12c; manganese bronze 24.00c; Muntz metal 20.12c; Naval brass 20.37c.

Angles and Channels: Yellow brass 27.98c; commercial bronze 90% 29.57c, 95% 29.78c; red brass 80% 28.65c, 85% 28.86c.

Copper Wire: Soft, f.o.b. Eastern mills, carlots 15.37½c, less-carlots 15.87½c; weatherproof, f.o.b. Eastern mills, carlot 17.00c, less-carlots 17.50c; magnet, delivered, carlots 17.50c, 15,000 lbs. or more 17.75c, less carlots 18.25c.

Aluminum Sheets and Circles: 2s and 3s flat mill finish, base 30,000 lbs. or more; del.; sheet widths as indicated; circle diameter 9" and larger:

Gage	Width	Sheets	Circles
.249"-7	12"-48"	22.70c	25.20c
8-10	12"-48"	23.20c	25.70c
11-12	26"-48"	24.20c	27.00c
13-14	26"-48"	25.20c	28.50c
15-16	26"-48"	26.40c	30.40c
17-18	26"-48"	27.90c	32.90c
19-20	24"-42"	29.80c	35.30c
21-22	24"-42"	31.70c	37.20c
23-24	3"-24"	25.60c	29.20c

Lead Products: Prices to jobbers; full sheets 9.50c; cut sheets 9.75c; pipe 8.15c, New York; 8.25c, Philadelphia, Baltimore, Rochester and Buffalo; 8.75c, Chicago, Cleveland, Worcester, Boston.

Zinc Products: Sheet f.o.b. mill, 13.15c; 36,000 lbs. and over deduct 7%; Ribbon and strip 12.25c, 3000-lb. lots deduct 1%, 6000 lbs. 2%, 9000 lbs. 3%, 18,000 lbs. 4%, carloads and over 7%. Boiler plate (not over 12") 3 tons and over 11.00c; 1-3 tons 12.00c; 500-2000 lbs. 12.50c; 100-500 lbs. 13.00c; under 100 lbs. 14.00c. Hull plate (over 12") add 1c to boiler plate prices.

Plating Materials

Chromic Acid: 99.75%, flake, del., carloads 16.25c; 5 tons and over 16.75c; 1-5 tons 17.25c; 400 lbs. to 1 ton 17.75c; under 400 lbs. 18.25c.

Copper Anodes: Base 2000-5000 lbs., del.; oval 17.62c; untrimmed 18.12c; electro-deposited 17.37c.

Copper Carbonate: 52-54% metallic cu, 250 lb. barrels 20.50c.

Copper Cyanide: 70-71% cu, 100-lb. kegs or bbls. 34.00c f.o.b. Niagara Falls.

Sodium Cyanide: 96%, 200-lb. drums 15.00c; 10,000-lb. lots 13.00c f.o.b. Niagara Falls.

Nickel Anodes: 500-2999 lb. lots; cast and rolled carbonized 47.00c; rolled, depolarized 48.00c.

Nickel Chloride: 100-lb. kegs or 275-lb. bbls. 18.00c lb., del.

Tin Anodes: 1000 lbs. and over 58.50c del.; 500-999 59.00c; 200-499 59.50c; 100-199 61.00c.

Tin Crystals: 400 lb. bbls. 39.00c f.o.b. Grasselli, N. J.; 100-lb. kegs 39.50c.

Sodium Stannate: 100 or 300-lb. drums 36.50c, del.; ton lots 33.50c.

Zinc Cyanide: 100-lb. kegs or bbls. 33.00c f.o.b. Niagara Falls.

Brass Mill Allowances: Prices for less than 15,000 lbs. f.o.b. shipping point. Add ⅝c for 15,000-40,000 lbs.; 1c for 40,000 or more.

Scrap Metals

	Clean Heavy	Rod Ends	Clean Turnings
Copper	10.250	10.250	9.500
Tinned Copper	9.625	9.625	9.375
Yellow Brass	8.625	8.375	7.785
Commercial bronze 90%	9.375	9.125	8.625
Commercial bronze 95%	9.500	9.250	8.750
Red Brass, 85%	9.125	8.875	8.375
Red Brass, 80%	9.125	8.875	8.375
Muntz Metal	8.000	7.750	7.250
Nickel Sil, 5%	9.250	9.000	4.625
Phos. br., A, B, 5%	11.000	10.750	9.750
Herculoy, Everdur or equivalent	10.250	10.000	9.250
Naval brass	8.250	8.000	7.500
Mang. bronze	8.250	8.000	7.500

Other than Brass Mill Scrap: Prices apply on material not meeting brass mill specifications and are f.o.b. shipping point; add ⅝c for shipment of 60,000 lbs. of one group and ½c for 20,000 lbs. of second group shipped in same car. Typical prices follow:

(Group 1) No. 1 heavy copper and wire, No. 1 tinned copper, copper borings 9.75c; No. 2 copper wire and mixed heavy copper, copper tuyeres 8.75c.

(Group 2) soft red brass and borings, aluminum bronze 9.00c; copper-nickel and borings 9.25c; car boxes, cocks and faucets 7.75c; bell metal 15.50c; babbit-lined brass bushings 13.00c.

(Group 3) zincy bronze borings, Admiralty condenser tubes, brass pipe 7.50c; Muntz metal condenser tubes 7.00c; yellow brass 6.25c; manganese bronze (lead 0.00%-0.40%) 7.25c, (lead 0.41%-1.0%) 6.25c; manganese bronze borings (lead 0.00-0.40%) 6.50c, (lead 0.41-1.00%) 5.50c.

Aluminum Scrap: Price f.o.b. point of shipment, truckloads of 5000 pounds or over; Segregated solids, 2S, 3S, 5c lb., 11, 14, etc., 3 to 3.50c lb. All other high grade alloys 5c lb. Segregated borings and turnings, wrought alloys, 2, 2.50c lb. Other high-grade alloys 3.50, 4.00c lb. Mixed plant scrap, all solids, 2, 2.50c lb. borings and turnings one cent less than segregated.

Lead Scrap: Prices f.o.b. point of shipment. For soft and hard lead, including cable lead, deduct 0.55c from basing point prices for refined metal.

Zinc Scrap: New clippings 7.25c, old zinc 5.25c f.o.b. point of shipment; add ½-cent for 10,000 lbs. or more. New die-cast scrap, radiator grilles 4.95c, add ½c 20,000 or more. Unsweated zinc dross; die cast slab 5.80c any quantity.

Nickel, Monel Scrap: Prices f.o.b. point of shipment; add ½c for 2000 lbs. or more of nickel or cupro-nickel shipped at one time and 20,000 lbs. or more of Monel. Converters (dealers) allowed 2c premium.

Nickel: 98% or more nickel and not over ½% copper 26.00c; 90-98% nickel, 26.00c per lb. nickel contained.

Cupro-nickel: 90% or more combined nickel and copper 26.00c per lb. contained nickel, plus 8.00c per lb. contained copper; less than 90% combined nickel and copper 26.00c for contained nickel only.

Monel: No. 1 castings, turnings 15.00c; new clipping 20.00c; soldered sheet 18.00c.

Sheets, Strip . . .

Sheet & Strip Prices, Page 358

Possibility of a general steel strike or an increase in prices on steel has caused increased pressure for delivery of sheets and strip early this month. Mills are unable to give much relief in this respect under present condition of schedules. Automobile tonnage still is being shipped on General Motors orders, and quantity affected by the strike is unimportant up to this time. Consumers still express dissatisfaction with allotments under quota plans.

Chicago — Sheet consumers are seeking maximum deliveries before Jan. 15 of tonnage in current schedules. Two implications are discernible from this, presumption that a steel strike Jan. 14 will shut down all production capacity, and possibly that some upward price revisions might be allowed. New orders continue heavy, despite the fact several months must elapse before deliveries can be made. Automobile plants closed down by strikes are still accepting and warehousing all shipments, no suspensions so far having been reported.

Pittsburgh — Possibility of an industry-wide steel strike has had little bearing on current sheet bookings, but has added measurably to pressure for prompt delivery of tonnage already on mill books. Heavy new demand in recent weeks has been augmented by customers of nonintegrated mills seeking place on mill rolling schedules, for some of their suppliers have already shut down or are threatened with complete plant shutdown due to lack of sheet bars. Prospect of these steel consumers getting on integrated mills' early rolling schedules is limited, for the latter are filled well into third quarter in most instances and production is distributed under an allocation system based on prewar customer relationships. Most of these nonintegrated mills' customers are reportedly seeking special preference ratings from CPA. Such ratings, obtained on an emergency basis would develop similar cases among regular integrated mills' customers whose sheet tonnage is displaced by the preferred orders. The solution of nonintegrated mills' semifinished steel supply problem by means of allocations under CPA regulation is not considered probable, for integrated mills claim to be utilizing nearly all semifinished steel available and there is some doubt that any producer could be forced to ship steel at prices unprofitable.

Finished steel shipments continue on schedule to General Motors Corp.'s plants and parts suppliers. Should the strike remain unsettled for two or three more weeks some suspension of deliveries is probable for excessive stockpiling of inventories is prohibited under Directive 6 to PR-32.

Boston — An increasing number of consumers are short of sheets and strip, reflected in uneven production schedules on the part of fabricating shops. With mill capacity filled and in most cases definitely scheduled through second quarter, a substantial tonnage remains unplaced. Orders for delivery beyond June are filled without definite promise as to shipment. Some producers have arbitrarily reduced carryover for January by elimination of undelivered volume in December and this tonnage is definitely lost to consumers. Surplus stocks, even off grades, bring out more bidders. While lighter gages in sheets are tightest, demand for No. 12 hot-rolled for 275-gallon household heating tanks is heavy and unabated in this area. Narrow cold-rolled producers are under severe pressure with supply of hot strip reduced and more uncertain since the first of the year.

Cincinnati — Dissatisfaction with allotments of sheets continues but it is not apparent that mills can give major relief soon. Some tonnage has been released because of the automobile strike and it is possible this tonnage may be increased. Even with these changes in schedules, output will be insufficient to meet demands. Second quarter tightening of supplies may follow the directives for export, quotas on these needs not yet announced.

Philadelphia — Shortage of sheets is emphasized by the fact that some producers are booked up well into fourth quarter on cold-rolled and galvanized sheets, with some sellers practically out of the market for the year. That some other producers are not in almost the same position can be ascribed to the fact that they are operating on a quarterly quota basis, with none reported up to this time as having formally set up quotas for second quarter. Where books are opened for the later positions of this year hot-rolled sheets are available in third quarter. Silicon sheets and polished stainless steel are being offered generally for shipment late in the year.

Cleveland — Sheet and strip sellers as the new year opened were making no definite promises on new orders booked for delivery after mid-year and were discouraging business beyond June, due to uncertainty of supply. Some mills were several weeks behind in fourth quarter shipments and carried substantial tonnages into first quarter. Cancellations and suspensions were negligible, although plants of many customers were closed by strikes. Civilian Production Administration's extension of time for complete adjustment of outstanding orders placed by plants closed by work stoppages which started after Dec. 6 expired Jan. 5. Some suspension of deliveries will be made, therefore, during the current week. Direction 6 to priorities regulation 32 originally permitted continued receipt of materials during the first 30 days following a work stoppage that required complete adjustment of outstanding orders by the end of that time. In the case of General Motors, the original deadline would have fallen on Dec. 20. Aim of the order was to divert critical materials to other users in the event of work stoppages of more than 30 days and to accumulate a small reserve of materials to help in the later resumption of operations.

New York — Some sheet producers have entered the new year with schedules on cold-rolled and galvanized sheets filled for 12 months. They could book even beyond were they disposed to do so. Other producers, operating on a quarterly quota basis, have yet to open books for second quarter, although some believe they will be in a position to do so shortly.

Producers who are willing to extend bookings well into the future report that schedules on hot-rolled sheets have been filled solidly into fourth quarter, with few exceptions. Silicon sheet schedules likewise have been extended late into the year, especially on high silicon sheets. Certain sellers of silicon sheets are operating on a quota basis over second half and in at least one instance have not opened books for fourth quarter.

Polishing facilities are proving a considerable bottleneck in stainless sheets. One seller can offer unpolished stainless for shipment in first quarter but can do nothing on polished material before the close of 1946.

Steel Bars . . .

Bar Prices, Page 358

Bar deliveries by most producers are promised for mid-year on hot-rolled carbon, with small sizes sold even further. Little tonnage has been diverted because of the General Motors strike and parts suppliers take all shipments for immediate use or for inventory. Cold-finished deliveries are mainly in second quarter, with an occasional gap in March. Demand for cold-rolled has increased appreciably recently.

Pittsburgh — No significant tonnage yet has been diverted because of suspensions received from General Motors parts suppliers. Wherever possible these consumers are attempting to build up inventories and are not likely to be affected by Directive 6 to PR-32 for a few weeks. Cold-rollers' operations are at a fairly high level, with limited hot-rolled bar supplies chief retarding factor. Order backlogs on cold-finished items are extended into second quarter, although a few sizes are available late in March. Most producers have little to offer before late second quarter on small carbon bars, while alloys are obtainable late in February and March. Pressure for delivery is acute for all bar items, with customers attempting to build up inventories in preparation for a possible steel strike. Orders continue to exceed output, notably for small shapes, with carryover tonnage augmented by holiday production interruptions.

Chicago — Carbon bars are becoming tighter, and new business commands little better than late first quarter delivery. Demand is widespread with every consuming industry pressing to cover requirements, quotas set up by mills falling far below. Alloy bars, on the other hand, can be had in 30 to 45 days, and cause no trouble. At the moment, auto plants closed down by strike are accepting and warehousing shipments from mills, no suspensions having been learned of. Fear of a steel strike in mid-January is causing other consumers to press for quick deliveries of tonnage.

Boston — Although buying is down somewhat, due to extended deliveries in small carbon bar sizes, pressure for shipment against orders is heavy. Alloy buying is slightly more active against February schedules for hot-rolled stock. Some suppliers of cold-finished carbon material have withdrawn from this area, selling production at nearer deliveries, with lower freights. This situation in bars, in which higher freight absorption is a factor, is becoming more apparent in others and adds to tightness.

Philadelphia — Little hot carbon bar tonnage is available before third quarter and on small sizes some producers are booked well toward the end of the year. Even these schedules would be more extended were producers not limiting acceptances. Cold-drawn bar shipments

run late into second quarter and alloy steel schedules are stiffening, some mills quoting March.

New York — Hot carbon bar sellers now have little to offer before midsummer with deliveries on small sizes even further extended. Some mills are in fourth quarter on sizes under 1½ inches and assert that they could cover themselves into 1947 if they desired.

In practically all cases sellers are endeavoring to limit sales to their regular customers and even then are not supplying them with all these customers desire. Certain mills are basing their acceptances on prewar averages.

Cold-drawn bar deliveries after a relatively slow start have jumped appreciably over recent weeks. For a while after the end of the war shipments were offered on most sizes, and particularly on the larger sizes within a couple of months. Postwar cancellations were heavy, especially in the larger diameters required for rockets and other types of munitions. However, most cold drawers now are booked solidly four to five months and in certain instances are practically covered for entire first half.

Hot alloy schedules are becoming somewhat more extended, with most producers now offering March delivery.

Steel Plates . . .

Plate Prices, Page 359

Plate deliveries currently promised fall mainly in second quarter, with some producers sold for entire first half. This situation is much better than had been expected a short while ago. With shipbuilding, long the main consumer, now taking little, miscellaneous demand, largely for tanks, has come to the fore with a large aggregate.

Philadelphia — One leading plate producer has tonnage for delivery early in second quarter, while others, on the other hand, are booked for practically that entire period. Demand for light plates, particularly 3/16-inch, continues especially active for fuel oil tanks and railroad car work, with some producers limiting tonnage they will accept from any one buyer.

Boston — Although heavier plate gages are available for second quarter delivery light gage mills are filled for third quarter in some instances. Warehouses are placing more plate tonnage, which, on the whole, is well in excess of expectations, with shipyard volume down. Light tank work taking welding quality and an increasing volume of low-alloy materials, is noteworthy. Floor plate mills are not as heavily taxed and February shipment is possible.

Birmingham — Plate output holds steady at approximately 75 per cent of capacity, but has been fluctuating in line with ingot distribution. Demand, however, is consistently steady, especially from tank manufacturers.

New York — Plate sellers generally feel highly encouraged over long-term prospects. Some are booked up for practically the entire first half, while only a relatively short time ago they would have been more or less satisfied if they could have counted by now on a couple of months of solid work ahead. The situation is particularly interesting in view of the drastic decline in shipbuilding requirements, which during the

war peak consumed more tonnage than any other industry. However, there is still a fair amount of ship tonnage, although mainly for repairs.

Plate demand now is highly diversified, with boiler shops and railroad equipment manufacturers stepping up requirements and with especially good demand still coming from fabricators of light tanks, such as fuel oil storage. It is expected that by spring building construction, particularly bridges, will contribute considerably to plate demand.

A fairly substantial tonnage of plates is moving abroad and in this case ship needs are an important factor, not only for repairs but for the building of new ships. The Scandinavian countries and Holland, all prominent seafaring nations, are endeavoring to build their fleets to at least their prewar status as rapidly as possible. Also a substantial tonnage of plates now going abroad is for rehabilitation of railroad equipment.

Tubular Goods . . .

Tubular Goods Prices, Page 359

Pittsburgh — There is a wide spread in jobbers' inventories, with some reporting inadequate stocks while the reverse is true in a few instances. A number of large pipe lines are in the offing but are held up pending disposition of government lines built during the war. There is also a large potential demand for standard pipe for home construction, although shortage in construction materials probably will delay this program somewhat.

Demand for cast iron pipe is not expected to show much improvement until early next spring, when much municipal work held up during the war period likely will get under way. It is probable that much of the pipe requirements for these programs will not be available until early summer, however, for producers stocks are low and because of continued manpower shortages, production remains restricted with backlogs extended four months in some instances. Sellers are booked into late February and March on standard merchant pipe tubing.

Samkay Builders Inc., Pittsburgh, have been awarded 400 tons of 6 and 8-inch cast pipe for the Moon Run Township airport. Bids were taaken last week on about 44,000 feet of new seamless steel tubing located at the Naval ordnance plant, South Charleston, W. Va., and bids are due Jan. 2 on about 58,500 feet of carbon steel butt-weld black pipe in 40-foot lengths, located at the American Tubular Elevator Co., Neville Island, Pa.

Wire . . .

Wire Prices, Page 359

Cleveland—Several smaller producers of manufacturers' wire are considering raising prices on fine and specialty wire. No definite action has been taken so far but new price schedules may be issued early in the quarter. Drawn steel manufacturers' wire, either carbon or alloy, selling at a base price of $3.35 or less per 100 pounds, Pittsburgh, was exempted from price control on Nov. 20. An advance in prices would not give manufacturers relief from heavy pressure for material, however, since production is as high now as the labor situation will al-

low. Demand for spring wire is especially heavy with automotive and battery interests active. At the yearend, jobbers of merchant wire products generally were still doing business on a hand-to-mouth basis with stocks abnormally low. Demand for products, such as fencing, which usually is not heavy at this time of year, showed no signs of abating.

Chicago — Manufacturers' wire continues tight with orders and inquiries in heavy volume. Mills have voluminous backlogs and deliveries on newly placed business stand well into 1946. Among merchant products, a lessening demand for nails for the industrial trade is observed. This is offset, however, by strong requirements of jobbers of all kinds of nails for resale, suggesting considerable repair work is under way.

Birmingham—Wire continues in great demand and relatively scarce, although insistence from agricultural users of wire products is hardly as great as before the advent of current weather conditions. Early spring will bring a new high in demand, it is anticipated.

Boston — Further reductions in wire rod allocations by producers still supplying this area on the Worcester base since the first of the year tightens an already tight situation in finished wire. Sold through second quarter on numerous finishes and grades of drawn wire, mills are reluctant to accept more tonnage for delivery beyond. Some tonnage inquiry is being returned as fabricators become pinched for material in more instances. Brush wire, among other items, has become notably tight again. Less wire delivered last month aimed at better balance between carryovers and January production schedules, has hampered some consumers, most of whom have meager or no inventories. Pressure for delivery is intense, including material for automobile industry. The rod situation is also complicated by the high ratio in demand for cold-heading stock.

Tin Plate . . .

Tin Plate Prices, Page 359

Pittsburgh — No tin plate tonnage is available for first quarter delivery and orders for shipment the following period are rapidly filling production schedules. Export inquiries continue to exceed allotments for that purpose and increased pressure for early deliveries is developing from these sources. Quarterly exports of tin plate totaled as much as 150,000 tons during the war, but the trend has been downward since. Additional pressure is noted from can manufacturers for further revisions in container order M-81. Emphasis is directed toward use of 0.25-pound electrolytic for coffee, shortening, animal food and similar containers. From tonnage standpoint recent changes in order M-43 are not regarded as significant. Holiday interruptions last week reduced tin mill output somewhat, some units losing a total of four turns. There are good indications that tight manpower situation may be relieved considerably this year and also the possibility of further revisions in order M-81, all of which should result in greater production. One interest predicts output this year of all tin mill products will top last year's estimated production of about 3.5 million tons by 500,000 tons. This estimate, of course, excludes possibility of industry-wide

wide steel strike and other similar upsets to producton chedules.

Birmingham Made Base On Tin, Terne Plate

Tennessee Coal, Iron & Railroad Co., Birmingham, subsidiary of the United States Steel Corp., effective Dec. 31, set up Birmingham as a base on all tin mill products quoting tin plate at $5.10 per 100 pound base box, electrolytic tin plate at $4.45 per 100 pound box, tin mill black at 3.25c and terne plate at $4.40 per 100 pound base box.

Rails, Cars . . .

Track Material Prices, Page 359

New York — Car builders entered the new year with close to 45,000 cars on order for domestic account. There is also a moderate carry-over for export, which should be increased sharply soon, now that the French Supply Council is again active on 36,500 freight cars, comprising 26,500 box cars and 10,000 gondolas, although all of relatively light capacity. Bids were closed Dec. 29.

While there was a flurry in car buying as the year ended, domestic freight car buying in 1945 was down from the preceding year. Preliminary estimates place the total number of units involved in domestic bookings last year at around 45,000, compared with 53,221 for 1944.

Recent car buying included 1400 box cars for the Baltimore & Ohio, 575 cars of various types for the Elgin, Joliet & Eastern and 500 hoppers for the Union Railroad.

The carry-over into the new year represents a relatively small proportion of car-building capacity in this country, as the commercial car builders have facilities for turning out 160,000 cars annually and the railroad shops, 50,000 to 75,000, although the latter never produced more than 17,000 in any one year.

Structural Shapes . . .

Structural Shape Prices, Page 359

Chicago — Structural fabricators, operating up to the capacity permitted by steel supply and available manpower, show only mild interest in new inquiries. To remain within their monthly steel quotas, they carefully select for estimating the jobs they wish to handle or could accommodate if receiving the award. For this reason, the larger the job, the less likely it is to be of interest. Some projects are being postponed indefinitely, but not nearly as many as fabricators would like to see. Aside from scarcity of steel, construction costs which exceed estimates are responsible for some withdrawing of work.

Philadelphia — Shape deliveries range from May through July, with one leading producer quoting the latter month on standard sections. Schedules are expected to stiffen still more as much structural work is under contemplation and set to go ahead as soon as the labor and material situation is more settled. At the moment structural orders are irregular.

Boston — Pressure for small shapes is unabated, with some mills sold into third quarter on angles and channel and filling for second on larger sizes, over 10-inch.

Not only are demand and backlogs uneven as to sizes but also as to mill production. Two shape producers are practically out of the market or not producing, while another has sharply reduced aggregate mill schedules. This throws an abnormal load on other units and contributes toward maintenance of premium prices where permitted, due to the short supply.

Reinforcing Bars . . .

Reinforcing Bar Prices, Page 359

Chicago — Inquiries for reinforcing steel continue in substantial volume, despite the fact that steel is short and suppliers display little enthusiasm in assuming additional obligations. Current inquiries involve anything from a few tons up to several hundred tons. Now and then construction projects are postponed indefinitely because of this tight situation, but new jobs come out to take their place. After jobs have been bid, several weeks sometimes elapse before awards are made, reflecting uncertainties in the building field.

Pittsburgh — Fabricators are seeking protection on mill rolling schedules as far ahead as late second quarter, but in most instances producers are not making definite delivery promises past first quarter. Considerable number of projects are held up, due to inability to estimate future wage rates and steel prices. Concrete bar production in relation to other steel products has been fairly well established through first quarter. Output currently is moderately above that early last year but is still well below incoming tonnage. Additional export tonnage is seeking place on mill books but producers report they are already sold 18 months ahead on the basis of current production allocation for foreign use. It is estimated that present shipments for foreign account represent 10 to 15 per cent of total output, which is almost double prewar volume. Contractors are pressing for early deliveries to build up stocks in anticipation of a sharp increase in construction activity next spring and as a hedge against the prospect of an industry-wide steel strike.

Pig Iron . . .

Pig Iron Prices, Page 361

Pig iron production and consumption start the year well balanced, but with little margin of safety. Shadow of a general steel strike obscures the situation and foundries fear possibility of interruption from lack of iron. Heavy demand for castings continues and much offered business cannot be taken under present conditions of labor and material supply.

Pittsburgh — Pig iron production here is high with 8 out of 54 furnaces down for relining. There is close balance between coke production and consumption but furnace operations are not restricted by lack of coke. Slight improvement in foundry operation has developed, resulting from moderate easing in tight manpower supply. Chief concern of foundries in this district is lack of cast scrap, although in some instances they have had to wait two to three weeks to obtain desired iron analysis. Despite the close balance between production and consumption, most pig iron sellers are opposed to enforced alloca-

tions, preferring to work out their own problems. Iron stocks reported by both foundry and merchant sellers are said to be the lowest in many months. It is estimated that merchant iron producers lost production of 250,000 gross tons during the coal strike, which they have not been able to make up. Practically no bids are being received on the increasing volume of export tonnage offered, as sellers are hard pressed meeting domestic needs. The production pattern of merchant iron over the winter is pretty well established, except for possibility of the Struthers furnace being brought back into service if coke and ore are made available.

New York — Pig iron shipments started the month briskly, but the trend for a while will depend largely upon the extent of labor stoppages in the steel industry. Most consumers have been anxious to build up inventories to the full 30-day limit set by CPA in the belief that should furnaces be forced to suspend because of strikes they may be a little while starting up, even after labor troubles are adjusted.

Various consumers doubt if they will be able to continue production should a general strike hit the steel industry, because they have CIO labor which may also walk out. A number of foundries, however, are hopeful that they might be able to continue on until at least part of their supply has been consumed.

Meanwhile, gray iron foundries are being confronted by considerable business, particularly cast pipe makers, and their labor supply is steadily improving, all of which means a better melt, provided there are no general walkouts. The improvement in labor is noticeable, particularly in the fact that there is less turnover.

Chicago — With slightly more iron available than in recent weeks, suppliers have improved their position by lining up better distribution. For the moment, supply and demand are holding a close balance, but there is no assurance this can be maintained. A steel strike starting Jan. 14 hangs over the market as a depressing threat, for should this occur blast furnaces will go down and foundries, already operating with narrow inventories, would be paralyzed quickly. Foundry scrap continues short, forcing heavier use of iron, but limited manpower is the chief factor holding down production castings.

Boston — Numerous melters ask for substantially more pig iron for first quarter, but with producers allocating on a restricted basis prospects for additional tonnage are slight. Potential increase in melt is notable but supply of iron is retarding the upward trend. Several consumers previously listed as having excess inventories, including two textile mill equipment plants, are now under the limit and the ban on shipments has been lifted. Buffalo suppliers, losing production by lack of coke, and without reserves, depending on current production to meet demand, are behind in deliveries and some fourth quarter tonnage is yet to be shipped. Some foundries are in need of iron to maintain schedules, although steelworks are not in immediate danger of curtailment. One steelworks producer is shipping slightly more iron into this area, filling gaps here and there, without materially easing the pinch, with the district furnace down and stocks de-

pleted. This has, however, made possible a slight increase in melt by the district cast pipe foundry. Under the circumstances foundries are not able to take on all the volume offered and considerable subcontract offerings are going begging, including tonnage for castings offered by several automobile builders.

Cincinnati — The foundry melt was curtailed during the holiday season although most interests held shutdowns to a minimum. Orders placed for pig iron for first quarter show desire to expand output, if possible. Thus far shipments of iron have matched immediate needs but the tight supply is reflected in stocks well below the 30-day limitation.

Birmingham — Pig iron output, still on the basis of six blast furnaces for merchant iron, is barely keeping pace with demand. Merchant melters here are increasingly dissatisfied with the current price. Ten steel mill furnaces are in blast, with immediate need for the entire melt.

Philadelphia — Pig iron sellers are confronted by more demand than they can readily supply. However, there has been no curtailment in melt so far because of lack of iron. Unless there are important labor interruptions over the next few weeks the situation should continue on much the same basis. Cast pipe makers are more active than at any time since early in the war, some trade interests declare.

November Pig Iron Output Up After October Slump

Pig iron production in November totaled 4,025,958 net tons, according to the American Iron & Steel Institute, New York. This compares with 3,388,127 tons in October and with 4,904,011 tons in November, 1944. November output was the smallest for the year except for October, when the fuel shortage cut deeply.

For 11 months, production this year was 49,844,086 tons, compared with 56,940,719 tons in the comparable period in 1944. Included in the total are 676,597 tons of ferromanganese and spiegeleisen, compared with 623,696 tons in the corresponding period in 1944.

Scrap . . .

Scrap Prices, Page 362

No easing is apparent in scrap shortage and melters continue strenuous efforts to obtain tonnage, by unusual springboards and use of premium grades, regardless of increased cost. While reserves in some cases are nearly normal, in most cases they are much below the safety line and consumers depend on current shipments.

Boston — Steelworks are barely maintaining inventories of heavy melting scrap and some are taking in more low phos at premium prices. Reserves range from 45 to 60 days. Offerings are curtailed and holdings of cast and foundry grades vary widely. Some are low and depend on truck shipments, while others have the inventory limit of 60 days. Some melters seek to buy tonnage from these larger reserves. Heavy melting steel unprepared accumulation at the Boston yard brought a high bid of $12.01, in effect shaving preparation charges against a

ceiling of $15.05 to consumers. Heavy melting steel brought ceiling and light iron $9.05. This scrap is yet to be produced and covers a commitment of more than two months, which in view of the uncertain outlook over the strike threat, reflects a firm position as to steelmaking grades.

Cincinnati — Iron and steel scrap supply has become progressively tighter but melters, with a few exceptions, have not faced an emergency situation due to previously acquired stocks. Prices are exceptionally strong and some district interests are falling in line with willingness to pay springboards. The available tonnage may be increased after the holidays although handicaps, such as the season and lighter production, will likely be prolonged.

St. Louis — Increasingly bad weather and continued labor shortage have cut scrap shipments sharply. Yard processing labor is especially scarce. Mills, as the possible steel strike nears, are attempting to place more orders as a hedge against a possible post-strike shortage. Not many new orders are being accepted, however, because brokers fear difficulty in clearing up back orders under present conditions. Mill reserves are around 30 days and foundries are in somewhat better position proportionately. Increasing springboards are being paid to bring in better grades. All prices remain at ceilings.

Birmingham — General tightening of the scrap situation here is reported. Two steel mill blast furnaces being down has added to demand with the result that all grades are relatively scarce. Ceiling prices are in effect.

Chicago — Cold weather, which slows down or halts scrap preparation operations and delays shipments to consumers, coupled with already short supply, have combined to create a situation bordering on the critical. So far, only one steelmaker has been obliged to reduce its steel production rate because of the lack of scrap, but others may soon be confronted by the same problem. For this one interest, the situation is not quite as acute as two weeks ago, but it still operates as a limitation to output. Consumers are now displaying considerable interest in unprepared material. Practically every major grade is firmly entrenched at ceiling prices.

Pittsburgh—Despite willingness of leading consumers to pay $3 springboard on open-hearth grades, there has been little improvement in volume of this material moving into the Pittsburgh district. Scrap supply is becoming steadily tighter, due to continued heavy demand, while volume of production scrap has declined somewhat and movement of material to consumers' yards is retarded by unfavorable weather. For the first time in months two large mills here are taking in truck deliveries. Brokers are running behind on delivery schedules, while manpower shortage and adverse weather restrict movement of scrap through dealers' yards. In most instances consumers are further reducing inventories. A serious scrap shortage is likely to develop this winter, although the probability of a steel strike would drastically alter this possibility.

The Third Service Command, Frederick, Md., awarded 5000 tons of unpre-

pared heavy steel scrap last week as follows: Two thousand tons in four 500-ton lots to Butler Iron & Steel Co., Butler, Pa., at $13.08, $13.10, $13.12 and $13.14; 1500 tons in three 500-ton lots to Southwest Steel Corp., Pittsburgh, at $13.05, $13.11 and $13.13; 500 tons at $13.25 to Coatesville Iron & Metal Co., Coatesville, Pa.; 500 tons at $13.12 to West End Auto Wreckers, Pittsburgh; and 500 tons at $13.10 to Tube City Iron & Metal Co., McKeesport, Pa. All prices were f.o.b. cars, Frederick, Md. On the above tonnage, Luria Bros. & Co., Philadelphia; Bethlehem Steel Co., Bethlehem, Pa.; Charles Dreifus Co., Philadelphia and H. Klaff & Sons, Baltimore, all bida $13.03.

Iron Ore Prices Raised 10 to 20 Cents Per Ton

Office of Price Administration has authorized an increase of 10 to 20 cents per gross ton on Lake Superior iron ore, retroactive for the entire 1945 season. This is the first increase over prewar prices set in 1940.

This action adds 10 cents per ton on Mesabi ores and 20 cents on old range ores. Manganiferous and siliceous ores and lump ore are increased 20 cents.

This change gives the following ceilings: Mesabi nonbessemer $4.55 per ton, Mesabi bessemer $4.70, old range nonbessemer $4.80, old range bessemer $4.95, high phosphorus $4.55.

The OPA announcement provides that the increases are applied only to ore mined for sale and not to ore mined by steel companies for their own use. Of the 82,000,000 tons mined in 1944 only 19,000,000 tons were for sale, the remainder being for own use.

Warehouse . . .

Warehouse Prices, Page 360

Pittsburgh — Steel distributors report no improvement in mill shipments, particularly in sheets, small carbon bars and wide flange beams. Warehouse inventories are unusually low in relation to heavy demand and little improvement is indicated for some months. However, some relief may develop should the General Motors strike not end soon. Delayed mill deliveries and threat of a nation-wide steel strike have resulted in increased pressure for steel shipments from warehouse. The tremendous backlog of maintenance and repair requirements is said to be another factor in current overall demand. Warehouse steel customers are forced to take substitutes on a temporary basis because of the low and unbalanced inventory of most steel distributors.

Cincinnati — Demand for steel from warehouse defied holiday influence and was well maintained through December as consumers sought scarce items against near needs and possibly to bolster stocks against threat of strikes. Jobbers' inventories sagged under the impact and inadequate replacements, especially in sheets, strip and large structural sections.

Boston — Demand on warehouses is increasing as more fabricators turn to jobbers when unable to get mill deliveries. Wider gaps in distributor inventories limit ability to fill requirements

and replacements are falling behind schedule. Demand is also broadening as to products but is centered heavily in flat-rolled and structurals, the weakest point in stocks. Jobbers are more interested in surplus offerings. An interesting development is acceptance of some No. 19-gage cold-rolled sheets, automotive rejects. Secondary and rejected material have been as tight as primes for some time.

Chicago — Start of a new year finds warehouses hard put to serve customers adequately. Since VJ-Day, demand for steel for civilian goods has progressively reduced inventories to painful levels. At the same time, mills have been obliged to allocate output by assigning quotas to warehouses the same as other customers. Result was that steel was taken from distributors' stocks faster than it was replaced. Early months of 1946 hold no optimism that stocks can be restored to satisfactory levels, excepting possibly alloy steels. Inventories of sheets, strip, light structurals and plates are almost nonexistent.

Semifinished Steel . . .

Semifinished Prices, Page 358

Pittsburgh—The tight supply in semifinished is growing more critical, with nonintegrated interests particularly hard pressed for wire rods, skelp, sheet bars and slabs. Integrated mills are attempting to convert as much semifinished steel as possible into products netting them the best return. Demand for forging billets continues well below the level during the war period, but other semifinished steel requirements exceed current output. Sellers generally are booked into late first quarter on most semifinished items, and no decline in demand, barring steel strike possibility, is indicated. Export inquiries continue active, particularly for South America, but there is little prospect more than a relatively small proportion of this tonnage can be satisfied during first quarter. Considerable pressure is developing from a number of sources to force integrated mills, through some form of allocation, to meet a greater portion of demand originating from nonintegrated mills and for export. However, in most instances integrated mills are hard pressed to meet own requirements.

Ferroalloys . . .

Ferroalloy Prices, Page 361

New York — While some ferroalloy consumers are ordering ahead so as to built up stocks to cushion possible strike difficulty in the steel industry this month, others are still holding back because of year-end inventory-taking. It is still a bit early to gage the situation accurately, but it appears that December shipments for most leading ferroalloy sellers will not be as heavy as in November and October, respectively. Both of these latter months were about on a parity with each other with respect to shipments and were up substantially from September which was the low point for the last half of this year. Incidentally, according to some leading trade estimates, shipments during the last half will amount to about 65 per cent of those in the first half.

Ferroalloy inventories in consumers' hands are regarded as moderate on an average. In some cases where consum-

ers have been heavily engaged in war work, they have an excess of the alloys required for that purpose; however, they may be light on stocks required for peacetime production. Still others have fair stocks for peacetime needs but in various instances, nevertheless, they are endeavoring to build up supplies because of the possibility of widespread work stoppages in the steel industry, beginning Jan. 14.

The first week of the new year is expected to witness a substantial movement of ferroalloys, but if by the end of that time it appears that a general steel strike is imminent, shipments will drop sharply because of the possibility of cars becoming strike bound with resultant heavy demurrage charges. As a matter of fact, the railroads themselves may clamp down on embargo in an effort to keep many cars from being tied up.

Demand for ferroalloys for production of stainless steel is decreasing. It is estimated in some quarters that between 50,000 and 60,000 tons of stainless steel is now being produced monthly, which, it is pointed out, is substantially in excess of the average wartime production of stainless steel.

Steel in Europe . . .

London — (*By Cable*) — All iron and steel prices in Great Britain, except automobile sheets, have been increased as of Dec. 31, the first general increase since 1940. Pig iron is up £1 per ton. The steel increases average 5 per cent. Automobile sheets are lowered £2 per ton, thanks to modern strip mill economy. Controls have been dropped on iron ore. The steel industry central fund established early in the war to maintain price stability and support less efficient firms has been abolished.

STRUCTURAL SHAPES . . .

STRUCTURAL STEEL PLACED

1100 tons, warehouse building, Detroit, for Central Steel & Wire Co., to American Bridge Co., Pittsburgh.

840 tons, power station, West Tulsa, Okla., for Oklahoma Public Service Co., to Tulsa Boiler & Machinery Co., Tulsa.

240 tons, sheet piling, power station, Tyrone, Ky., for Kentucky Utilities & Power Co., to Inland Steel Co., Chicago; Bates & Rogers Construction Corp., Chicago; bids Dec. 10.

210 tons, building, Chicago, for B. T. Babbitt Inc., to American Bridge Co., Pittsburgh.

STRUCTURAL STEEL PENDING

300 tons, alterations to Conway building, Chicago; bids Dec. 26.

400 tons, power house, La Grange, Ill., for Electro-Motive Division, General Motors Corp.; bids Jan. 3.

400 tons, extension to factory building, Kenosha, Wis., for American Brass Co.; Austin Co., Chicago, contractor; bids Jan. 3.

250 tons, metallurgical building, Chicago, for Illinois Institute of Technology; bids Jan. 4.

REINFORCING BARS . . .

REINFORCED BARS PLACED

500 tons, elevators, Danville, Ill., for Lauhoff Grain Co., to Ceco Steel Products Corp., Cicero, Ill.; J. W. Montgomery, Danville, Ill., contractor.

100 tons, addition to buildings, Crawfordsville, Ind., for R. Donnelley & Sons Co., to Ceco

Steel Products Corp., Cicero, Ill.; J. L. Simmons Co., Indianapolis, contractor; bids Dec. 20.

REINFORCED BARS PENDING

182 tons, Sec. D6-F, Chicago subway, for Department of Subways and Superhighways; Kenny Construction Co., Chicago, low on general contract; bids Dec. 27.

RAILS, CARS . . .

RAILROAD CARS PLACED

Baltimore & Ohio, 1400 fifty-ton box cars, 600 to Bethlehem Steel Co., Bethlehem, Pa., 500 to Harlan & Hollingsworth Corp., Wilmington, Del., and 300 to Pressed Steel Car Co., Pittsburgh; the 500 going to Harlan & Hollingsworth will be 50 feet 6 inches in length, while the others will be 40 feet 6 inches long.

Delaware & Hudson, 25 fifty-ton 40-foot 6-inch steel-sheathed box cars to American Car & Foundry Co., New York.

Elgin, Joliet & Eastern, 575 cars, with 300 fifty-ton mill-type drop-end gondolas and 200 fifty-ton steel underframe flat cars to American Car & Foundry Co., New York, and 75 seventy-ton covered hopper cars to General American Tank Car Corp., Chicago.

Pittsburgh & West Virginia, 100 fifty-ton steel sheathed box cars 40 feet 6 inches long, with 8-foot doors, to American Car & Foundry Co., for its Chicago plant.

Toronto Transportation Commission, Toronto, Ont., 50 trackless trolley coaches and 25 buses, the Canadian Car & Foundry Co., Montreal, Que. .

Union Railroad, 500 seventy-ton hopper cars, to Greenville Steel Car Co., Greenville, Pa.

RAILROAD CARS PENDING

French Supply Council, Washington, 36,500 freight cars, of 20 and 30-ton capacity, comprising 26,500 box cars and 10,000 gondola cars; bids closed Dec. 29.

Pennsylvania, 214 lightweight streamlined cars; bids Jan. 10.

LOCOMOTIVES PLACED

Great Northern, two 5000-horsepower electric locomotives, to General Electric Co., Schenectady, N. Y.

Shipments of Coal Mining Machinery Increase

Shipments of coal mining machinery have shown a substantial increase during the last three months, according to the Civilian Production Administration. Another product which has been critically short and which is now showing production gains is cast iron soil pipe. Coal mining machinery is the only equipment for which production scheduling is still maintained.

Price Ruling Extended on Construction Machinery

Sellers of construction machinery and equipment who have increased their ceiling prices by 5 per cent in line with the 5 per cent interim increase in prices authorized Sept. 28, 1945, may continue to make deliveries at the higher prices through Jan. 31, 1946, the Office of Price Administration has ruled.

Ford Plans New Assembly Plant at St. Louis

Recently planned addition to production facilities of Ford Motor Co. is a new assembly plant at St. Louis, which will provide more than 850,000 sq ft of space. The new layout, as conceived by Albert Kahn Associated Architects & Engineers Inc., Detroit, comprises an assembly building, to which is joined a separate office building, separate power house, related service structures, and test track.

All buildings are of structural steel, with steel sash and enclosing walls of brick and gunite. The center and higher portion of the office building containing the entrance lobby, fan rooms, etc., is faced with limestone.

An architectural feature is the large combination office lobby and display room, monumental and modern in character, with high curved ceiling, stone piers, aluminum sash, and wall finish partly in limestone and the balance in plaster and acoustic material.

The assembly building is 520 x 1480 ft, with the production area one-story high. A monitorless roof of insulated cement tile supports eight fan rooms for summer and winter ventilation, as well as transformer and switch rooms.

Across the building midway of its length is a second story portion 120 x 450 ft exclusively for employee facilities. To the north of the building, and extending to the property line, is a parking area with a capacity of 650 cars.

The assembly line runs the length of the north section of the plant. Incoming parts are received in a railroad track bay along the south side and are processed as they move across the floor to the proper station on the line. Finished cars move on to a test track off the northwest section of the plant, with adjacent shipping and driveaway facilities.

West of the main plant is the one-story office building, 230 x 310 ft, housing general and executive offices, cafeteria for visitors and office workers, display room combined with the lobby, and conference room for service instruction and similar functions.

A separate power house, 100 x 120 ft, stands off the south side of the main plant. Three oil-fired boilers, each with a capacity of 60,000 lbs of steam per hour, provide steam for heating all buildings and for process work.

Truck Manufacturers Plan To Build 1,000,000 Units

The automotive industry enters the new year planning a record production of at least 1,000,000 motor trucks during

1946, or 40 per cent more than the average production for the five-year period from 1935 to 1939.

Truck makers in general emerged from the war with expanded production facilities, and, in addition, many of them are now completing programs to increase capacity from 25 to as much as 200 per cent. Reconversion has not involved retooling to produce radically new truck models. Most trucks now being manufactured are little changed in appearance from prewar models, and major mechanical changes probably are a year or two away. Automatic or power control of gear shifting, improvements in axle drives, increased engine power, better bearings and valves, more use of aluminum and magnesium to lower truck weights and increase pay loads, power steering, better brakes, and improvements in cabs are some of the possibilities.

OPA Orders Close Check Of Scrap Buying Prices

A careful check by Office of Price Administration's field offices on prices being paid for scrap has been ordered by that agency. There has developed recently on the part of certain dealers, brokers and consuming mills, OPA said, a tendency to bid prices above the ceiling for unprepared scrap, even though such scrap moves directly to the consumer from the shipping point where purchased, which constitutes a price violation.

The violations, in certain instances, stem from the fact that there is no ceiling on a sale of scrap to a dealer when the scrap moves directly into a dealer's yard. There are rigid ceilings, however, on all sales to consumers or brokers.

OPA pointed out that when scrap is shipped directly to a consumer, the dealer actually is acting as a broker, and the established ceilings apply to such purchases as well as to the sale of such scrap.

Cleveland To Be Scene of AAF Air Show, Jan. 11-20

Air power will be exhibited at the National Air Show in Cleveland's huge Public Auditorium, Jan. 11-20. The show will feature the B-17 Flying Fortress, Black Widow, Corsair, Warhawk, Mustang, Aircobra, Lightning, and the jet-propelled P-80 Shooting Star. Captured German and Japanese fighters and robot bombs will be among exhibits. The show is sponsored by the Cleveland Aviation Club. Aviation products manufacturers will exhibit their wartime contributions to the industry and will show the adaptation of these and new products to peacetime aircraft industry.

CONSTRUCTION AND ENTERPRISE

PENNSYLVANIA

BEDFORD, PA.—Bedford Boro, Charles C. Lee, secretary, West Penn St., will build sewage treatment plant costing about $100,000. T. Pealor, Indiana, Pa., is consulting engineer.

PHILADELPHIA—Edgcomb Steel Co., D St. and Erie Ave., has let contract to Turner Construction Co., 1500 Walnut St., for a manufacturing plant building to cost about $75,000. Wenner & Chance, same address, are architects.

PITTSBURGH—Pittsburgh Brewing Co., 3340 Liberty Ave., has let contract to H. A. Bloedel, 3720 Ruggles St., for a one-story brewery addition estimated to cost about $80,000.

TYRONE, PA.—Corning Glass Co., Walnut St., Corning, N. Y., has let contract to H. K. Ferguson Co., 1650 Hanna Bldg., Cleveland, for design and construction of a plant and office building costing about $1 million.

NEW YORK

BROOKLYN, N. Y.—Taylor & Co. Inc., 680 Morgan Ave., has let contract to Industrial Engineering Co., 50 Church St., New York, for a one-story 200 x 510-foot foundry and office building estimated to cost $225,000. S. Napp, 1749 Grand Concourse, New York, is engineer.

FLUSHING, N. Y.—Gem Oil Co., Lawrence St., has let contracts for an oil distributing station, including 1,500,000-gallon tanks, office, loading racks, foam house and boiler-house, estimated to cost $140,000.

LONG ISLAND CITY, N. Y.—Auto Electrical Specialty Co., 422 East 53rd St., New York, has plans for a plant on 45th St., to cost about $140,000. G. E. Tilt, care owner, is consulting engineer.

SYRACUSE, N. Y.—L. C. Smith & Corona Typewriters Inc., 701 East Washington St., has let contract to J. D. Taylor Construction Co., 115 South Salina St., for an eight-story plant addition costing about $400,000. C. Clark, Cortland, N. Y., is architect.

OHIO

WICKLIFFE, O.—Lubrizoil Corp., St. Clair Ave. and Lloyd Rd., has let contract to Sam W. Emerson Co., 1836 Euclid Ave., Cleveland, for a two-story 46 x 80-foot plant building costing about $150,000. F. Hauschaka, Ninth-Chester Bldg., Cleveland, is architect.

MICHIGAN

DETROIT—Kelsey-Hayes Wheel Co., 3600 Military Ave., will let contract soon through Giffels & Vallet and L. Rosetti, architects, 1000 Marquette Bldg., for a plant addition estimated to cost $200,000.

MENOMINEE, MICH.—Lloyd Mfg. Co., manufacturer of furniture and perambulators, plans an addition to its plant.

ILLINOIS

CHICAGO—John A. Roebling's Sons Co., 600 West Jackson Blvd., has bought from Chicago Flexible Shaft Co., 299 x 666-foot site at Roosevelt Rd. and Central Ave., Cicero, Ill., for an office and warehouse building. Plans are by Skidmore, Owings & Merrill, architects, 100 West Monroe St., Chicago.

CICERO, ILL.—City plans garbage incinerator costing about $250,000. DeLauw, Cather & Co., 20 North Wacker Dr., Chicago, are engineers.

LA GRANGE, ILL.—Electro-Motive Corp., division of General Motors Corp., manufacturer of diesel locomotives, will take bids soon on a power plant to cost about $750,000.

Schmidt, Garden & Erickson, 104 South Michigan Ave., Chicago, are architects.

ROCKFORD, ILL.—O. & H. Foundry Co., has let contract for a foundry 50 x 100 feet, at 2144 15th St.

ROCK ISLAND, ILL.—Swords-Morton Veneer Co. has let contract for a one-story plant 80 x 188 feet at 37th Ave. and Seventh St. Benjamin A. Horn, Rock Island Bank & Trust Bldg., is architect.

MISSOURI

KANSAS CITY, MO.—Rex Welder & Engineering Co., Walnut and 19th St., plans a one-story plant addition 94 x 104 feet.

ST. LOUIS—Herman Body Co., 4400 Clayton Ave., has let contract for a one-story 41 x 200-foot plant building to Pelligreen Construction Co., 318 North Eighth St. Plans are by Hari Van Hoefen, 2173 Railway Exchange Bldg., 611 Olive St.

OKLAHOMA

OKLAHOMA CITY, OKLA.—Boardman Steel Products Co., manufacturer of tanks, etc., plans a one-story plant 120 x 175 feet.

WISCONSIN

MILWAUKEE—Zenith Foundry Co., 1501 South 83rd St., has let contract for a two-story foundry addition.

MILWAUKEE—Stainless Foundry & Engineering Co., 5132 North 35th St., has let contract for a one-story foundry 40 x 80 feet.

MILWAUKEE—Jos. Schlitz Brewing Co., 235 West Galena St., has let contract for a two-story bottling plant, 280 x 280 feet to cost about $2 million. Brimeyer, Grellinger & Rose, 730 North Jackson St., are architects.

MILWAUKEE—Western Sound & Electric Laboratory Inc., care A. L. Seidenschwartz, architect, 2104 North 64th St., Wauwatosa, Wis., is having plans made for a one and two-story plant building 73 x 145 feet.

MILWAUKEE—Phenix Mfg. Co., manufacturer of windows and screens, has let contract to Gebhard-Berghammer Inc. for a one-story 180 x 450-foot plant on North Port Washington Rd., V. K. Boynton, 647 West Virginia St., is engineer.

MILWAUKEE—Delta Mfg. Co., 620 East Vienna Ave., has let contract to Selzer-Ornst Co., 6222 West State St., Wauwatosa, Wis., for a one-story plant addition costing about $300,000. R. H. Kloppenburg, 708 East Green Tree Rd., is architect.

WAUKESHA, WIS.—Industrial Clutch Co., 1300 National Ave., has let contract to Hunzinger Construction Co., Station K, Milwaukee, for a one-story 100 x 125-foot plant building estimated to cost $150,000.

MINNESOTA

FARIBAULT, MINN. — Electrical Industries Inc., newly established firm, is building a one-story plant 100 x 300 feet for manufacture of radios and appliances. John W. Millunchick is manager.

MINNEAPOLIS—Roy F. Gillette has started construction of a foundry at 517 38th Ave., Columbia Heights.

MINNEAPOLIS—Super Six Mfg. Co., 2007 Central Ave., has let contract for a one-story machine shop 62 x 105 feet, at 4026 Washington Ave. N.

MINNEAPOLIS—Standard Iron & Wire Works, 1900 Third St. NE, manufacturer of architectural iron, plans new plant to accommodate new line of farm machinery, including a manure loader.

MINNEAPOLIS — Hoffman Engineering Co., Sexton Bldg., has been incorporated to manufacture adaptations of the photoelectric cell to industrial uses, particularly for control of automatic machinery. Also plans manufacture of heat-treating devices using high-frequency electronic currents and other electrical devices. A plant will be built as soon as equipment is available. Harry H. Hoffman is president.

KANSAS

HUTCHINSON, KANS.—Hartman Mfg. & Supply Co., 120 North Adams St., plans a one-story gray iron and brass foundry 100 x 160 feet.

TEXAS

GRAND PRAIRIE, TEX.—Texas Pattern Service & Mfg. Co., has plans under way for a foundry unit to cost about $50,000.

HOLLIDAY, TEX.—Warren Petroleum Corp., National Bank of Tulsa Bldg., Tulsa, Okla., is taking bids on a natural gasoline plant of 70,000 gallons daily capacity, to cost about $650,000.

ROBSTOWN, TEX.—Tennessee Gas Transmission Co., Commerce Bldg., Houston, Tex., has plans under way for a gas dehydration plant to cost about $750,000.

IOWA

CEDAR RAPIDS, IOWA—Causeway Co. Inc., subsidiary of Barnard & Leas Mfg. Co., Moline, Ill., has bought five-acre Chandler Heating Co. plant, which will be converted for manufacture of grain elevator and flour mill machinery and dust collection equipment.

CENTERVILLE, IOWA—Hercules Mfg. Co., manufacturer of stump pullers, haying machinery, mining equipment, wire rope couplings, etc., has been bought by Batavia Metal Products Inc., Batavia, Ill., and will become Hercules division of that company. B. A.

Fuller, who has been president of the Hercules company, will be manager.

FAIRFIELD, IOWA—Fairfield Metal Products Inc., care August Van Lanschoot, manager, has been incorporated to manufacture aluminum castings at the former Fairfield Engine Co. plant. Mr. Van Lanschoot formerly was foundry superintendent for Iowa Malleable Iron Co.

LE MARS, IOWA—LeMars Mfg. Co., incorporated a year ago with $200,000 capital, has begun airplane production at rate of one a week, to be increased later. Dr. D. O. Kime, president of Western Union College, is head of the company.

ARIZONA

PHOENIX, ARIZ.—City, C. J. Henne, manager, plans enlargement of sewage disposal plant at cost of about $600,000.

CALIFORNIA

ALHAMBRA, CALIF.—Reliance Regulator Co. has let contract to E. S. McKittrick Co., 7839 Santa Fe Ave., Los Angeles, for a shop addition 40 x 170 feet, at 1000 Meridian St., Alhambra, to cost about $20,000.

ANAHEIM, CALIF.—General Electric Co., 212 North Vignes St., Los Angeles, has plans by A. C. Martin, 233 Higgins Bldg., Los Angeles, for a one-story 200 x 360-foot plastics plant to cost $500,000 and by Blaw-Knox, Box 5087 East Liberty Station, Pittsburgh, for a chemical factory, including 102 x 162-foot processing building and 102 x 102-foot storage building.

LOS ANGELES—Earle Jorgensen Co., steel warehouse concern, has let contracts for a warehouse building and office at 10510 South Alameda St., Warehouse will be 60 x 350 feet with two 20-ton cranes. Office building will contain 14,000 square feet floor area. Cost of two structures will be about $185,000.

VERNON, CALIF.—Byron Jackson Co., pump manufacturer, has started construction of ten plant buildings at 2301 East Vernon Ave., including machine shop 60,000 square feet floor space, pattern shop and storage building 100 x 120 feet, four stories, warehouse 21,000 square feet, open crane runway, welding, casting and cleaning building, three-story office building 50 x 160 feet, to cost about $900,000.

OREGON

HILLSBORO, OREG.—Voters have approved $650,000 revenue bond issue to finance water system. J. W. Barney, city engineer, will call bids soon. Will include 18-inch steel supply line and 5-million-gallon reservoir.

PORTLAND, OREG.—Parkrose water district, Jack Sturdgeon, superintendent, plans early installation of several miles of 6 to 12-inch cast iron pipe.

PORTLAND, OREG.—Beall Pipe & Tank Co., Verne Romig, manager, states negotiations are still under way for construction of proposed $500,000 plant at Portland.

WASHINGTON

OKANAGON, WASH.—W. L. Maloney, engineer, Spokane, is preparing plans for a proposed $65,000 disposal plant and $75,000 sewer system and a disposal plant at Lind, Wash.

SEATTLE—Truck Welding Co., 735 Ninth Ave. North, plans erection of a machine shop 50 x 100 feet.

SEATTLE—Troy Laundry Co., 307 Fairview Ave. North, plans a $35,000 addition, including boiler house and water softening plant, 44 x 162 feet. Plans are by Henry Bittman, Seattle.

SEATTLE—Seattle Gas Co. has bought land adjoining its plant and plans a $750,000 expansion program, including two oil-gas generators utilizing waste heat and additional by-product facilities. Briquet output will be increased to 35,000 tons annually.

Problems of Peacetime as Trying As Were the Problems of Wartime

(*Continued from Page* 234)

Housing Policy bill. Hearings on this bill were begun before the Senate Banking and Currency Committee on Nov. 17 and it should be reported, with recommendations, early in 1946.

With the encouragement this bill would give to construction of low-cost and low-rental housing, National Housing Agency spokesmen believe, housing construction should be in the neighborhood of 1,250,000 units per year. At an average investment of $5000, this would come to an annual house building program of some $6 billion a year.

Such a program, they figure, would provide 1.5 million jobs directly on building sites, good for an average of 40 weeks a year. It would provide indirectly for some 2.5 million jobs, averaging 47 weeks per year, in manufacturing plants, on railroads and truck lines and in distribution capacities.

The program should be exceptionally profitable to the metal industries. Recently National Housing Agency statisticians found that about 5 tons of metals were used in the prewar home. This included building hardware, bathtubs and other plumbing, gutters and downspouts, furnaces and radiators, refrigerators, washing machines, pipe connections with street water and gas mains. These figures made no allowance for a recent trend toward more prefabricated metal buildings and prefabricated building assemblies such as steel purchases, closets and staircases.

INDUSTRIAL DECENTRALIZATION: Two bills aimed at alleviating alleged defects in the location of manufacturing facilities may come up for attention next year. One of them is the resolution by Sen. Pat McCarren (Dem., Nev.) calling for "an investigation of the effect upon interstate commerce of the centralization of heavy industry in the United States." Indications in November were that senators from industrial states would block any proposals that would encourage the flight of established industry from present locations.

Another bill, introduced by Senator Bailey and Rep. Brooks Hays, would provide $5 million to meet first-year expenses in a program to stimulate industrialization of backward regions in the country. The secretaries of Agriculture, Commerce and Labor, as well as the Budget Bureau director, are preparing reports on this bill which now is pigeonholed in the Senate Committee on Commerce and the House Committee on Interstate and Foreign Commerce.

SURPLUS PLANTS: Much thought will continue to be given during 1946 to disposition of government-owned war plants. The pattern for disposing of these plants has been pretty well developed excepting for such properties as aluminum reduction plants, the plant of the Geneva Steel Co., synthetic rubber plants, pipelines, etc. For these properties disposal policies remain to be worked out.

In other cases the government is selling plants at what is regarded as a very fair return on original costs. For example, the Melrose Park, Chicago, airplane parts plant operated by Buick originally cost about $17.25 million for plant and land. Plant and land were sold to International Harvester Co. for about $13.75 million. The difference was due largely to wiping off some $4 million covering the cost of 85 test cells which were needed for war production but which would have no use in the peacetime operations.

Many plant sales have been arranged and now are in process of being approved by the RFC and by the Department of Justice. Many additional sales are in the negotiation stage.

POSTWAR MILITARY SETUP: Congress will move into 1946 with the whole postwar military problem before it. It will have to decide the answer as to whether the Army and Navy shall be merged into a single Department of National Defense. It will have to act on the President's request for a universal military training law.

The House on Oct. 30 approved a program under which the Navy would have 6084 combatant and auxiliary ships in the peacetime period—a force smaller, but heavier and harder-hitting than the pre-Pearl Harbor fleet. The active fleet would comprise 297 major combat vessels and 1375 auxiliaries. The rest would include ready and laid-up reserves. The Senate still has to act on the program.

SCIENTIFIC RESEARCH: Another bill on which Congress should take early action, and which is of importance to business, is that which would put the government back of scientific research: To develop new products by which industry can provide more employment, to improve the public health, to develop new military weapons, etc.

Late in November the two leading proponents of a law to protect the public interest in scientific research, Senators Kilgore and Magnuson, were in process of compromising two highly controversial points. One is whether contractors should have any patent rights in discoveries made as a result of research financed in whole or in part by the government. The other is whether the proposed government organization to supervise and encourage scientific research should be run by a single administrator or by a board composed of leading scientists.

During the extensive series of hearings numerous scientists supported the view of Dr. Vannevar Bush, head of the wartime Office of Scientific Research & Development that contractors should have the right to patent discoveries, not only as a matter of simple justice but for the good of the country.

"The government," declared Dr. Bush, "is among the greatest destroyers of patents. Any company that solves the production and marketing problems in utilizing a government-held patent loses the benefits of its efforts and investment, because as soon as it has pioneered and developed the 'know-how' any other group of individuals can enter into competition. When the government acquires the rights, therefore, nobody has any incentive to spend time and money on developing them."

This view also was corroborated by FCC Chairman Paul A. Porter who reported that the patent situation in radar is so complicated "that no company on earth can safely proceed to manufacture with any confidence that it will be immune from suits of infringement." In radar the patents developed during the war are held by the United States and British governments and by private manufacturers, with utmost confusion where ownership begins and leaves off, and Mr. Porter predicted it may be months or years before the confusion is sufficiently cleared to permit manufacture of radar for peacetime uses.

ATOMIC RESEARCH: An important problem left over for decision in 1946 has to do with atomic research. The May-Johnson bill which would set up a nine-man commission to direct development of atomic research, and control the fruits of such research, was reported favorably by the House Military Affairs Committee, but action by the House was held up indefinitely, to be combined possibly with legislation for international controls. The House also wanted to wait and see the outcome of the broad-scale inquiry into all aspects of the atomic problem by a Special Senate Committee on Atomic Energy headed by Sen. Brien McMahon (Dem., Conn.)

The May-Johnson bill resulted from the President's message to Congress Oct.

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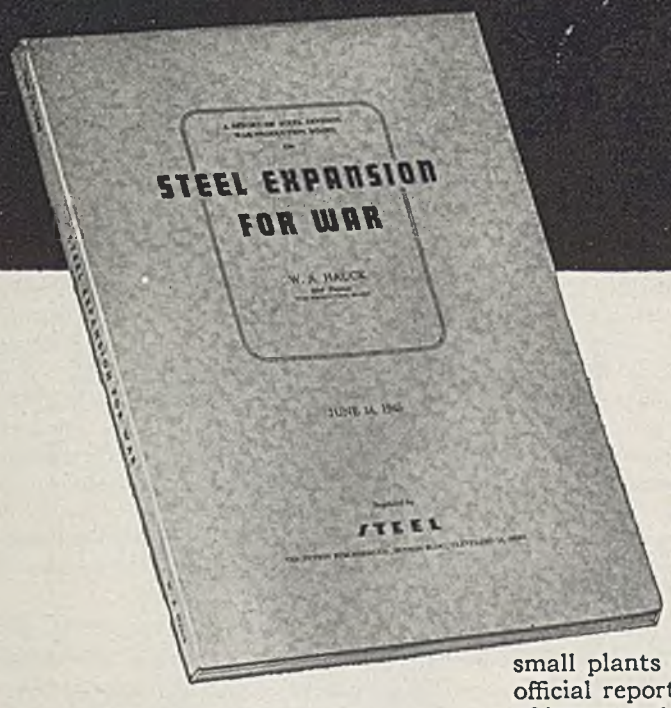
[An official report by Mr. Hauck for the War Production Board]



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• Mr. Hauck has been with the Steel Division since its inception in June, 1940, then under the National Defense Advisory Commission (predecessor to WPB). Assigned to the task of expanding and balancing steel capacity for war, Mr. Hauck has inspected both large and small plants all over the United States. He prepared several official reports which lead to the addition of 10,000,000 tons of integrated steel capacity, plus over 5,000,000 tons of capacity by the expansion of existing facilities.

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3, 1945, requesting a law to fix a policy and establish an agency for the domestic development and control of atomic energy. The primary objectives of the bill are: Promotion of the national defense, protection of the safety of the inhabitants of the United States, promotion of world peace, enrichment of the national life, promotion of the general welfare, and the furtherance of the acquisition of knowledge concerning atomic energy. It would establish a nine-man Atomic Energy Commission. It was hailed as a bad bill, providing a gag on public discussion, and as an enemy of free scientific research.

FOREIGN RELATIONS: Announcement early in December of signing of the agreement to loan $4.4 billion to Great Britain was regarded in Washington as the first important move to open up markets of the world to American exporters and manufacturers. The agreement not only clears away the debts incurred in terminating lend-lease, but provides for a World Trade Conference in 1946 to cover "tariffs and preferences, quantitative restrictions, subsidies, state trading, cartels and other types of trade barriers." Other important moves on the agenda for 1946 are the arrangement of loans to the U. S. S. R., France, Belgium, Denmark, China and other countries—all involving credits for purchase of American goods and services.

In the meantime, the administration has organized an Executive Committee for Economic Foreign Policy which consists of key men from the various interested departments of the government—State, Commerce, etc.—who get together at regular intervals to discuss problems of foreign trade. In this setup the group which represents the country's business interests is the new Office of International Trade Operations of the Department of Commerce. This office was appointed by Secretary Wallace to take over the export controls formerly conducted in the Foreign Economic Administration.

Secretary of Commerce Wallace, in fact, has become the principal government spokesman on the subject. His outlook, characteristically, is that there can be no return to what he terms "laissez faire" in foreign trade. Even though the United States government is, as he claims, getting out of the public import business in which it engaged as a war measure, and is removing its wartime export controls as rapidly as possible, he sees United States progress in this direction tied to the rapidity with which the rest of the world likewise de-controls its international trade.

And, he points out, there is little prospect of any immediate general relaxation of controls throughout the world. On the premise which he constructs, that our foreign trade is henceforth to be confronted with regulations and new forms of control all over the world, that in some countries foreign trade is either entirely a state of monopoly or partly so, he sees a new role for the government in connection with foreign trade.

A major part of this government participation, according to Secretary Wallace, may be related to establishment of certain international economic organizations, which he visualizes as replacing the prewar "unilateral actions" or outright economic warfare. The U. S. government program, as he sees it, would involve a retention of sufficient control to insure that a proper proportion of American goods reaches foreign markets, and his particular concern is that enough goods are earmarked for assistance to liberated countries and United Nations relief activities.

He visualizes his department, particularly, as operating a far-ranging reporting service, covering these international organization developments, as well as the more mundane foreign trade possibilities abroad.

DEPARTMENT OF COMMERCE: On the basis of these, and other greatly enhanced roles for the department, Secretary Wallace placed before Congress late in the year, proposals for expanding his department. He would enlarge the nucleus of the Commerce Department, now concerned with the foreign field, to deal exclusively with international trade, and would develop other bureaus and branches in connection with reconversion and postwar adjustment.

Emphasis is to be placed on the departmental statistical services; on technological aids to business, especially small business; on management aids and other forms of direct service to business, also beamed especially to the supposed requirements of the smaller operator in business and industry, but not limited to such fields; strengthened scientific and technical services, such as the weather reporting services, Coast and Geodetic Survey, a stronger Civil Aeronautics Administration; expanded research work.

There would be a strongly reinforced field service, and the plan of enlarging the department now before Congress calls for an unprecedented broadening of the top administrative organization. Included are plans for three new assistant secretaries of the department, in addition to the present under secretary and one assistant secretary.

The secretary plans a comprehensive system of advisory bodies and committees, particularly in the fields of research and science.

Standards Association as the agency to develop a program based on the committee's belief that "standards would be of ever-increasing importance, that they would ultimately affect the production and sale of all goods and that, therefore, provisions must be made for the orderly development of all standards."

Object of the program is twofold. One is to smooth the path of manufacturers by permitting them to benefit from mass production and distribution, better control of product quality, broadening of sources of supply, broadening of markets, and lessening of customer complaints. The other is to provide more adequate safeguards to buyers, who will be able to buy more intelligently and who will be able to judge whether the goods, upon delivery, conform to the standards under which they were bought. skill of the craft," and, ostensibly at least, to encourage what the secretary calls true inventions, either by such research teams, or others.

The plan contemplates restrictions on patents for what will be ruled as nonpatentable matter; closer examination of proposed patents, combing out of the *Patent Register* of questionable patents previously issued; modernization of patent legal procedure, to mention only a few highlights.

STANDARDIZATION: Further action in the Commerce Department's effort to encourage standardization of all manufactured products is expected early next year when the committee headed by Charles E. Wilson, president, General Electric Co., submits its final report. This committee already has gone on record as favoring the selection of the American

PATENTS: Included under the Department of Commerce is the Patent Office. That brings this important agency within the orbit of the ambitious Mr. Wallace. Moreover, there are pending a multitude of bills drastically changing the conception of patent operation and use, which, if approved by Congress, would place a much larger responsibility on the Patent Office, or even supplant many of its functions.

In advance of any concrete materialization of these changes, however, the secretary has busied his staff and others, on the problem of patent controls, patent administration, and possible revision of the whole system of patent procedure.

As projected, this survey looks to a tightened restriction on patent issues, to rule out findings of sustained industrial and engineering research in the normal course of their operations; in short, an attempt to apply the distinctions made by the Supreme Court some time earlier, between simon-pure hit-or-miss inventions, and what the court termed "the

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Daily technical and practical sessions and educational lectures will feature the National Metal Congress which will run concurrently with the Exposition. 39 research papers will be presented by important technical authorities under the auspices of the American Society for Metals on Monday and Tuesday, February 4 and 5. . . . Special research investigation will be presented on Wednesday, February 6, with Thursday and Friday, February 7 and 8, devoted to a series of educational lectures on magnesium, induction heating, corrosion and surface stressing of metals.

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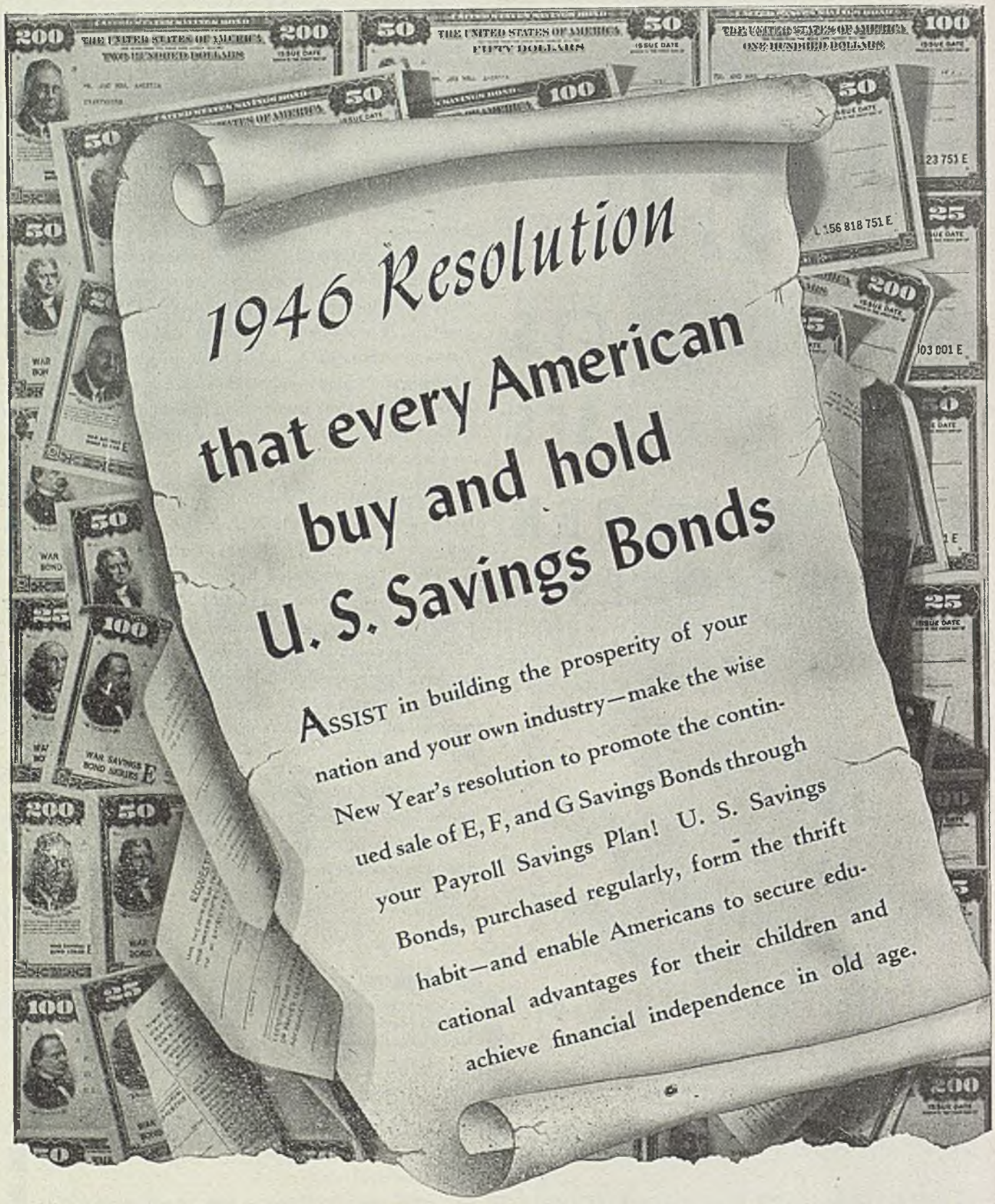

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STEEL

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Trend Toward Left Complicates Industry Reconversion Problem

(*Continued from Page 345*)

and talked about in France, Czechoslovakia, and Holland. In fact where elections have taken place in Europe it is obvious that the trend toward socialistic governments is extremely marked, and nationalization of key industries will be the order of the day.

In Great Britain and France the question of state ownership takes a slightly different aspect in each case. In Britain, no start had been made to nationalize until the new labor government had come into power, although all essential industries were fully controlled by the coalition government during the war. On the other hand, nationalization of the coal mining industry, the Bank of England, the iron and steel industry, and others, was a specific part of the program of the Labor Party, which was practically the only opposition party of any importance. As soon as the socialist government came into power, they implemented part of their program and immediately took steps to legislate for nationalizing the Bank of England and the coal mines. The iron and steel industry is not covered in the program for the first year of the government's life, but if they remain in power long enough there is no doubt that the turn of iron and steel will come. There is as yet no indication as to how the nationalizing scheme will be put into effect but it is probable that it will be limited to the heavy side of the industry.

Nationalization Widely Favored

In France nationalization is not quite such a specific or precise item in one large party's program. On the other hand the three parties that have captured by far the greatest number of votes in the October elections to the Constituent Assembly, namely the MRP (Mouvement Republicaine Populaire), the Communists and the Socialists, are all three in favor of nationalization of the Bank of France and of certain industries. It is interesting to note that the MRP is a new party with barely more than a year's existence. It tends towards socialism without going to extremes, and is essentially composed of Catholics. It polled the largest number of individual votes in the country.

Whether the iron and steel industry of most European industrial countries is to become nationalized or not, the present situation is that it remains everywhere under direct control of the governments. In Great Britain and France the organization of the industry runs along somewhat parallel lines although differences exist in modes of application. In France the prewar Comité des Forges, which essentially was the employers' federation, has been transformed into the Office Professionnel de la Sidérurgie, at the head of which is a representative from the industry appointed by the government. This is the controlling organization; all the major industries in France are organized on the same pattern, the Ministère de Production Industrielle being the responsible government department. In Great Britain, Iron and Steel Control, which is an offshoot of the Ministry of Supply, fulfills a function similar to that of the Office Professionnel. The Comptoir Francais des Products Sidérurgigues handles commercial transactions between the iron and steelworks and consumers; the British Iron & Steel Corp. may, to some extent, be considered as the parallel organization in Britain.

Germany Could Boost Output

Very little information is available concerning the iron and steel industry on the continent of Europe, especially as regards the nations of central and eastern Europe. In Germany there appears at present to be some production of crude iron and steel on a small scale but it is claimed that, despite effects of widespread bombing over the Ruhr plants, these would be capable of producing 300,000 tons of steel monthly, and it is claimed that from 50 to 60 per cent of the Ruhr capacity could be put into operation in a relatively short time. Rolling mills at the Gutehoffnungshutte and at two or three other works have been put into operation on behalf of the Allies for local needs only, such as bridge repairs and rehousing. According to certain reports its seems that within a few months Germany proper would be able to produce steel at an annual rate of 12 million tons.

In Belgium it is likely that the output of steel for 1945 will be in the region of 600,000 tons. Progress was made as the year went on, since the output in January was just under 10,000 tons and exceeded 50,000 tons in June. The monthly target at the end of the year was about 100,000 tons and it is hoped that by April, 1946, a monthly production of steel of 200,000 tons may be reached. Pig iron output would follow a similar course.

Luxemburg's iron and steel industry is also reviving and it was expected that from 10 to 12 blast furnaces would be in operation by the end of 1945. Production in Sweden has been maintained and the output for 1945 will be comparable with that of 1944, reaching approximately 900,000 tons of pig iron and 1,250,000 tons of steel. These figures indicate that Sweden's output now exceeds prewar levels. In Holland one of the blast furnaces at Ijmuiden was started at the end of October; the capacity of production of the leading Dutch iron and steelworks is estimated at some 300,000 tons of pig iron and 215,000 tons of steel ingots. From Italy it is reported that the iron and steelworks have escaped any large damage and it is expected that in the course of 1946 these works will be operating to about half capacity, subject to coal deliveries. Production in Spain is reported to be a little above prewar figures, amounting to about 550,000 tons of pig iron and 660,000 tons of ingot steel.

Works in Czechoslovakia have suffered from war damage but partial resumption of production has started. Poland is reported to be expanding its production along normal lines. However, no details have been released from this part of Europe, and as to Russia herself, it is only known that a new five-year plan has been started, having as its first goal a rate of output of 20 million tons of steel per year at the end of 1946. The output of new works in the Urals and Siberia, which were set up to compensate the loss sustained during the war in Ukraine, has greatly expanded and the Ukraine works themselves are being reconstructed. Thus, at the termination of this five-year plan Russia will be by far the most formidable producer of iron and steel in Europe.

BRITISH IRON, STEEL EXPORTS

(Thousands of gross tons—Scrap eliminated)

	Exports	Imports
1945	157*	221*
1944	219	1,764
1943	135	2,812
1942	258	2,509
1941	487	4,177
1940	1,077	3,689
1939	1,582	1,821

*Six months ended June 30, 1945.

BRITISH DOMESTIC PRICES

Foundry Pig Iron, 2.50-3.00 silicon	£7. 3. 0*
Basic Pig Iron	6.15. 6*
Furnace Coke, fot at ovens	2. 7. 6
Billets, basic, soft, 100-ton lots and over	12. 5. 0
Standard Rails, 60 lb per yard, 500-ton lots and over	14.10. 6
Merchant Bars, rounds and squares, under 3 in 1	17.12. 0†
Shapes	15. 8. 0†
Plates, ship	16. 3. 0†
Plates, boiler	17. 0. 6†
Sheets, black, 24 lb, 4-ton lots and over	22.15. 0
Sheets, galvanized, 24 gage, corrugated, 4-ton lots and over	26. 2. 6
Plain Wire, mild drawn, catch-weight coils, 2-ton lots and over	24.10. 0
Bands and strips, hot-rolled	18. 7. 0†

*Delivered railroad siding—5/-rebate.
†15/-rebate.

Iron and Steel Production Still Hedged by Wartime Regulations

(*Continued from Page 347*)

struction of steel plants are being pressed towards the goal of technical efficiency.

But to turn from speculation to solid facts. The statistical blackout has been lifted and it is now disclosed that 76 million tons of steel were produced and processed duing the six years for a multitude of war requirements. The industry was greatly handicapped when imported raw materials were practically cut off by enemy action. Extensive substitution of home ores for the richer foreign ores meant about double the quantity had to be charged for a given output of pig iron, and this resulted not only in a lengthening of process time in pig iron production but also, in some integrated works, a consequential slowing down of steelmaking and subsequent processing. In spite of this difficulty, however, production of pig iron was maintained at its prewar level and total output of steel, by the increased use of scrap, was maintained at a level in excess of any previous year with the exception of 1937, when ample supplies of the most suitable raw materials were available.

Secondly, wartime steel requirements necessitated considerable changes in the pattern of production. Thus the output of certain products, notably shell steel, armor plate, gun forgings, bomb castings, forgings of all kinds, including drop forgings, was markedly increased while circumstances necessitated the closing of many tin plate and sheet mills. Much of the change in pattern of production had to be undertaken before special plant could be installed, and it was achieved to a large extent by improvisation and adaptation of existing equipment and by the use of plant for purposes for which it was not designed.

Alloy Steel Output Soared

Alloy steel production increased enormously, and while no records are available covering prewar output it is estimated that it never exceeded half a million tons per annum or 5 per cent of total steel production. During the five years 1940-1944 out of a total make of steel amounting to 63,403,000 tons, 6,191,000 or nearly ten per cent was alloy steel, and in 1942 and 1943 the proportion rose to 12½ per cent. Much of this increased tonnage of alloy steel was made in plants normally occupied with the production of commercial carbon steels, and its processing was also largely carried out in mills, forges, etc. designed for the handling of lower grade steels. The longer melting time, the more careful handling and slower working associated with alloy steel production and the disturbance of balanced production resulting from these factors all militated against attainment of output tonnages comparable with what is possible with the same plants working on their normal range of products.

Transport difficulties which were abnormal throughout the war became acute in 1944 because of the assembly of troops and military stores in anticipation of the landing in Normandy. From March onwards the iron and steel industry was called upon to make a saving of half a million tons of traffic a month. By a planned reduction of mining and movement of iron ore, of production and movement of pig iron, and by drawing on stocks of pig iron, steel ingots and semifinished which to some extent had been relocated in anticipation of this event, the necessary saving in transport was achieved without any serious reduction in finished steel deliveries.

On the labor side, the industry, up to the end of 1944 lost 90,000 of its younger men to the armed forces, and to the extent that replacements were available, older men and women were recruited. In normal times, there are few women process workers in the industry, except in some of the lighter trades, but the percentage of women employed on process work rose to nearly 20 per cent in 1943 and 1944, spread over every branch of the industry.

Consumers' needs were satisfied to a high degree largely through the iron and steel distribution program begun in 1940.

The allocations represented actual requirements, established by a systematic examination of all relevant factors including availability of labor to consume the material in turning it into tanks, guns, aircraft and all the other equipment required.

The following table shows the relationship between demand, as represented by allocations, and supply, as represented by deliveries, from 1941 onwards.

FINISHED STEEL

	Allocation '000 tons	Deliveries '000 tons	Per cent of allocation
1941.....	11,340	10,497	92.6
1942.....	11,640	11,188	96.1
1943.....	10,921	11,005	100.8
1944.....	10,465	10,270	98.1

This represents a supply of steel much higher than anything achieved previously. To an important extent this increase was made possible by imports of steel from the United States, which, coming mainly in ingots and semifinished forms, provided a valuable base on which flexibility of supply could be arranged.

Except for relatively small tonnages shipped overseas for war purposes averaging about 250,000 tons a year, all steel available was consumed in Britain. The maximum domestic consumption in any one year before the war was 9,100,000 tons of finished steel (in 1937); the 1942 and 1943 consumption represents an increase of about 20 per cent over that figure.

Steel production in 1939 was 13,221,300 tons; 1940 it was 12,975,300 tons; 1941 it totaled 12,312,200 tons; 1942 it amounted to 12,941,700 tons; 1943 the total was 13,031,200 tons and in 1945 output was placed at 12,142,200 tons. Pig iron output in 1939 was 7,979,800; 1940 it amounted to 8,204,600; 1941 it totaled 7,392,500; 1942 it was 7,725,600; 1943 a total of 7,186,900 was produced and 1944, the output was placed at 6,736,500 tons, from which it will be seen that the peak period of the war was 1940 for pig iron and 1939 for steel.

Strives to Boost Exports

Britain's export trade was largely sacrificed during the war period. Consequently strenuous efforts are now being made to recover lost ground. Manufacturers have already had many inquiries and have booked a considerable tonnage for export but only small quantities have been shipped so far, mainly because of the small allocations of material allowed and the October dock strike which had far-reaching effects. In 1939 Britain exported 1,582,300 tons. Bottom was touched in 1943 with the figure of 135,000 tons but the tide has now turned and exports reached 225,300 tons in 1944 and 157,000 tons in the first six months of 1945. In 1944 Britain imported 2,167,300 tons of iron ore, 316,300 tons of manganese ore, 1,763,800 tons of iron and steel and 13,400 tons of scrap. Imports were increased substantially in 1940 and 1941, the great bulk of these supplies coming from America.

The use of imported steel increased to a peak in 1942. Thereafter imports were used up at a greater rate than they arrived. There was thus in the early part of the war a gradual build-up of stocks until 1942. These have since been run down to a normal level and at some works below the normal owing to the cessation of supplies from America following cutting off of lend-lease arrangements. To replace these imports material has been

ordered from the dominions, mostly in the form of semifinished steel.

Steel prices have been stable since 1941. It is remarkable that this should be so, remembering the 100 per cent increase in coal prices and 135 per cent increase in coke. Equally the increase in steel prices is moderate when compared with the rise of almost 70 per cent in the general wholesale price index, built up on prices of textiles, chemicals, oils and metals. The main factor in keeping down steel prices has been the use of the ministry of supply central fund. Now, however, an increase of £1 ($4.00) per ton has been made in steel for export and an increase in domestic prices is expected.

The limited supply of coke is the reason for the fact that it has not been possible to increase the number of furnaces in blast. With the shipping position slightly easier the flow of Swedish and North African ores is now increasing.

Manpower is the limiting factor in the light castings trade. Work could be found for many more skilled molders but the return of men from the services and other industries is only a trickle. Nevertheless, great efforts are being made to meet the demand which is likely to develop for the products of the light foundries.

Britain has entered upon an intense housing drive and there has been some suggestion that the trade will not be able to meet the call for the necessary components. This is refuted by James Shaw, chairman of Allied Ironfounders, who says that in the years preceding 1939 the trade took care of all the components necessary to build 400,000 houses a year.

A marked falling off in output followed the V-J days celebrating the victory over Japan as well the normal holiday season. But the autumn months registered an upward turn and in September pig iron moved to a weekly average of 139,500 tons, while steel ingots and castings rose to 240,700 tons.

The following table is taken from the statistics of the British Iron & Steel Federation:

PRODUCTION OF PIG IRON AND STEEL INGOTS
(WEEKLY AVERAGES)

Weekly averages for	Consumption of Iron Ore		Furnaces in Blast	Pig Iron Production	Production Steel Ingots and Castings		
	Home	Imported			Total	Carbon	Alloy
	'000 tons		No.	'000 tons			
1943	329.3	36.1	108	138.2	250.6	219.9	30.7
1944	286.7	46.8	101	129.5	233.5	211.8	21.7
1945:							
January*	282.5	52.2	101	127.1	216.2	201.2	15.0
February	290.5	57.5	102	136.7	236.2	223.7	17.2
March	294.8	60.3	102	141.4	246.2	229.5	16.7
April	280.0	64.2	100	137.6	236.6	219.9	16.7
May*	262.2	61.1	98	128.2	210.8	196.7	14.1
June	261.2	68.7	98	133.0	238.4	221.3	17.1
July	252.2	77.5	99	134.7	213.9	200.7	13.2
August*	223.5	78.0	95	125.2	186.1	175.8	10.1
September	....	....	..	139.5	240.7	....	....

*Average of 5 weeks; other months 4 weeks.

Coal Shortage Hampers French Steel Industry Rehabilitation

(*Continued from Page* 349)

Siderurgie, which was under the supervision of a *Commissaire du Gouvernement,* or government delegate. A *Chambre Syndicate de la Metallurgic* was operating in the premises and by the existing staff of the old *Comite de Forges.*

The allocation of iron and steel materials and products was in charge of O.F.F.A., or *Office de Repartition des Fers Fonteset Aciers.* This body allocated to the various consuming industries the output of the French works and eventually that of certain German and Luxemburg works. The method of procedure was to issue vouchers known as *"bons matieres"* in relation to the tonnage of production. These vouchers were allocated to the members of the committee of organization (the C.O.R.S.I.D.) in accordance with their requirements, but certain vouchers known as "Zast" were reserved for German requirements.

Consumers, having obtained their vouchers, placed their orders with certain groups of iron and steelworks who transmitted these orders to the *Comptoir Francais des Produits Siderurgiques* (C.P.S.), and the comptoir finally entrusted the orders to those works that were in the best position to take them on.

Since the liberation of France no material change has been made in the structure of this organization, but certain underlying principles have been modified and the trend is increasingly toward state control. The *Comites d'Organisation* have become known as *Offices Professionnels* and these come more directly under government management because, it is claimed, only the state has sufficient powers and means to re-establish the economic activities of the nation.

The principles now governing the organization of industry are:

1. The part played by the state: The *Offices Professionnels* depend from the state and must follow the policies set down by the state; the government delegate (commissaire) who directs the office transmits the government's instructions and sees to it that they are followed.

2. The *Offices Professionnels* must act in accordance with national interest and therefore do not necessarily defend the interests of the particular trade and industry that they cover. These professional interests are taken care of by the respective professional syndicates.

3. The *Offices Professionnels* have nothing to do with social questions or conditions of labor.

Finally, special consultative committees have been set up, which include representatives from the employers' federations or syndicates, the trade unions, and the engineers and managers (cadres). These committees make known to the government delegates the advices of the three sections of the trade or industry in regard to the measures to be taken to apply the policies of the government and their practical application.

Steel Industry Organization

Under this plan, the iron and steel industry is at present organized as follows:

1. At the ministry of production there is a director for iron and steel.

2. The *Office Professionnel de la Siderurgie* (O.P.S.I.D.) works out the output program and the supply of coke, scrap, ores, and it controls the purchase of other raw materials.

3. The *Commissaire du Gouvernement,* or government delegate, who is the representative of the director for iron and steel at the *Office Professionnel.*

4. The *Chambre Syndicate de la Siderurgie,* or employers' organization, which informs its members of the various measures applied to them and defends their interests.

5. The *O.F.F.A.,* which is charged with the allocation of iron and steel products.

6. The *Comptoir Francais des Produits Siderurgiques* (C. P. S.) which allocates contracts and orders to the various works.

During the period of occupation large numbers of French workers were conscripted by the German authorities to do forced labor in Germany. The employers did their best to obstruct this levy of workers by accepting to work for the Germans and by keeping and protecting refractory workers who refused to leave. An organization was officially formed under the style of *"Service du Travail Obligatoire"* to put labor conscription into effect but many men went to the *"maquis."* Trade unions, and the C.G.T. *or Confederation Generale du Travail*

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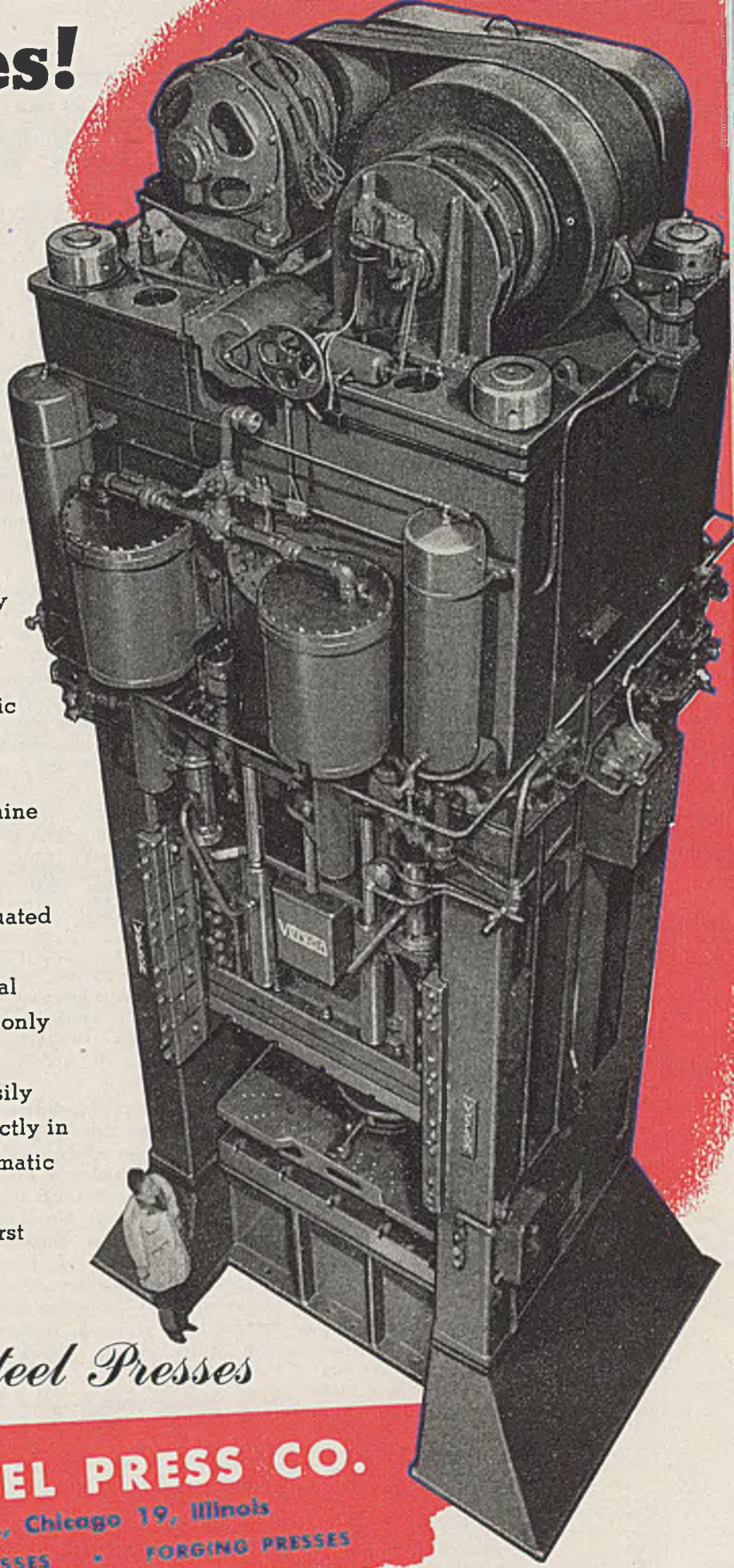

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were made illegal and dissolved in 1940.

In 1943 a Workers' Charter was set up, after protracted negotiations between employers and workers. The object was to adjust the relations between capital and labor. At the same time two organizations were created to replace the defunct trade unions, one dealing with conditions of work and the other dealing with questions of social welfare. Committees of these organizations were arranged locally, regionally and nationally, to co-operate with industry and unify conditions of working.

Output of iron and steel during the German occupation was considerably slowed down by sabotage in the works, and of transport and, particularly from 1944, by Allied bombing.

Since the liberation, actually since September, 1944, output began to increase gradually in the coal mines and in the steelworks, the latter depending considerably upon conditions in the former. In fact, it is the reduced output of coal and coke which is now preventing steel production from resuming its normal level. Output of coal during the first ten months of 1945 is shown in following table:

	Tons per month (000 of metric tons)	Tons per man-day
Monthly avg. 1938	3,964	156,044
1945		
Jan.	2,733	105,129
Feb.	2,499	104.145
March	2,757	102.127
April	2,403	100,145
May	2,139	89.133
June	2,687	103.329
July	2,694	107,762
Aug.	3,079	118.431
Sept.	3,127	125.251
Oct.	3,721	137,821

Output for October was about 94 per cent of the average monthly output in 1938, thanks to the increase of manpower, but this includes 31,578 war prisoners and the output per man-day is only about 75 per cent of prewar. Imports of coal are also increasing, rising from 183,731 tons in January, 1945, to 741,000 tons in October. In October imports of coal from the Ruhr, which are especially important for the iron and steel industry, were only 83,463 tons and imports from the Saar district, 93,909 tons.

The output of steel within the present-day borders of France was 6,973,000 metric tons in 1913. The maximum was reached in 1929 with 9,700,000 tons. In 1932 production of steel was at its lowest level since 1913 with 5,640,000 tons. Figures of production during the war years and for the first ten months of 1945 are given in the following table.

(000 of Metric Tons)

	Pig Iron	Steel Ingots & Castings
1938	6,004	6,185
1939	7,363	7,949
1940	3,673	4,326
1941	3,352	4,221
1942	3,839	4,400
1943	4,921	5,052
1944	2,890	3,054
Monthly avg. 1938	500	515

(000 of Metric Tons)

	Pig Iron	Steel Ingots & Castings
1945		
Jan.	30	55
Feb.	33	60
March	35	82
April	69	88
May	90	101
June	97	125
July	100	125
Aug.	106	133
Sept.	125	164
Oct.	151	205

The October figures, compared with the average monthly output in 1938, represent a 30 per cent output of pig iron and a 39 per cent output of steel. The production of steel in October included 103,000 tons of basic bessemer steel, 83,000 tons of open-hearth steel and 18,000 tons of electric steel. The present capacity of steel production is estimated at 12,000,000 tons.

There were no large fluctuations of steel prices during German occupation Two increases were made, one on Dec. 6, 1940, one on Feb. 28, 1943. It was only in April, 1945, that a considerable rise in prices was made to meet increased costs resulting from higher wages and increased prices of raw materials. Changes in prices, in French francs, are shown below:

(Francs per metric ton)

	12/6/40	2/28/42	3/27/45
Soft billets	1,663	1,905	3,400
Beams	2,025	2,393	4,950
Merchant bars	2,084	2,501	5,150
Sheets, light gage	3,125	3,717	7,700
Hoops	2,332	2,801	5,800

Apart from certain adjustments to equalize wages in certain regions, the wage level in the iron and steel industry during the period of occupation did not materially increase. However, shortly after the liberation of France a substantial rise was granted.

In general, French iron and steel plants were not seriously damaged during the war. Only in Normandy, during the preparation of the landing of June, 1944, were the important iron and steelworks of Societe Normande de Metallurgie and the Usines de Trignac completely destroyed. Maintenance of plant and equipment in the works was not up to requirements and a considerable amount requires to be replaced. Some replacement orders will be placed in the United States.

Considering the present state of French mines and iron and steelworks, it is estimated that by April, 1946, an output of 350,000 tons per month of steel will be reached provided that Ruhr and Westphalian coal mines can supply from 500,000 to 600,000 tons of coke per month to the French works. There is sufficient manpower to attain the proposed output of over 4 million tons for a year, but if prewar production is to be reached then the manpower problem will interfere and it would be necessary to import labor for unskilled work. Such a possibility is at present being studied. There would also be some hindrance due to the lack of rolling stock for the transportation of ore and coke. Finally there is no little uncertainty in connection with future government policy in regard to control and, possibly, nationalization of certain industries.

Auto Industry's Record For 1945 Is Impressive

(*Concluded from Page 242*)

tomatic transmission is in the wind. Lincoln and Mercury may have such equipment available for 1947 models, a Detroit plant of Borg-Warner now being equipped to manufacture the device. Chrysler also is reported intrigued by the design. Extension of the General Motors Hydra-matic drive to models other than Olds and Cadillac is an early possibility.

Now in the works are at least two passenger cars in the light-weight economy, low-price category. One is a Ford for which, among other engines, a 5-cylinder power plant is being tested. The other is a Chevrolet, to be built at a new plant not yet erected in the Cleveland area. Engineering crews are already at work on layouts for this model, which will be entirely divorced from regular Chevrolet production. It appears 12-14 months away by the most optimistic guess.

The Big Three have had low-price economy models on drawing boards for years, but have always held them back in the belief the used car lots of the country could supply ample quantities of low-price merchandise, so why strain a cost sheet to compete, when used cars have to be moved to sell new cars? The situation is somewhat changed now, however, after a four-year drouth of new cars and a gradual disappearance of used car supplies. The time may be more propitious than it ever has been for the introduction of low-price economy models, particularly if recognition is given to the fact new car prices will have to move further upward to cover higher costs.

Seldom has the automotive industry been faced with the brilliant market prospects and the chaotic production situation of the moment. Without a solution of the latter, it is hopeless to contemplate the former. Still, if honesty, vigor, forthrightness and technical brilliance can disinfect the wage-price miasma, the automobile industry can be counted on to supply them.

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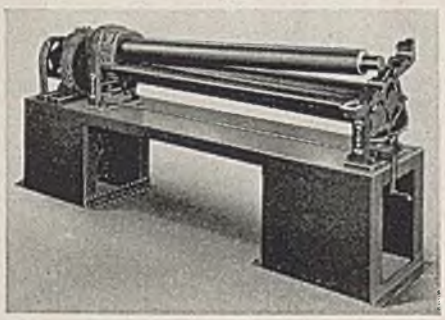

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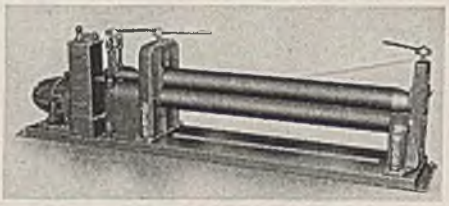

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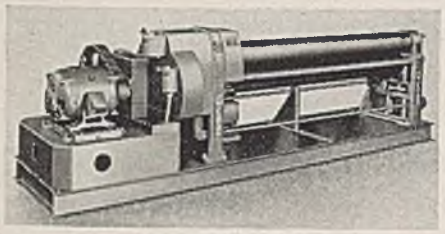
(Compares to R-3-L Initial Type)

MODEL BR-3 PYRAMID TYPE



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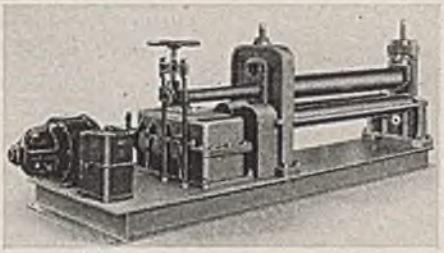
MODEL R-3-L INITIAL TYPE



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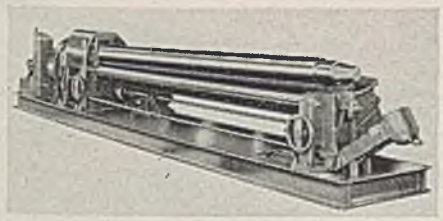

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8' x ⅜";
10' x ¼";
12' x 3/16".

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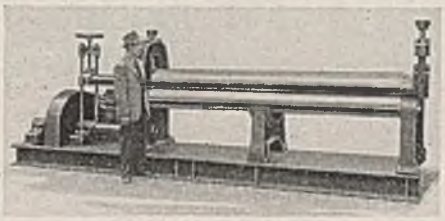

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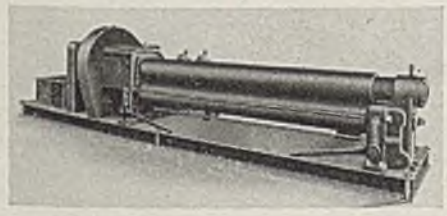
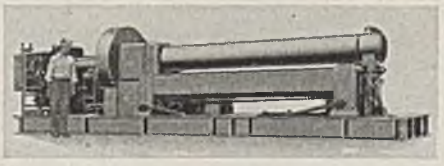
MODEL BR-10 PYRAMID TYPE



Made in Sizes To Handle
6' x ¾";
8' x ⅝";
10' x ½";
12' x ⅜".

12" Dia. Shafts.

MODEL 9-L INITIAL TYPE



Made in Sizes To Handle
8' x 1¼";
10' x 1⅛";
12' x 1";
14' x ⅞";
16' x ¾".

17½" Dia. Shafts

MODEL 16-L INITIAL TYPE

MADE IN BOTH INITIAL AND PYRAMID TYPES
"WRITE FOR COMPLETE CATALOG NO. 55"

THE WEBB CORP.

MANUFACTURERS

WEBB CITY, MO.

Heavy Order Backlogs Carried By Steel Producers at Yearend

(*Continued from Page* 351)

steelmakers started a plan of rationing their output, dividing it as equitably as possible among their regular customers in proportion to their normal consumption in earlier years, without regard to the tonnage they might have ordered under present conditions. This resulted in fairly equitable distribution and was accepted in general by consumers. One result was to obscure the total tonnage on mill books, as schedules were formulated for a quarter at a time, and in some cases month by month. Under these circumstances delivery promises held little meaning. One effect of the rationing system was to discourage shopping for tonnage and to eliminate duplicate buying. Consumers without established mill supply sources had little chance of obtaining steel from any mill.

Fuel Supplies Cut Sharply

October brought the severest blow of the year to the steel mills. Soft coal miners in Pennsylvania started a strike at the same time oil refinery workers walked out, thus cutting supplies of fuel sharply. The coal strike persisted and cut coke production to an extent that a large number of blast furnaces were banked and steel production was cut correspondingly. Oct. 15 operations were down to 73.5 per cent and a week later dipped to 65 per cent. Sudden about-face by the miners the next week reopened the mines and iron and steel production began to improve, though scars of the interruption lasted to the end of the year and losses have not yet been made up.

Through the year demand for sheets and strip was the heaviest for any product and mills had much more flat-rolled tonnage on books than could be produced. A large buyer was the automotive industry, which sought to resume civilian production, though faced by strike threats. To avoid delays, some automobile builders planned to accept all sheet deliveries offered and to store the material through any labor interruptions. Other sheet consumers pressed for tonnage but were unable to obtain all they needed, reconversion to civilian production being delayed in some instances due to this shortage of sheet steel.

A surprising development of the year was the fact that plate demand came back strongly after a dip in the middle of the year. It had been supposed that with the decline of shipbuilding, plates would be in small demand but the railroads, tankmakers and various other users came into the market for large quantities and by the end of the year plate deliveries were in the future.

Structural steel demand gained strength late in the year as private and industrial building began to resume. Gains in this department were made despite difficulties. Fabricators had far too few draftsmen and estimators to handle the projects offered them and had to choose those they could serve with their limited forces. Contractors were slow to bid because of uncertainty as to wage rates during construction and also as to time of delivery of steel, as well as possibility of increased material prices. In spite of these drawbacks volume of construction gained heavily and shape mills soon became loaded with orders. In one instance a housing project was offered for bids four times without eliciting a single offer by contractors. In many cases of public projects bids were far larger than estimates and appropriation and could not go forward.

New Basing Points Established

Following decisions of the Supreme Court involving basing points, OPA announced a study of the situation as applied to iron and steel products, but a decision has not yet been made. However, in September the United States Steel Corp. and other manufacturers of stainless steel products announced a number of additional basing points, practically every mill making this product being made a base. Previously all stainless steel had been based on Pittsburgh, with freight added to point of delivery. Additional basing points also were set up on tool steel. Carnegie-Illinois Steel Corp. in October made Pittsburgh a basing point for ferromanganese and Pittsburgh and Chicago for spiegeleisen. In the same month Carnegie-Illinois Steel Corp. made Youngstown a basing point on tobacco hogshead and slack barrel hoops and Tennessee Coal, Iron & Railroad Co. made Birmingham a base on the same products.

Executive Personnel Challenged By Transitional Period Problems

(*Concluded from Page* 252)

Dresser Industries Inc., Cleveland, Continental Industries Inc., New York, the Aviation Corp. and Curtiss-Wright Corp.

This merger phase, strictly speaking, is not new. It has been in progress since the turn of the century in more or less degree. After World War I a wave of mergers was experienced as small businesses, faced with increasing hardship in fitting themselves into the peacetime market, sought financial strength and production efficiency through consolidation. We are going through a similar phase at present, though it is significant that corporate identities are being maintained to a much larger extent than in the past.

Must Refit Industrial Machine

As the nation's economy is readjusted to the demands of peace, industrial machine must be fitted to the needs of the hour. Broad markets must be opened to absorb the mass production of our factories. Employment possibilities must be made available for returning veterans and displaced war workers, and amicable labor relations must be achieved if we are to have uninterrupted production, lower per unit costs and volume output of goods at prices which will attract the widest possible consuming demand.

American industry's unprecedented war production performance is a monument to the genius of industrial management and the productive power of labor. But it is more than that. It is the signpost pointing the way to a peacetime production possible of providing a job for all who want to work.

Close Co-operation Still Needed

Both management and labor contributed to the production clincher which brought military victory in 1945 in the face of what, away back in 1941, seemed insuperable odds. Teamwork made this possible. And only through attainment of an even higher degree of co-operation in peacetime can a level of prosperity be achieved which will come anywhere near satisfying the aspirations of the American people.

Business leaders, charged with the responsibility of keeping the wheels of industry turning ever faster in the postwar era, will be called upon to exert utmost judgment, tact and imagination in adjusting the economic machine to a pattern largely drawn by influences outside their immediate control. Their task will be most difficult.

Machining

(*Continued from Page* 304)

raised and prices still remain unchanged due to lowered manufacturing costs, or whether wages are unchanged with prices lowered due to lowered manufacturing costs. The important thing is that manufacturing costs in either case must be lowered. Manufacturing costs can be lowered to some extent by greater volume production. This is primarily true because greater volume production permits greater application of tool engineering knowledge and improved manufacturing methods.

"One thing is certain. That is that if we are to realize further improvement in our standard of living and further increases in real wages and purchasing power, such things will not come about by any waving a magic wand. They will come, as in the past, only through hard work and hard thinking; through free enterprise and willingness to gamble or invest on an idea. They will come through competition and the stimulation of ingenuity and application that the 'competitive race' creates.

"And last but not least, they will come through whole-hearted co-operation in application of new tool engineering ideas possible only under conditions of consideration and mutual respect between management and labor working, with everyone working together for the achievement for a common goal. With such conditions in effect, we shall continue to outstrip the world. Without them we will lose out entirely."

Next Five Years Will Bring New Unpredictable Developments

W. L. Dolle, president and general manager, Lodge & Shipley Machine Tool Co., Cincinnati: "Naturally it is hard to predict just what technical developments will take place in the future. We believe, however, that they will be governed by the fact that wages and costs will continue their upward trend. Hence manufacturing of any product must be looked at from the view point of having equipment to reduce costs.

"Development of carbide tools by no means is completed. From our own experience we know that certain things take place in the cutting of metal with carbide tools, which must be explored further. Use of these tools brings up a major problem to the machine designer as well as the manufacturer, this being the question of disposal of chips. This problem has been gone over and very serious thought given to it. Several of the shell plants devised methods of disposal which took care of the immediate problem but these can only be looked upon as early stages of developments in that direction.

"There also is a tendency to break down operations into simpler units rather than having complicated set ups. Such subdivisions must be looked at in the light that they will reduce costs and permit the article to be manufactured cheaper. Further applications of electronics to high production machine tools probably will take place. However, there is a vast amount of manufacturing done in quantities not sufficient to justify this kind of thing. In such cases machine tools must be kept simple enough that they can be readily changed over from one job to another.

"We believe the next four or five years are going to be most interesting ones in the machine tool field."

Release of Surplus Tools Challenge to Ingenuity

Charles J. Stilwell, president, Warner & Swasey Co., Cleveland: "In the months ahead in this year 1946 our chickens will be coming home to roost. Machine tools were built for war in tremendous quantities. Now at last they are being released by the government and being sold into industry in competition with machines currently produced. We had anticipated competition from government surplus long before this. Now, however, surplus machine tools are being released in great numbers.

"This situation represents a challenge to individual enterprise and ingenuity. Progress already is being made in the development of new types of equipment. Machine tools are being designed with greater power factors and greater accuracy, in order that the industrial pace may be lifted to produce more goods at less cost, thereby raising the level of income for all the people.

"As machine tool makers for over 65 years, our emphasis will continue to be predominantly on the development of greater efficiency and increasing productivity in the kinds of tools on which we specialize. One of the effects of war production has been to emphasize the need for greater accuracy in the manufacture of turned parts. At the same time, it seems expedient that additional newly-designed machines should be added to our machine tool line, in an effort to utilize—to some extent at least—our greatly expanded manufacturing facilities.

"The Warner & Swasey precision tapping and threading machine and our newly-introduced five-spindle automatic screw machine are the first in the line of new machines. Both have been developed in answer to the demand for greater precision at lower cost.

"To be sure, some further diversification of product will be needed if our war facilities are to be fully occupied, but as in all of our history, the talents of the Warner & Swasey organization will continue to be devoted principally to machine tools—machine tools that will help make better automobiles, better locomotives and better baby carriages at constantly decreasing costs."

Engineering and Economic Facts Favor Pressed Steel Components

Lucien I. Yeomans, president, Lucien I. Yeomans Inc., manufacturing consultants, Chicago: "There will be a greater interest in the use of press worked steel components, welded or brazed into finished parts, rather than a wholesale, blind acceptance of more expensive materials cast or molded by any methods into finished parts. Because die castings and plastic molded parts are most suitable for some parts the tendency to use them inappropriately has been great, and the pendulum is due to swing backward.

"The manufacturer who buys high priced parts, substantially ready for assembly, reduces the direct labor in his own shop and increases his burden rate on his remaining direct labor, while paying in his purchase price the burden rate of another shop.

"Pressed steel components require a minimum of machining, are capable of receiving a wide variety of finishes at low cost of surface preparation, and—by the amount of the press work labor—increase the direct labor employed and reduce proportionately the burden rate.

"Such components, properly designed, may be as accurately machined as any type of castings; the raw material is easily obtained; and a manufacturer is not at the mercy of any supplier whose long deliveries may be the bottleneck

KEEP YOUR PRODUCTION "LIGHT ON ITS FEET"!

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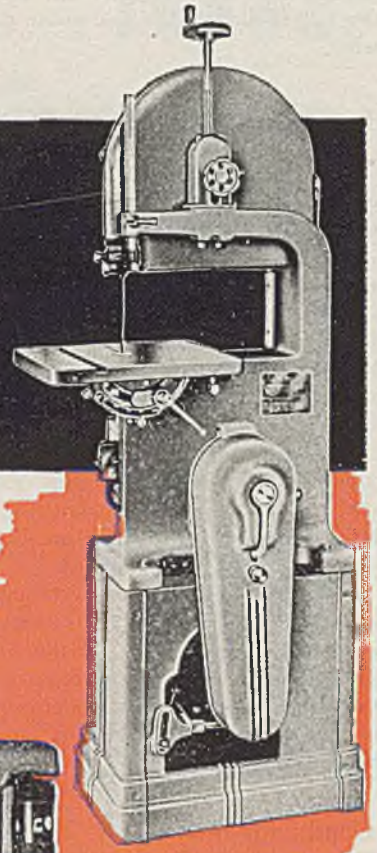

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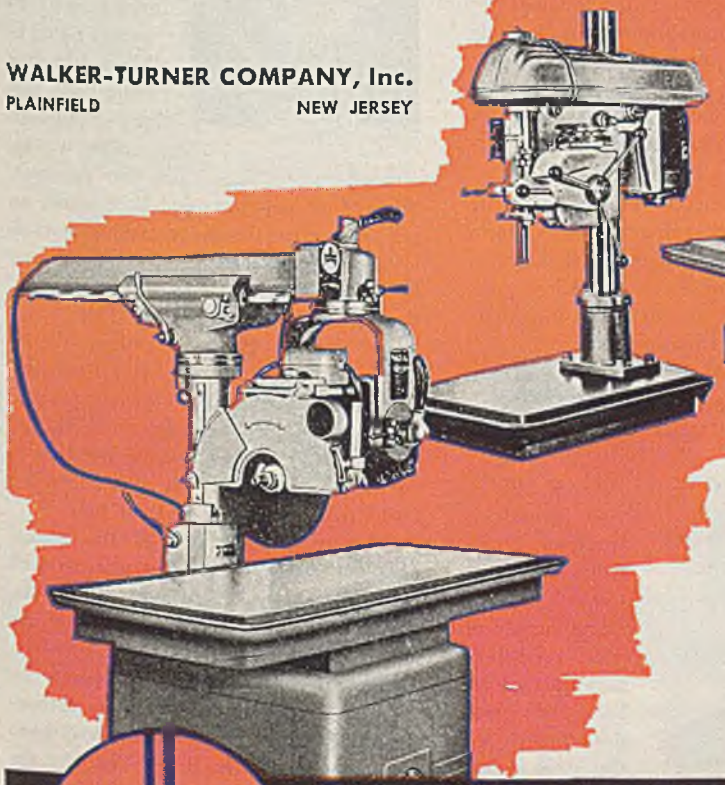

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14" BAND SAW
Back-gearing and cone pulley gives high speeds for wood (up to 4630 s.f.m.), low speeds for metals (as low as 60 s.f.m.). Also made in 16" model.

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METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

in his production.

"The greatest possible cost reductions ahead are in materials and ratio of burden rate to direct labor, and not in direct labor."

Iron and Steel Production

(*Concluded from Page* 332)

includes suspended port roofs and port slope roofs of basic brick.

"This furnace was operated with a sprung silica main roof knuckle to knuckle for some 500 heats, following which we suspended a basic roof from knuckle to knuckle in place of the sprung silica. The first roof lasted for 331 heats and was followed by a second roof of the same design but leaving less provision for expansion. This second roof has been in operation for over 160 heats and gives promise of equaling or exceeding the life of the first.

"We have established, according to our own practice, that the basic end construction produces a definite saving in materials cost and also reduces lost time due to repairs, and are now planning to convert all our 180 ton furnaces to this design."

Conditions Make Large Blast Furnace Most Economical

Owen R. Rice, metallurgical engineer, Freyn Engineering Co., Chicago: "The blast furnace field is facing two factors of significance: (1) Broader beneficiation of raw materials, and (2) larger units, well designed. Both factors have a common fundamental root, the need to keep down cost.

"It is true that the first factor has its individual reason for being, in the degenerating quality of ore and coal reserves now virtually upon us. But, were it not for the fundamental need to keep down the cost of pig iron, blast furnaces could worry along on 40 per cent iron ore and high and variable ash coke, and could accept the consequent reduction in output per furnace.

"Daily expenses of running a blast furnace are not destined downward. If anything, their course is upward. The only means for holding the line on "cost above" per ton is more tons per furnace per day, more tons per man-hour. The call is for good raw materials and good furnace design, so that furnaces can be run at 100 rather than 80 per cent of rating. As perhaps never before, the case is strongest for the large blast furnace whereon 200 man-hours can show, not 800 tons, but rather 1500 tons of pig iron".

Design Innovations Stimulate Demand for New Furnaces

M. H. Mawhinney, consulting engineer, Salem, O.: "Ideas which accumulated during the war period will create a demand for large numbers of new furnaces in the next few years. Advances may be expected in gas burner design for greater flexibility and better heat application, in the use of induction heating, in salts and salt bath furnaces for a wider range of products, in high temperature mechanical furnaces for heat treatment of stainless and metal-clad wire and strip, and in protective furnace atmospheres.

"In the matter of protective atmospheres a great deal of development remains to be accomplished, particularly in their application for stainless steels, and competition between this method of heating and induction and salt heating of stainless products can be expected to be keen.

"In the construction of furnaces, the use of castable refractories to form monolithic furnace linings is finding increasingly wide application. Alloys continue to improve, and new and ingenious designs continue to arouse interest."

Quality of Refractories Held At Par During War Period

C. E. Bales, vice president, Ironton Fire Brick Co., Ironton, O.: "Adequate supply of good refractory materials has been of great importance to the steel industry during the war period. Par quality was maintained and there was no decline in workmanship, as there was during World War I. Research work has been continued on all types of refractories and considerable improvement has been made in fire clay and silica brick. Basic brick have also been improved and experiments are being continued with the use of these brick for the complete lining of the open-hearth furnace. Carbon brick are being experimented with in the bottom sections of some blast furnaces and they may or may not be successful under American operating conditions.

"Considerable interest has developed in a siliceous ramming refractory for use in foundry ladles, side-blown converters and for the bottoms of acid electric furnaces. This material when mixed with grain sized ganister, can be used for rammed sidewalls in acid electrics. Some steel foundries report that they obtain twice as much service from a rammed lining as from regular silica brick.

"Special silica cements of greater refractoriness and of greater water retention are also available for bonding silica brick with thin joints."

Only One Charcoal Furnace Remains on Active List

Ralph H. Sweetser, consultant in blast furnace practice, New York: "Two blast furnace records were established last year—the coke iron blast furnace capacity was increased to 66,256,810 net tons per year, the highest ever attained (225 stacks on pig iron, plus 16 stacks making ferroalloys); and the number of charcoal iron blast furnaces was reduced to one stack, the lowest in 300 years. The No. 2 blast furnace, Edgar Thomson Works, Carnegie-Illinois Steel Corp., Braddock, a DPC furnace built two years ago, produced the record tonnage of 50,590 net tons in July, and made 1976 net tons in 24 hr on July 12, 48 per cent above the rated daily capacity of 1330 tons.

"During World War II the annual charcoal pig iron capacity was reduced from 105,000 gross tons, with four stacks, down to 29,000 gross tons with only one active stack.

"A charcoal blast furnace plant, including the first improvement in carbonizing retorts in this century, had been partially erected at Rusk, Tex., by the DPC by the end of the war. When completed by the RFC, this stack will replace 36,000 tons of the lost annual capacity. The U. S. Department of Agriculture (Division of Forest Products) would like this plant to operate because it will use the unmarketable hardwoods ("weed wood") of East Texas".

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Materials Handling

(*Continued from Page 289*)

An overhead traveling crane is the adopted standard method to efficiently handle this material. It requires no additional floor space or wide aisles such as would be necessary when handling this material across the floor.

"We are looking forward to seeing many improvements in the construction of cranes in the next few years, thereby, making old, slow-speed cranes obsolete."

Greater Versatility To Characterize Handling Equipment

J. W. Wunsch, consulting engineer, Milford Crane & Machine Co., Milford, Conn.: "We are engaged in that segment of materials handling equipment which comprises self-contained and self-propelled units that can pick up any load, whatever its shape or form, and carry it from where it is to where it is wanted.

"The modus operandi sounds very simple as stated. It may be, and often is, a complex procedure requiring a machine of very considerable versatility. The field and market for these locomotive type of materials handling machines will be vastly enlarged when their scope and usefulness is increased. Many plants will be able to justify equipment of this type when the working day of the equipment is extended. To the stevedore the materails handling equipment is a *primary tool*. For him, loads are not standardized as to weight, shape or form. Here the universality of a materials-handling tool is compelling and most significant."

Special Machinery Holds Rehandling to Minimum

F. J. Shepherd, Jr.; treasurer, Lewis-Shepherd Products Inc., Watertown, Mass.: "The continued critical labor shortage has brought increased interest in mechanical handling equipment, such as special floor trucks, hand lift trucks and skids, port-

able elevators, and gas and electric fork trucks.

"These machines multiply manpower and enable operators to move more materials with less effort.

"The saving in rehandling, with resulting decrease in damage and pilferage, through use of platforms and pallets, has been widely demonstrated by the Armed Forces during war years. Industry will be quick to profit from this new technique, as the thousands of returning servicemen who are familiar with efficient handling methods will demand its general use.

"New developments in the industry during the year have largely been adaptations of standard machines for special uses. Termination of government restrictions, limiting the sales to standard models, has opened a large demand that is keeping the engineering departments working overtime."

° ° °

Economic Pressure Provides Inducement for Best Welding

R. E. Kinkead, welding consultant, Cleveland: "As manufacturers turn to civilian production, they find a wealth of new knowledge, experience and technical service available for their use in all welding and joining fields. Sales service personnel is more broad minded in recommending the best process for the job rather than the one they are selling. Mechanization and application of automatic controls and recorders in all welding and joining operations is proceeding at record rates. The producer who sticks to manual operations will find himself out of line on costs.

"Several new cladding processes coming into use will open up a whole new set of welding problems along with a great many new opportunities for producers of consumer's goods. The job of welding thin gage lightly clad metals is not easy, but substantial progress has been made—much remains to be done. The urge for better welding methods is great because economic pressure is mounting to make available to a wider market metal having only one or both surfaces made of the austenitic steels or the copper nickel and nickel chromium alloys but the main mass of metal steel. Neck of the bottle, in some cases, will be the process of welding or joining the clad materials."

Forging-Drawing-Stamping

(*Continued from Page 284*)

subsequent cooling (or shrinking).

Slide stroke of 18 in. is imparted through a full eccentric shaft which is driven by twin gears. This is forged steel weighing 20 tons. Slide and the eccentric strap are steel castings weighing 19 tons and 10 tons, respectively.

"Conventional drop hammer forging is accomplished by repeated blows of a forging ram upon work piece. Accordingly, as required forging pressure increases due to larger products, the time required to produce such pieces would increase considerably. These presses perform their work in a single stroke per die set up (instead of repeated blows). One of the aluminum forgings being produced requires four individual operations, the last two of which are on the 4000 ton machines. Speed is 30 strokes per minute, requiring double gearing between the 8-ton, 68-in. flywheel and the eccentric shaft.

"Operating speed, together with 4000-ton forging pressure, required a clutch of unusual proportions. This unit, built into the flywheel, is capable of transmitting 14,000 hp at full flywheel speed. A 200 hp motor drives flywheel to maintain the rated speed. Clutch is hydraulically actuated and interlocked with a brake which provides tremendous stopping force required by the heavy elements. Unit has a horsepower value of 4260 at full speed and can supply a resisting torque of 59,000 ft-lb to the driveshaft."

Drawing of Pipe Expedited by Centrifugal Casting of Tubes

Paul Goetcheus, manager, Fabricated Products Division, Michigan Steel Casting Co., Detroit: "STEEL magazine and other informants have told the metallurgical industries the advantageous uses of rolled and drawn heat resistant alloys of types such as 330 (35 per cent Ni—15 per cent Cr) and 309 (25 per cent Cr—12 per cent Ni) many times. Like many other specialized alloys for which the demand is limited, they have been difficult to procure for prompt delivery.

"During the past year we have made it our business to make these alloys in rolled forms available for immediate delivery. It was not too difficult to or-

ganize adequate stocks of sheet, plate, rounds, flats, squares, hexagons, and welding rod, but tubular forms were practically unknown. The difficulty seemed to be in piercing billets of alloys with such high yield points, especially in the small quantities usually required. To overcome this, we centrifugally cast tubes of 6-in. OD which could be redrawn to smaller pipe sizes by established stainless drawing methods."

° ° °

Flurry of Mechanization To Extend Through 1946

P. J. Potter, executive vice president, Pangborn Corp., Hagerstown, Md.: "Past year wound up with a burst of activity by the automobile tractor and farm implement and sanitary ware manufacturers trying to ready their foundries for bigger production, and also, to mechanize their operations more completely. Foundry labor—including molders, coremakers, chippers, grinders—is very scarce.

"To make foundry jobs more attractive to returning veterans and to men who are returning veterans and to men who are leaving wartime jobs, every effort is being made to reduce manual labor and to better the hygienic working conditions. This is an objective which is just as important as the reduction of total labor costs.

"Mechanization and more mechanization is planned by the foundries specializing on automotive, and all other repetitive work. One conveyor from shakeout floor to the final inspection is their goal.

"Standards of cleanliness and finish, both on castings and forgings are getting more and more exacting. Finished casting must be absolutely free from sand, scale, discoloration and rust. Many of the foundries producing machine tools, diesel engines and tractor castings, deliver castings with exterior surfaces prime coated and interior surfaces completely painted.

"We are sure the trend to mechanization will continue and expand throughout 1946. All progressive foundrymen are planning to make their foundries a good place to work by better lighting, better dust suppression and more mechanical aids for handling materials and products."

Metallurgy

(*Continued from Page 274*)

"Due to space limitations beyond our control, Baldwin may not be able to build larger locomotives in physical dimensions but, by use of alloys now available and the adoption of modern drives, more powerful locomotives for higher speeds will be built."

Cemented Carbides Emerge As Product Materials

James R. Longwell, director, Engineering and Research, Carboloy Company Inc., Detroit: "Having established themselves firmly — during the past 10 years — as cutting-tool metals, cemented carbides today are emerging as 'product' materials.

"Some of the very factors which contributed to their success in cutting tools are responsible for this development. Among these are: Hardness; extreme resistance to abrasion; high compressive strength; high modulus of elasticity; resistance to 'galling' (responsible for their ability to cut steels at elevated temperatures); etc.

"In many of the carbide or carbide-containing products now nearing the market stage or under development, several of the properties of carbides are combined to produce a desired result. Thus, one of the biggest potential developments—bearings made of carbides —results from a combination of two factors: resistance to galling and resistance to abrasion.

Importance of Hardness Emphasized

"Hardness alone may not seem important. Yet it is on this factor, plus their high resistance to disintegration, that the success of masonry tools, coal picks, peening hammers, etc., is depending. High elastic modulus of carbides has permitted their use in other products (such as boring bars) where a high degree of stiffness is vital. Even springs of carbides, embodying a tremendous resistance to fatigue, are not beyond the realms of product possibilities.

"Major problem today in the wider usage of carbides as 'product' materials is a better understanding of how they may be applied and how their characteristics may be varied to suit the individual job. A particular product, in which the usefulness of carbides seems

obvious, may require a minor change in design to permit their use.

"During the past year or so, there have been tremendous strides in learning what can be done with carbides. Knowledge gained in the production of hard metal cores for armor piercing projectiles and other applications will serve industry in good stead in the future in improving products and their manufacture by use of these hard metals."

Competition Between Metals And Processes To Be Keen

Arthur E. Focke, research metallurgist, Diamond Chain & Mfg. Co., Indianapolis: "One of the most significant developments which should be followed closely during the coming year will be found in the competition between powdered metals, precision castings, brazed assemblies and the more conventional methods of machining for production of steel parts.

"While each has a field in which it predominates to an extent which virtually excludes the others, the boundary zones between these fields are not yet clearly defined.

"There is evidence that termination of war contracts has left enough capacity for production of powdered metal compacts, precision castings and brazed assemblies that producers of these items are actively quoting in direct competition for relatively simple civilian items made previously by conventional machining processes.

"Results of this competition will provide useful data on which to judge the true field of application of each of these processes in our civilian economy."

Ceramic and Metal Powders Joined in Composite Articles

Dr. J. L. Bray, head, school of Chemical and Metallurgical Engineering, Purdue University, Lafayette, Ind.: "There has been a phenomenal growth in the art of making objects from powdered metals during the war years, particularly in the last two. These remarkable advances have been chiefly

in powders, presses, products and design of parts. Powders have not only been made less costly, but improved so that articles can be made to meet more rigid specifications and compete with those of cast and forged materials. Iron-base powders especially have been extended to include many alloy steels. Formerly such mixtures required inordinately long heat-treatments with uncertain results. Working with the aeronautical industry, manufacturers have not only made available presses with much greater capacities, but have also been able to so modify medium-power presses as to notably speed up the cycle and thus reduce cost of the finished part.

"Pressures now required vary between 5 and 100 tons psi and are related to yield point of metals involved and density and flow shape of the part. Recent work has indicated that slow compression is not as satisfactory as a quick stroke which tends to produce a much more uniform product. With finer powders now available, the compression ratio, which used to be of the order of 4 to 1, has been increased to 6 and even 8 to 1. These fine powders and large presses have notably increased size of parts which can be made by this method.

"It is interesting to note that it has been possible to combine ceramic and metal powders into new composite articles, for example, with certain telephone applications iron and nickel or molybdenum are coated with a thin film of ceramic clay. With new methods of design, the field of powder metallurgy has been extended from an almost exclusive use in materials or products impossible or difficult to cast or shape by conventional methods, to those involving successful competition with established forming methods on the bases of speed, cost or conservation of materials."

War Years Witness Great Transition in Carbide Field

K. R. Beardslee, vice president, Carboloy Co., Inc., Detroit: "Prime development in past few months in the carbide field is release of a pent-up demand for cemented carbides for all kinds of uses. Queries regarding the possibilities of using carbides for almost any kind of product: Paint nozzles; cutting edges for almost every conceivable hand tool; inlays for 'wear spots'; all kinds of progressive forming dies; bearings and bushings; balls for shot

peening and ball milling; reamers, twist drills, etc., are typical examples.

"The carbide industry is able to take care of the needs for carbide metals. In addition, the industry is providing an increasing amount of product engineering and development service where carbides are involved. Inevitably, there will probably develop a group of specializing manufacturers who will also produce or engineer more applications just as has been the history with other metals. Indicative, perhaps, is one small industry that started out producing carbide tools and a few 'wear resistant' products. Today, its 'wear resistant' business on carbides already represents 90 per cent of its volume.

"In the carbide field, the war years have witnessed a tremendous transition along the line of distribution methods and needs. Carbide tools are no longer a specialty and therefore, manufacturers are reverting to their natural inclination of wanting to buy carbide tools from their regular sources of supply—near home. As a result, more and more of the large tool producers and distributors have been adding carbides to their 'regular' line.

"Whether or not the market eventually will be flooded by carbide fabricators only time can tell. At present the need for such companies far exceeds their number despite the growing trend in that direction evidenced particularly in the last three or four months."

Parts with Controlled Porosity Proved Value in Ordnance

H. W. Fischer, American Electro Metal Corp., Yonkers, N. Y.: "We have participated in development of the safety switch for the VT proximity fuze in collaboration with scientists of Johns Hopkins University. The manufacture of a part with such controlled porosity has been extremely valuable. It will enable manufacture of peacetime products of a similar nature.

"Aside from this development, we have now satisfactorily entered the field of medium and high carbon steels, which harden today up to rockwell C 60 at a tensile strength of between 100,000 and 150,000 psi. Manufacture of soft magnetic iron parts for electric applications also has been our field during the war, producing, on an exclusive basis, pole pieces and armatures for the field telephones of the Signal Corp. Stainless steel parts and certain ferrous alloys are now being investigated by our laboratory staff.

"An indication of interest in research is the fact that, since the end of the war, our laboratory staff was increased and

is now composed of over 20 research members, each one of whom is working on certain parts of powder metallurgy."

Limitations of Powder Metallurgy Warrant Further Study

Howard Bullard, sales manager, Powder Metallurgy Corp., Long Island City, N. Y.: "Many articles have been written and much space devoted to the subject of powder metallurgy in the various trade magazines and journals. To a large degree, these articles have expounded on new developments, new materials, close tolerances obtainable, unusual physical properties and economical advantages deriving from the production of innumerable types and shapes of parts compacted from metal powders.

"More attention should be devoted to the method's limitations or on what cannot be made rather than what can be made. The prospective purchaser of powdered metal products is being apprised of the method's expanding scope and it is, therefore, natural for him to assume that the limitations are being proportionately reduced. From the numerous inquiries still being received, the general conception appears to be that, regardless of quantities involved, if a given part is comparatively small and made of metal, powder metallurgy can produce it quickly and cheaply.

"A better understanding of the process limitations by executives, engineers, designers and purchasing agents would be of inestimable value to the industry as a whole, to producers and consumers alike. To have a fair knowledge of the method's limitations is particularly important in the consideration of structural or mechanical parts such as cams, gears, levers, etc., involving a multitude of shapes and varying properties. Specific applications in the specialized fields of high frequency cores, filters, oil-less bearings and the like, wherein powder metallurgy is an established medium and conventional, if not the only, method of manufacture, do not offer similar problems.

"As a guide to assist a prospective purchaser in determining the possibilities offered by powder metallurgy in the manufacture of a given part, the following questions should be considered: (1) Are the yearly requirements under 25,000 pieces?— (2) Can it readily be produced by stamping, automatic screw machine, or by casting, to the user's full satisfaction and without need for subsequent ex-

pensive machine operations?—(3) Is the surface area greater than approximately 8 sq in.?—(4) Is its depth or thickness greater than 3 in. or its weight more than approximately 2 lb?—(5) Are the physical properties required extremely high, involving heavy shock or impact loads?

"If the answer to any of these questions is in the affirmative, it is likely that powder metallurgy is not the best way to manufacture the particular part.

"As may be seen, the process has its definite limitations. In some instances, however, certain properties or conditions may be sacrificed to improve others. A hard-and-fast rule does not apply. In typical cases, deviations from these limitations involve problems which are difficult to overcome in the production of parts of uniform quality in mass production.

"In spite of the seemingly narrow limits outlined above, hundreds of different types of precision parts are currently being produced in huge quantities by manufacturers in this comparatively new field. There are thousands of additional parts which are adaptable to the process in this postwar era, each of which will do its respective job more efficiently and economically."

• • •

Refractory Furnaces to Be Operated at High Wartime Rates

S. M. Swain, director of research, North American Refractories Co., Cleveland: "Changes in the refractories industry, accompanying conversion from war to peace time production, has been merely a continuation of earlier trends. One important development is that furnaces still will be operated in many plants at practically the same high rates developed during wartime.

"This trend started before the war with the object of cost reduction but had been carried beyond the most economical rate due to desire for maximum output. Such high operating schedules brought about rapid 'wear' of refractories in many parts of furnaces, which resulted in high refractories costs and frequent shutdowns for repairs.

"In an attempt to keep furnaces in operation for longer periods, a more detailed study of the selection of refractories for these critical spots was made and special refractories selected and used.

"In the prewar period, reduction in

fuel and operating costs per unit of product brought about by higher operating rates was limited by increased maintenance expenses. Recent improvements in quality as well as selection of refractories has reduced this limitation to the point that high furnace operating rates will continue at close to wartime levels."

° ° °

Use of Cutting Fluids Affords Increases in Machine Efficiency

W. C. Lockwood, Technical and Research Division, The Texas Co., New York: "Reconversion is the problem confronting industry today and the main concern is to get into production quickly. Cost of production is an important matter and investigations are underway to find ways and means to reduce it. In this investigation, new machine tools, steels of various grades and improved cutting tools are getting main consideration, with less thought being given to cutting fluids. Experience has proven that careful selection, proper application and accurate control of cutting fluids can result in large increases in machine efficiency.

"Time and expense entailed in careful selection and study of cutting fluids to determine the best type product for each operation will be returned many fold in less down-time on machines, increased tool life, and decreased tool breakage. These all add up to a definite reduction in manufacturing costs.

"Four materials must be given equal consideration in setting up purchasing requirements and plant control systems, if maximum production is going to be secured. These are: Machine tools, steels, cutting tools and cutting fluids. A very careful control of any three, with neglect of the fourth, will not result in the maximum benefits attainable.

"After correct cutting fluids have been selected and have been proven satisfactory by plant tests for each operation, one should not consider the production problem finished, but should establish definite controls for their proper handling and application. Contamination of cutting fluids or mixing with machine lubricants, solvents, or other oils carelessly placed in the cutting fluid storage tank, has been the cause of poor tool life and loss of production."

Surface Treatment

(*Concluded from Page 324*)

tools as well as the cost of power in extruding operations. This development is now in use in several seamless steel tube mills, and it is anticipated its use will extend to many other drawing operations in the metalworking industry. Savings in tool and die cost and increased production permissible more than offsets the expense of the coating treatment.

"Spra-Bonderite method of preparing such articles as automobile bodies, sheet metal parts, washing machines, refrigerator cabinets, kitchen cabinets, etc., has been further improved in that less floor space is required in carrying out the treatment, and economies have been effected by equipment design so as to reduce maintenance and operating cost.

"A development called Parco Lubrizing, which reduces wear on bearing surfaces, was used extensively on war implements, and demand for its use on bearing surfaces in general is steadily increasing. Process is a chemical treatment that produces on wearing surfaces, without use of electric current, a nonmetallic oil absorptive coating that permits rapid break-in of moving parts without scoring or scuffing, and reduces subsequent wear. It is in production use on such items as cylinder liners, piston rings, pistons, tappets, camshafts, worm gears, etc.

"Bonderizing of blackplate in the major steel mills has conserved millions of pounds of tin, and this development is expected to be used extensively even after return of tin. It is accomplished by continuously feeding properly cleaned sheets or strip through a series of rollers contained in a machine, whereby the phosphating solution is sprayed onto it through a series of nozzles. Coating resulting from this method of application is of an unusually fine grain crystalline structure, and will withstand drawing, bending and rolling operations encountered in manufacture of caps, crowns and cans.

"A most recent development constitutes a method of Bonderizing aluminum and its alloys to improve the resultant durability of applied paint finishes. Process is applicable to aluminum articles by spray application in a manner similar to treating steel articles. Treatment is carried out without use of current, and requires approximately 60 sec in the coating formation.

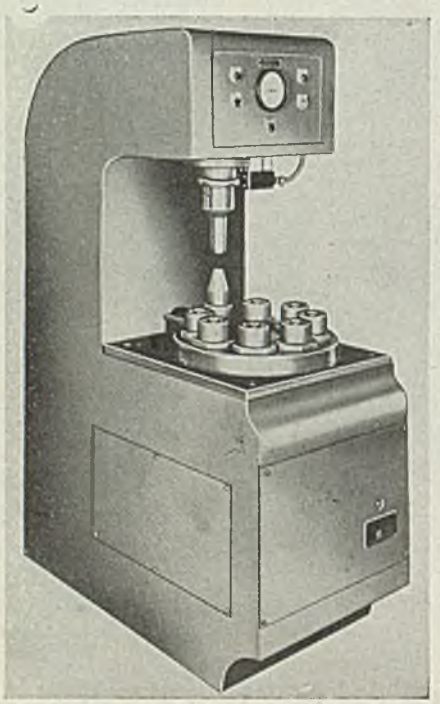
"Parkerizing, to prevent corrosion, is now available to users in various colors. Coloring of such coatings is obtained by immersing articles in an aqueous solution of Endurion at near boiling temperature from 2 to 5 min time, followed by thorough rinse in hot water."

INDUSTRIAL EQUIPMENT

Hydraulic Press

Hydraulic Machinery Inc., 12825 Ford road, Dearborn, Mich., offers a press powered by a Hy-Mac hydraulic power unit housed in base and featuring continuous dial feed and automatic ejection of part.

Cycle of machine is accomplished by hydraulic sequence valves, solenoid-operated 4-way valves, pressure switch, limit switch, with special electrical control panel. Part is fed manually as start button for cycle is pressed; part indexes to work station; work ram moves



down on work and ejector ram moves up, unloading part in chute or conveyor; upon completion of operation, work ram and ejector ram return to starting position.

Crown of machine houses pushbutton panel, pressure gage and work ram. Base of machine houses dial feed index mechanism (operated by a swivel-type cylinder), the locating cylinder which positively locates and locks dial feed index and the ejector ram that unloads part from machine.

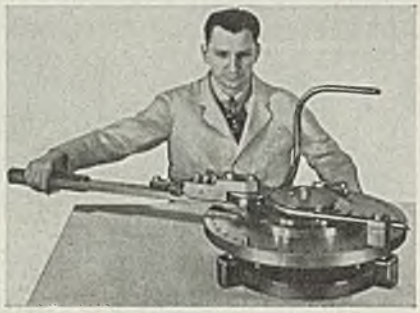
Item No. 9893

Benders

Three models of the DI-ACRO bender, made by O'Neil-Irwin Mfg. Co., Minneapolis 5, have been redesigned and incorporate several major changes and improvements over the original models.

Operating friction has been reduced in these benders by the installation of Torrington roller bearings which increases the ease of operation approximately 35 per cent and adds forming capacity to these precision units.

Another feature of the No. 2 and No. 3 size DI-ACRO benders is the reversible lever control cam, which allows the operator a choice of either right or left



hand forming direction. Interference, which may develop when forming several intricate shapes successively in a single piece, can be eliminated through this two way operating feature.

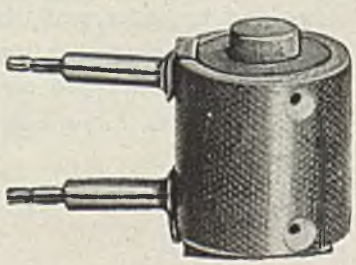
These machines can be arranged on the job for all types of forming in all ductile materials, including round, half round, square and hexagon rod, tubing, angle, channel, molding strip stock and bus bar (formed both flat or edgewise).

Item No. 9975

Renewable Switch

A switch which is instantly renewable, in the manner of replacing a fuse, is being marketed by Robert Hetherington. & Son Inc., Sharon Hill, Pa.

The renewable switch is a plug-in type in that there are two brass plugs which



fit into socket. The switch is furnished complete with plug and socket. It is a non-snap type. Company is arranging to furnish their entire line of switches, which run from midget size to some capable of taking 50 amp at 110 v ac, with this renewable feature. These are full snap switches having double break contacts and operating at speeds from 1/10 to 1/50 of a second.

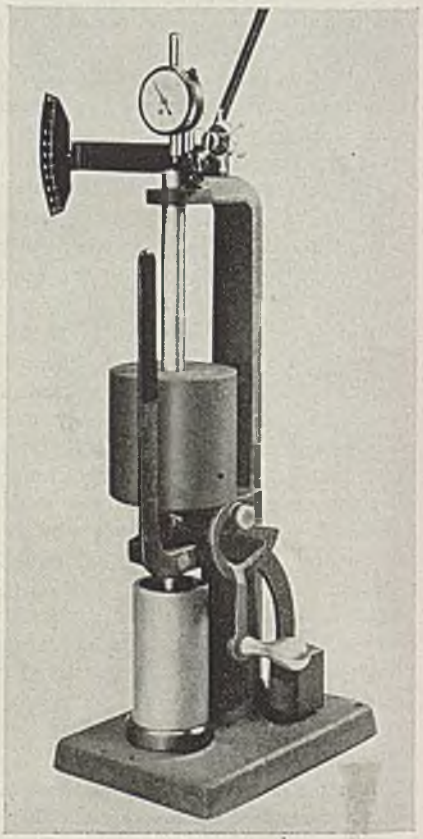
Renewable feature will also be extended to its environment-proof switches. These are furnished with either bellows or rubber cap. They are water-proof and damp-proof switches.

Item No. 9997

Sand Rammer

Harry W. Dietert Co., 9330 Roselawn avenue, Detroit 4, announces a sand rammer built in accordance with AFA specifications. This sand rammer is said to incorporate improvements that aid in obtaining a precisely rammed sand specimen of 2 x 2 in. dimension.

These improvements are described to be: Longer weight raising cam bearing;

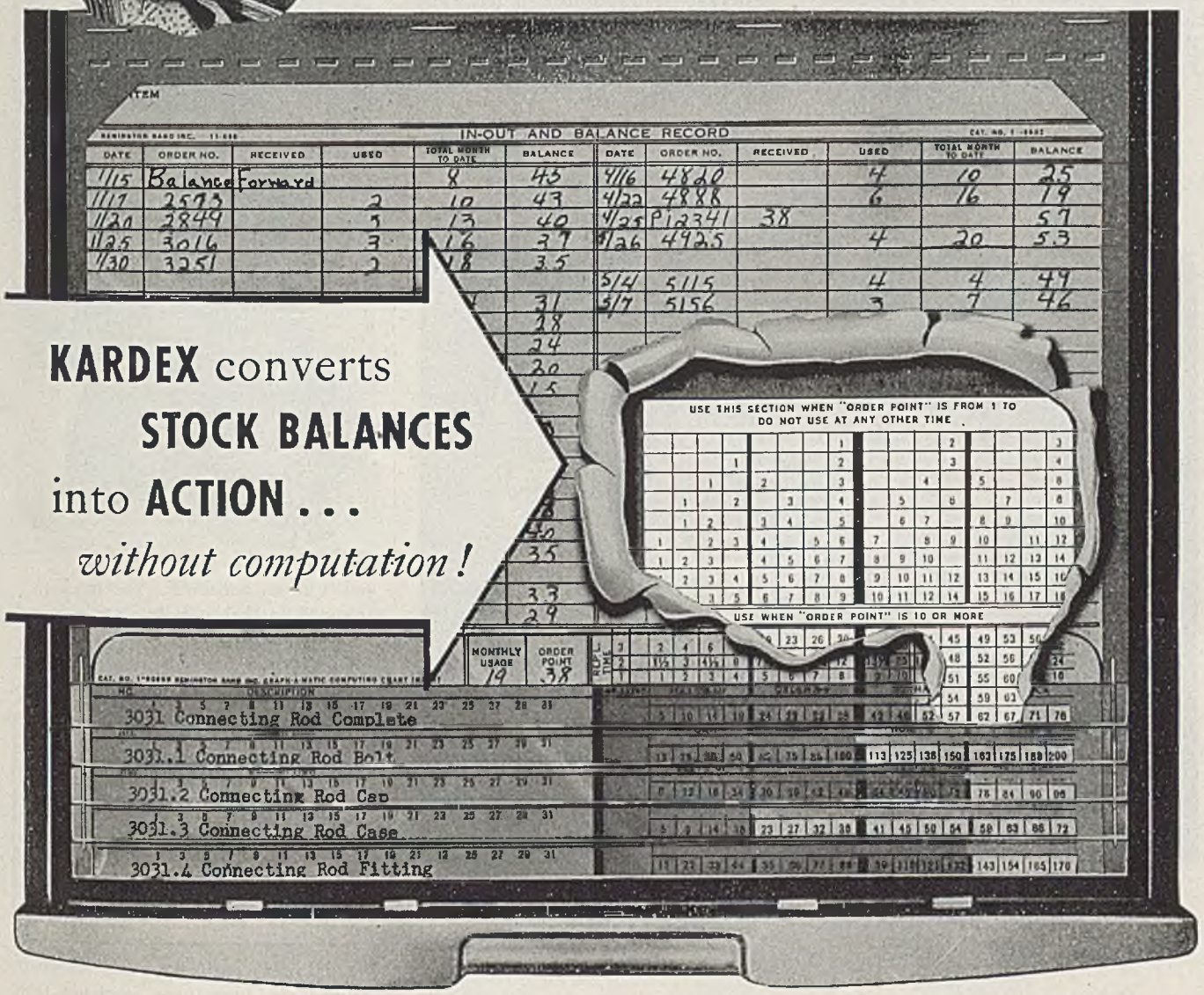


take-up on weight raising cam bearing; lever cam for conveniently and easily raising rammer-plunger-weight assembly during the loading and unloading cycle to insure a uniform impact between plunger and sand on loading; greater strength in rammer support frame, flowability indicator mounted on top of sand rammer to improve visibility of flowability dial, cleanliness of indicator and the life of indicator by reducing shock, flowability indicator automatically moves to inoperative position on raising plunger

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

USED!..PROVED!!..PRAISED!!!

New form of "Fact-Power" works **RECONVERSION** wonders!



PROVED in operation and praised by users* working under the stress of war production and reconversion!

THIS is the Graph-A-Matic Computing Chart — the revolutionary record-keeping idea that ends the need for time-costly computation and laborious analyzing to obtain positive stock control. Users report over-all operating economies ranging as high as 50%!

WITH the Computing Chart and Graph-A-Matic Signalling, stock control in the full meaning is accurate, certain and fast. And the "chart" idea is so simple, so flexible that the visible scales are re-set in seconds whenever conditions necessitate the establishment of a new reorder point.

TIME to reorder and to expedite, normal conditions, over-stocks and under-stocks — the needed and usable data supplied by Kardex "Fact-Power"—are seen clearly at a glance because they are *in uniform position.* The proper action is sure to be taken at the proper time!

GET FULL DETAILS. Management Controller No. 708 describes in full this proved-in-use stock control method, with illustrations and details on prominent installations. Available from our Systems Research Data File — at our nearest Branch Office or by mail from New York.

*Prominent companies whose names will be supplied on request.

SYSTEMS DIVISION

REMINGTON RAND

315 Fourth Avenue, New York 10, N. Y.

assembly; and, moisture indicator and flowability indicator are actuated by contact with flat end of plunger rod.

Item No. 9973

Indexing Machine

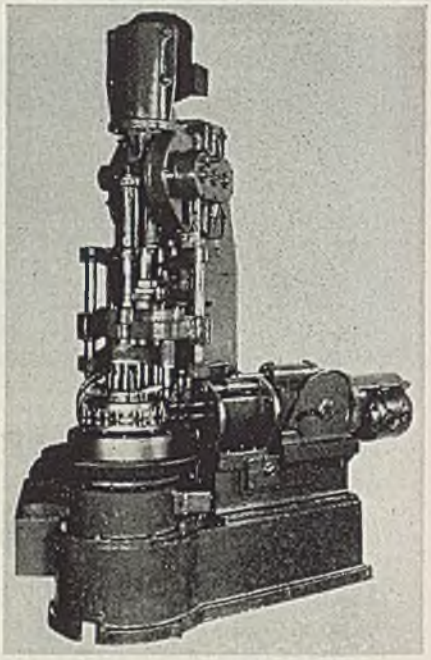
No. 5A automatic indexing machine for high production operation of drilling, reaming, milling, spot facing and on automotive parts, etc., is announced by W. K. Millholland Machinery Co., 1048 Fairfield avenue, Indianapolis 5.

Indexing table is 18 to 20 in. in diameter and can be arranged to index 6, 8 or 12 positions and can be indexed up to 720 times per hour. Multiple heads with 4, 6, 8, 10 and 12 or more spindles can be mounted on the vertical master power units; side heads can be mounted on each side of the vertical master unit and equipped with multiple spindles for different operations.

Parts can be drilled, reamed, faced and milled or tapped progressively in two planes. Vertical master unit can be equipped with motor up to 10 hp and side unit up to 3 hp.

Feed is sensitive enough to drill ⅛-in. holes in steel and powerful enough for ⅞ and 1-in. holes in steel, boring up to 2½ in., facing up to 3 in. for multiple operations.

Tool spindle speed ranging from 100 to 2500 rpm can be used with maximum stroke up to 6 in. length on vertical



and 5 in. on horizontal. The machine is arranged so that it is impossible to get out of time.

Operator is not required to put his hands near any revolving tools and loading and unloading is done at point where fixtures are away from revolving tools and with minimum risk to operator involved. Chip removal is accomplished with fixtures made with channels for leading chips into the chip pan, and a paddle secured to index table carries chips into chip receptacle.

Item No. 9974

Additional information on Industrial Equipment items appearing in this issue may be obtained by addressing STEEL, Engineering Dept., 1213 West Third St., Cleveland 13, O. In writing, please mention item numbers.

Portable Pyrometer

Portable pyrometer, with a direct reading scale, is announced by Roller-Smith Co., Bethlehem, Pa. It provides easy, accurate temperature determination by simply inserting into the liquid or atmosphere to measured reading temperature from the scale.

Item No. 9894

LEADING
the way back...

Just as they have helped assure victory in war, American business papers are now helping lead the way back to greater achievements in peace.

From the pages of American business papers—*like the one you are reading now*—you have learned much to help you through the trying days of war. From these pages you can now learn much that will help you make the transition from war back to peace with the least loss of time, effort and profit.

Your business paper editor is your experienced counsel. He knows your problems. Discuss them with him. It is his business to help you solve them. Read your business paper regularly and carefully because the business paper reader is a better business man.

One of a series of messages prepared by the Business and Industry Department of St. Joseph's of Indiana, college for men, at Collegeville, Indiana.

Aircraft Output in 1946 Expected To Fall to 6 Per Cent of War Peak

THE AVIATION industry in 1946 will be re-aligning its resources to place more emphasis upon research, development and sales on the scale necessary to maintain our national air power leadership, broaden the utility and economy of commercial aviation and spur the already promising growth of private flying, according to Ernest R. Breech, president, Bendix Aviation Corp.

Total 1946 aircraft production in America is expected to fall below a billion dollars—or to approximately 6 per cent of peak annual output of 16 billion dollars during wartime, says Mr. Breech. This estimated volume of the industry's first peacetime year, while nearly three times the prewar annual volume of $225 million in 1939, will not be sufficient to support the extensive and continuing research program that will be needed to uphold America's supremacy in the air, which should be a prime objective in our overall national plans for aviation's future.

"The aviation industry faces the fact that while volume is coming down, future research costs are going up. The necessity for exploring entirely new phases of aerodynamics, together with jet, gas turbine and rocket propulsion and guided missiles will entail greatly increased financial appropriations for research. To guard our security, America must be preeminent in the technical and production skill required to apply these new developments to the high-performance military and naval aircraft of the future.

"Recognizing that fact, our national leadership has joined the Army and Navy and the aircraft industry in laying the groundwork for a sound and adequately supported program of aeronautical research. The Air Co-ordinating Committee of the Army, Navy and the Department of Commerce has recently recommended a minimum annual production of from 3000 to 5704 military planes as a base for expansion in case of emergency. This represents a slight increase in 1939 output of 2141 military planes.

Costs Important Factor

"The extent of American progress in military aviation development will be determined to a considerable degree by our ability to keep all costs under reasonable control. If the pressure of labor demands for sweeping wage increases forces aviation development costs beyond justifiable bounds, our future air supremacy will be in grave danger.

"The full impact of modern aviation progress will begin to assert its influence in our national economy and daily living during 1946.

"The domestic airlines of the United States are flying an average of more than 550,000 miles daily, compared with 364,000 in 1941. Mileage schedules are climbing almost daily and they will continue to gain as new transports already placed on order by the airlines go into service and as scores of new and projected 'feeder lines' are put into operation.

"Reconversion costs, in themselves, will be enormous. According to present estimates, Bendix Aviation Corporation, for example, will expand approximately $25,000,000 for purchase and modernization of facilities needed to carry out present plans for peacetime operations. These operations will be broader in scope than any undertakings in the company's previous history."

How Murex Type MA Helped Us out of a Jam

We'd almost gotten our new arc welding department running perfectly, when in comes this special carbon-moly steel pipe job that threatened to knock us back on our heels.

I went over the situation with Tom, our arc welding super, and he was not happy about it.

"The work can't be positioned," he said, "and we have to use these A.C. Machines—the D.C. sets won't be ready for weeks. On top of that, they want a tensile strength of 70,000 or more, with better than 22% ductility. That's going to take quite a rod."

"Right, Boss," I agreed. "*And Murex Type MA is the rod.* It was designed for *all-position* welding of carbon molybdenum and other high strength steels. It works on A.C. or D.C. It's especially useful for high-quality overhead and vertical welds. This rod was the first of its type in the industry...only been available for a couple of months. Want to try it?"

"You bet," Tom told me. "We'd better check on it right away."

We did, and it worked fine. We got the pipe job out on time, and now we stock a supply of Murex Type MA rods regularly for similar jobs. Tom swears by this new E-7011 electrode; the welders like it; and Quality Control thinks the work we turn out with it is swell. Of course, I'm happy, too.

METAL & THERMIT CORPORATION

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MUREX Electrodes

President Names Steel Fact-Finding Board; Urges OPA To Act on Prices

HOPES for averting a paralyzing steel strike lay in the expectation the United Steelworkers may postpone the walkout scheduled for Jan. 14 until price control officials complete their study of 1945 steel earnings and decide on increasing steel price ceilings.

In an attempt to stave off the stoppage in this basic industry, President Truman has ordered the Office of Price Administration to speed up its analysis of 1945 steel earnings and to determine by Feb. 1 whether a price increase is justified. The President also has appointed a fact-finding board to study the dispute between the union and the United States Steel Corp. and to report on the case by Feb. 10.

Reaction of union officials to the President's actions could not be learned immediately. President Philip Murray was in Florida and other union officials stated the matter would have to be studied by the union policy committee before any comment was made or, presumably, before any action to postpone the strike could be taken. It was the union wage and policy committee which called the strike for Jan. 14 after such action had been authorized by union members in a National Labor Relations Board election Nov. 28 to enforce demands for a $2-a-day wage increase.

Appointed to the steel fact-finding board were: Roger McDonough, associate justice of the Utah Supreme Court; James M. Douglas, chief justice of the Missouri Supreme Court; Nathan P. Feinsinger, former public member of the War Labor Board, and a professor of law at the University of Wisconsin.

The steel fact-finding board is the third created by the Chief Executive. One such board now is considering the wage dispute in the oil refining industry and a second is acting in the General Motors dispute. Creation of the fact-finding boards was preceded by a Presidential request to Congress to enact legislation authorizing such boards and granting them power to subpoena books and other records of corporations involved in wage disputes. As yet, Congress has taken no action on the request. At present, the fact-finding boards lack authority to compel companies to produce their books and the General Motors Corp. has refused to participate further in the proceedings of the board.

In the General Motors case the union based its demand for a 30 per cent wage increase largely on a contention that the corporation was able to pay the increased rates and called upon GM to produce its books and records for public scrutiny.

General Motors offered to supply the board with all data regarding wage rates, employees' earnings, hours of employment and other relevant information regarding wages and employment. It balked at the board's proposal to consider ability to pay as a factor in determining an increase in wages.

"This would require an appraisal of costs, prices, prospective volume of business, investment factors, expenses and the entire forward operating program of the business," corporation officials said. "Thus the board would assume the most vital functions of management."

Political determination of the relationships between these factors, accord-

ing to the corporation, "means regimentation."

In the steel wage dispute, the situation is somewhat different. The producers contend they now are selling most steel products at a loss and that no wage increase can be granted unless steel prices are increased. Earnings of steel producers have fallen off sharply since the war ended and demand for the premium-priced war steels slackened. General expectation is that OPA will grant some price relief and the extent of such relief will determine whether the steel producers are able to raise wages.

If the scheduled steel strike is postponed to permit the OPA to complete its study and make recommendations for a new steel price structure, wage negotiations between the union and the companies probably will be resumed.

If the union holds to its schedule, a srtike affecting possibly 700,000 workers in steel plants, iron ore mines and aluminum plants will start next Monday.

As the date of the scheduled strike approaches, the country has no effective agency to deal with such a stoppage. The National War Labor Board went out of existence at the end of 1945, after handling some 21,000 disputes during the war period.

To pick up the tangled threads left by the NWLB, President Truman last week appointed a National Wage Stabilization Board, which will continue the NWLB panels established to adjust wage inequities in the steel, textile and meat packing industry and which will appoint arbiters when parties in a labor dispute request it. The new agency will not have the sweeping powers to force settlements which were held by the NWLB.

Members of the new board are: Public, W. Willard Wirtz, former general counsel of the NWLB, and Sylvester Garrett, former chairman of the Philadelphia regional board; labor, Robert J. Watt, American Federation of Labor, and Carl J. Shipley, Congress of Industrial Organizations; industry, Earl Cannon, vice president of the American Trucking Association, and R. Randall Irwin, assistant to the president, Lockheed Aviation Corp.

Severance Pay Ordered for Steel Men, Ore Miners

Severance pay for workers displaced by permanent closing of less efficient plants was ordered by the National War Labor Board just before it passed out of existence in a case involving the subsidiaries of the United States Steel Corp. The board also recommended severance pay to workers in 44 Lake Superior mines where operations were suspended due to exhaustion of ore.

In the steel case, the board directed payments ranging from four to eight weeks, depending on length of service. Amount of severance pay to ore miners is to be determinded by collective bargaining.

Grace Says Future of Steel Was Never Better

E. G. Grace, chairman, Bethlehem Steel Corp., Bethlehem, Pa., said last week that the "future of steel, if allowed to operate normally, was never better. Obviously," he added, "no satisfactory peacetime condition is in the cards for the worker, the investor, the employer, or the public until present industrial disturbances cease."

Cast Iron Plumbing Ware Ceiling Prices Established

Maximum manufacturers' prices for enameled cast iron plumbing fixture ware have been established on the basis of an increase of 8 per cent over Oct. 1, 1941, prices.

Aluminum Producers Plan Drive For Broader Market During 1946

WITH aluminum production capacity in the United States twice total world consumption in 1939, the nation's aluminum industry is putting into effect intensified 1946 sales campaigns to promote the greatest possible use of the metal, Roy A. Hunt, president, Aluminum Co. of America, Pittsburgh, states.

"Aluminum emerged from the war a better metal for many new purposes, and is now available at the lowest price in history," states Mr. Hunt. "Manufacturers and fabricators plan to take advantage of these conditions to utilize efficiently not only the enlarged production facilities for primary aluminum but the heavy supply of scrap now available. Estimates of the supply of aluminum scrap range from one to three billion pounds.

"Alcoa looks forward to sharp expansion in its sales force and distributing program. The company has recently opened 11 new regional sales offices and is planning to open five more, some in areas where it previously had no direct sales representation.

"As evidence of the growing acceptance of aluminum for new applications, a trend the industry hopes to accelerate during the coming year, the industry will depend for volume, in part, upon applications comparatively little known till now in a number of the nation's largest industries. New types of roofing sheet to tap a tonnage market are now being introduced to the building industry, and should account for hundreds of millions of pounds.

"The nation's railroads, seeking modern, more attractive and lighter equipment, are specifying aluminum in many applications for 1946. Of 1100 rail passenger cars now on order, 160 will be of all-aluminum construction, and the others will average between 2000 and 10,000 pounds of aluminum per car. Alcoa sales engineers are also calculating the lightening of such specialized railroad equipment as trucks, brakes, air conditioning equipment and lighting systems. Even locomotives in 1946 will employ large amounts of the light metal. The Pennsylvania Railroad has 50 new type locomotives under construction which will average 10,000 pounds of aluminum each for cabs, walkways and boiler coverings.

Market in Smaller Items

"Among smaller items already in volume production is a line of aluminum canoes weighing only one-half to two-thirds as much as their counterparts made of other materials. Some of the new packaging applications developed during the war will have postwar applications. Aluminum caps and seals made for penicillin bottles will have peacetime counterparts in packages designed for pharmaceuticals, while heat-sealed aluminum foil envelopes used during the war will protect and display such products as dehydrated soups and powdered fruit juices.

"The industry's ability to satisfy all new markets speedily and thus create the greatest possible number of jobs will be influenced by labor and other conditions in consuming industries. While the aluminum industry is a basic industry, any disturbance in the consumers goods fields using aluminum will be immediately reflected in the production and consumption figures of the metal."

Platinum Metals Used Extensively In Production of War Materials

ALTHOUGH the cessation of hostilities in mid-August was rapidly followed by a sharp abatement of demand for critical materials for military purposes, platinum is not yet in adequate supply, Charles Engelhard, president, Baker & Co. Inc., leading refiner of precious metals, stated in a year-end review.

"Soon after the war ended, the United States government, and other governments, removed all remaining restrictions on the use of platinum metals for jewelry and other peacetime uses," Mr. Engelhard said. "This was followed by a heavy demand for platinum by domestic and foreign manufacturers of civilian goods—particularly jewelry manufacturers—who, having been restricted in their use of platinum for several years, were desirous of restoring their stocks.

"Supplies of platinum in the hands of the trade were not adequate to meet this pent-up demand. United States stocks of platinum in the hands of refiners, dealers and importers when the war ended were below normal. They were approximately 20 per cent lower on Sept. 1 than at the beginning of the year. Deliveries of platinum for war purposes during the first eight months of 1945 were well in excess of the recoveries and imports of refined metal which averaged about 25,000 troy ounces a month in that period.

"The merit and value of the platinum metals for industrial purposes is demonstrated by the following figures compiled by the United States Bureau of Mines, showing the use of the platinum metals during the first six months of 1945:

	Platinum	Palladium
Electrical and Chemical Industries	165,000	40,000
Dental and Medical Purposes	15,000	22,000
Jewelry	.....	37,000
Total	180,000	99,000

"Platinum metals contributed greatly to the winning of the war through their widespread use in military equipment and in the production of war goods. Large quantities of platinum were used for electrodes in airplane spark plugs, for contacts in magnetos and in numerous instruments, including airplane flight controls, bombing equipment, and computing apparatus. Electronic devices, including radar, utilized the superior performance of platinum metals in various parts, one of the most notable being the use of platinum and platinum clad grids in high frequency transmission tubes.

"Platinum alloys played a vital role in production of military explosives, 'being used as catalysts in manufacturing nitric acid, which is one of the principal raw materials in the production of such explosives. From platinum alloy spinnerets and bushings came the rayon and fiber glass used for so many varied war purposes. Insoluble platinum anodes produced the perchlorates, peroxides and other chemicals obtained by anodic oxidation, and were employed in production of war equipment that involved electrodeposition of nickel, rhodium or other metals. The innumerable instruments used in communications, in navigation, in automatic controllers, and in measuring and recording devices utilized the exceptional corrosion and heat resistance of platinum metals as well as their electrical and mechanical properties."

First Upturn in Production Since V-E Day Recorded in November

INDUSTRIAL production turned upward in November for the first time since V-E Day with gains being registered in practically every industry, Civilian Production Administration reported last week:

"All-out production can be expected rapidly after settlement of present labor-management differences," John D. Small, Administrator of CPA, said, pointing out that "reconversion is now virtually completed in most plants, with some production already reaching satisfactory proportions."

Raw materials and basic services were principally responsible for the sharp rise in November industrial output. Production of such basic materials as steel and bituminous coal is running about equal to or ahead of the 1941 rate, he said. This is also true of such indexes of activity as freight carloadings and electric power output. Despite the high level of industrial activity, the heavy demands of both consumers and producers are not being met in all cases. Consumer expenditures have shown no tendency to decline, although munitions production has dropped off sharply; the flow of civilian goods has not yet had time to increase, and national income has dropped 10 to 15 per cent since last July.

The report outlined the following principal steps which CPA is taking to speed production and break bottlenecks: Granting special ratings or recommending some justifiable price increases in cases where it is evident that supply will fall far short of the demand and will threaten the possibility of widespread production slow-downs; limiting the use of scarce basic materials to essential needs; preventing hoarding and pre-emptive buying by strict controls on inventories; granting "CC" ratings to clear up crippling bottlenecks; keeping close check on the export market to see that there is not an undue drain on materials in short supply and to make sure that we meet our minimum essential export obligations; working closely with OPA to develop a large-scale low-cost clothing program; and implementing the President's moderate-cost housing program with veterans' preference in occupancy. This latter program is designed to produce during 1946 between 400,000 and 500,000 dwelling units costing less than $10,000 or renting for less than $80 a month.

On the production lines, Mr. Small said, progress is still slower than was hoped for, due to a variety of reasons including shortage of component parts, work stoppages, uncertainty as to wage-cost factors, and reluctance to make long-term commitments.

In the case of passenger cars, refrigerators, washing machines and other items of consumer durable goods, manufacturers have been able to do little beyond producing enough models for their thousands of distributors to use as samples. No substantial amounts are expected to be delivered to the public until the early part of 1946.

ICC Postpones Effective Date of Class Rate Change

The Interstate Commerce Commission last week authorized indefinite deferment of the effective date of a 10 per cent rate reduction on "so-called" classified freight

in southern and western territory and a corresponding increase of 10 per cent in eastern and northern territory ordered by the ICC last May. The new rates had been ordered effective Jan. 1, 1946.

Action of the commission postponing the effective date followed the granting of an injunction by a circuit court against putting the rates into effect. Under standard procedure the railroads are required to file a change in rates 30 days ahead of the effective date. Since the court decision was not rendered until mid-December it is impossible for the carriers to comply with this filing requirement and consequently the ICC's latest authorization, in effect, postpones the effective date indefinitely.

Rustless-American Rolling Mill Merger Approved

Stockholders of Rustless Iron & Steel Corp., Baltimore, have approved the agreement of merger into the American Rolling Mill Co., Middletown, O. Of the outstanding stock, 84.5 per cent voted in favor of the merger. Stockholders of American Rolling Mill Co. had previously adopted the agreement of merger. The merger became effective Jan. 1.

Pennsylvania Asks Bids on 214 Streamlined Cars

The Pennsylvania Railroad has asked for bids from car builders on construction of 214 lightweight streamlined passenger cars, including sleeping cars, diners, lounge and observation cars and coaches. It is estimated the orders when placed will total approximately $21 million. Bids are to be submitted by Jan. 10.

Steel Companies Deposit $9,600,000 in Patent Suits

Seven steel companies, complying with a federal court order, have made deposits totaling $9,600,000 for impoundment in federal court at Cleveland for royalties to the Cold Metal Process Co., Youngstown, pending ultimate decision in a suit against that company by the federal government which charges some of the company's patents were obtained fraudulently.

The deposit was made by the steel companies as a result of infringement suits against them by the Cold Metal company. A federal court order decreed that royalties due the Cold Metal Process Co. be impounded pending final decision in the government's suit against that company. Licenses have been granted to the steel companies under 25 Cold Metal Process Co. patents.

Payments reported made are: American Rolling Mill Co., Middletown, O., $2,407,500; Bethlehem Steel Co., Bethlehem, Pa., $2,132,100; Jones & Laughlin Steel Corp., Pittsburgh, $1,380,600; Wheeling Steel Corp., Wheeling, W. Va., $1,643,400; Youngstown Sheet & Tube Co., Youngstown, $1,235,700; Inland Steel Co., Chicago, $600,000; and Crown Cork & Seal Co., New York, $200,700.

Suit to cancel two of the patents covering cold process granted in 1930 was brought by the Department of Justice against the Cold Metal Process Co. and Abram P. Steckel in 1943. Hearing of testimony began in November, 1944, before Judge Shackelford Miller Jr., of Louisville, Ky., sitting in Cleveland by assignment, and ended in January, 1945.

Last August, Judge Miller ruled against the government. The Department of Justice appealed, and the litigation regarding the fraudulency of patents is now in the United States Circuit Court of Appeals.

Nickel Consumption Expected To Drop 25 Per Cent Below War Peak

DELIVERIES of Canadian nickel to all markets in 1945 will be approximately 25 per cent under the peak levels attained during the war years, but will be in excess of all but one peacetime year, according to Robert C. Stanley, chairman and president, International Nickel Co. of Canada Ltd. In recent months, he said, deliveries have declined substantially from the corresponding period of 1944.

"Production was reduced at our Canadian plants by a shortage of labor during the first half of the year, reaching a high of 1850 men in the spring, and by a sharp drop in nickel demand since August, caused by the sudden cutbacks in military requirements.

"Up to V-E Day practically all nickel went into war uses of the United Nations. Controls on the use of nickel and nickel alloys were removed by the Canadian and United States governments in late August and since then consumers have again been free to purchase their full requirements.

"In the six years beginning in September, 1939, the company produced and delivered to the United Nations about 1,500,000,000 pounds of nickel in all forms. Its capacity was materially increased in these years through expenditure of its own funds. The rate of our refined nickel production during the war years was about 50 per cent greater than in prewar years.

"Present enlarged nickel capacity of Canadian producers is nearly 320 million pounds annually. The largest annual prewar nickel consumption by the world was approximately 240 million pounds in 1937. From this it would appear that Canada's nickel capacity is greater than the world's peace-time requirements.

"The war's end brought the nickel industry many of the same unsettled conditions that now confront other large industries. While the industry does not itself have the problems of reconversion, it must await the reconversion of its customers. It has no extensive plant alterations to make in this transition period from war to peace.

U. S. Strikes Retarded Demand

"Following the sharp decline in nickel consumption which occurred at the war's close, the fourth quarter of the year has witnessed betterment in the demand. This improvement would have been greater had it not been for labor troubles particularly in the steel and automotive industries in the United States.

"To provide for war contingencies, the output of nickel was maintained in excess of requirements for some months prior to the cessation of hostilities with Japan. Stocks on hand were fast accumulating.

"As has been the case in the past, the steel industry in the United States continued to be the greatest consumer of nickel in 1945. Approximately 60 per cent of the total refined nickel delivered went into this field. During the years 1942 through 1945, International Nickel delivered nickel for war purposes to steel and other industries in the United States at an annual rate more than twice as great as any year prior to 1939. This was done in addition to supplying Canadian, United States and British nickel requirements at greatly increased wartime schedules.

"Four series of wartime engineering

steels, which were developed by metallurgists of industry and government in the United States to conserve supplies of alloying elements, were adopted as standard by the American steel industry during 1945. These steels, known as 'triple-alloy steels,' contain nickel.

"Of the nickel consumed by the steel industry for wrought steels during the year, over 40 per cent went into stainless steels. The tonnage of stainless steels during the past three war years has averaged the highest on record. Peace-time outlook for stainless steels is most encouraging. Some of the fields in which the uses of nickel-chromium stainless steels are expected to expand are the chemical, transportation and food processing industries.

"The company's rolling mills at Huntington, West Va., Birmingham, England, and Glasgow, Scotland, delivered substantially increased quantities of vitally needed Monel, Inconel and other nickel alloys for war requirements. During the conflict, the land, sea and air forces of the United Nations were the largest users of products of the Huntington Works, which was honored seven times by the Army and Navy of the United States.

"The end of the war saw an almost immediate resumption of nickel electroplating. All decorative applications of plating had been discontinued and new developments in the past few years have furthered the adoption of specifications calling for thicker nickel coatings. Nickel is already flowing in sizable amounts into plating uses. The automotive industry in the United States is planning to use heavier nickel plating in its 1946 line of cars and trucks, which will result in a marked increase in the consumption of nickel in plating.

War Restricted Civilian Use

"Due to war restrictions the use of nickel silver for civilian purposes almost ceased. With the reawakening of this market, production of nickel silver for peace-time uses was resumed late in the third quarter. Since then a large demand has been noted and a continuation appears likely for its many applications, a few of which are silver-plated flatware, slide fasteners and hardware.

"Our company's stock of refined nickel at Port Colborne is now exceptionally high due to lack of demand, which is believed to be temporary. Many war uses of nickel were in industrial equipment converted to war services and these will now resume their place as peace-time applications. New uses for the metal have been developed during the war and manufacturers who never used nickel previously have discovered its beneficial qualities."

MEN of industry

Fred T. H. Youngman, formerly vice president, has been elected president, Jessop Steel Co., Washington, Pa. He succeeds **R. Edson Emery** who has been made chairman of the board.

—o—

George E. Rose, vice president, Steel Division, International Harvester Co., Chicago, has retired after nearly 40 years with the company. He is succeeded by **Harry O. Bercher,** who has been his assistant.

—o—

Irving J. Louis, formerly with New York Commodity Corp., New York, has resigned to take charge of the newly-formed Metals Department of Bache & Co., New York metal brokers.

—o—

Charles N. Karr has been appointed sales promotion manager, Tractor Division, Allis-Chalmers Mfg. Co., Milwaukee. He succeeds **E. L. Aikins** who was recently put in charge of the company's Tractor Division at Seattle.

—o—

Robert B. McColl has been elected president, American Locomotive Co., New York, succeeding **Duncan W. Fraser,** who is now chairman of the board. Mr. Fraser has taken the post vacated by **William C. Dickerman** who recently retired but who continues as a director and member of the executive committee of the company.

—o—

Samuel C. Avalonne, chief metallurgist, has been made manager of sales, Spencer Wire Co., West Brookfield, Mass. Formerly with American Steel & Wire Co., Mr. Avalonne succeeds **John J. Gillis,** vice president and sales manager who has retired.

—o—

J. R. Morley, until recently associated with Great Lakes Steel Corp., Detroit, has joined Luria Steel & Trading Corp., Detroit.

—o—

Dr. Raymond G. Spencer, chairman, Metals & Minerals Division, Armour Research Foundation, Illinois Institute of Technology, Chicago, has accepted the directorship of Washington University Research Foundation, St. Louis.

—o—

John R. Johnston has been appointed manager, Milwaukee district sales office, Carnegie-Illinois Steel Corp., Pittsburgh. **John H. Morava,** until recently a lieutenant colonel in the Engineers, succeeds Mr. Johnston as assistant manager of sales in the Chicago district office. **Howard J. Mullins** has been named assistant manager, St. Louis district sales office of the corporation. **John A. English Jr.** has left his position as assistant manager, railroad material sales, Chicago district, to become assistant manager, Detroit district sales, and is succeeded by **Edward W. Backes,** until recently sales engineer, Chicago general sales office.

—o—

Col. Jesse G. Vincent, vice president in charge of engineering, Packard Motor Car Co., Detroit, since 1915, has been elected to the board of directors. He succeeds the late **Truman H. Newberry,** who died last October after serving as a director since 1903.

—o—

O. R. Lutz has been appointed service engineer for Surface Combustion Corp., Toledo, O. He will make his headquarters at the company's Columbus, O., plant.

—o—

W. S. Mounce, formerly senior metallurgist with Hamilton Standard Propellers Division, United Aircraft Corp., East Hartford, Conn., has joined the Development & Research Division, International Nickel Co. Inc., New York.

—o—

Orville F. Figley has been appointed Chicago district sales manager, United States Steel Supply Co., Chicago, succeeding **Andrew Verschuur,** who retired Dec. 31 after 51 years' service. Mr. Figley has been assistant manager of sales since 1942. Other appointments in the company include: **Walter P. Maguire,** for several years manager, Philadelphia sales office, who is now district plant manager in Baltimore, succeeding **James B. McIntyre,** who retired Dec. 31. Mr. Maguire will be succeeded by **George R. Jones Jr.**

—o—

Thomas C. Phillips has been named assistant general manager of sales, Pittsburgh Steel Co., Pittsburgh, having served as dealer sales manager of construction products for the company since 1941.

—o—

T. E. Eagan, chief metallurgist, Cooper-Bessemer Corp., Mt. Vernon, O., has been appointed chairman, Gray Iron Division, American Foundrymens Association.

—o—

George L. Meyer Jr., chairman of the board, Bassick Co., Bridgeport, Conn., has been elected president of the company, succeeding **W. A. Rose,** who has retired as president and general manager but will continue as a director. **Walter F. Herold,** vice president and chief engineer of the company, has been elected executive vice president.

—o—

J. J. Daggon has been appointed vice president in charge of sales, Leland Electric Co., Dayton, O. He has served as assistant to the vice president in charge of engineering for the past three years.

—o—

L. C. Boos has been elected president, United States Rubber Export Co. Ltd., New York, and **Herbert G. Kieswetter,** vice president. New vice presidents of

R. L. PUETTE

Who recently was named general sales manager, Clark Controller Co., Cleveland, noted in STEEL, Dec. 31 issue, p. 46.

J. H. WALSH

Who recently retired as vice president in charge of steel works, Inland Steel Co., Chicago, noted in STEEL, Dec. 31 issue, p. 50.

A. L. THURMAN

F. W. McMEANS

J. B. TERBELL

the parent company, United States Rubber Co., are: **Ernest G. Brown, John P. Coe, H. Gordon Smith, John W. McGovern,** and **Elmer H. White.**

—o—

A. L. Thurman has been appointed electrical engineering chief, Aetna-Standard Engineering Co., Youngstown, having resigned as application engineer for General Electric Co., Schenectady, N. Y.

—o—

Kenneth B. Halstead, general solicitor, and **Alfred T. Duffield,** assistant secretary, United States Steel Corp., New York, have retired under the corporation's pension plan. Mr. Halstead has been general solicitor for 23 years, and Mr. Duffield has been connected with the corporation since its organization in 1901, serving as assistant secretary since 1930.

—o—

Forrest W. McMeans has been appointed sales manager, Milwaukee Hay Tool Co., a division of Milwaukee Malleable & Grey Iron Works, Milwaukee. Mr. McMeans was formerly manager, Detroit sales office, and more recently executive assistant, Automotive Gear Works.

—o—

Herbert J. Rosen has been elected executive vice president, Griffin Wheel Co., Chicago. Associated with the company 45 years, he has been vice president. **A. J. Soderberg,** formerly auditor and a veteran of 26 years, has been made assistant treasurer.

—o—

Joseph B. Terbell has been appointed executive vice president, American Manganese Steel Division, Chicago Heights, Ill., American Brake Shoe Co.

—o—

George R. Larsen has joined Marion Electrical Instrument Co., Manchester, N. H., as development engineer. During the war Mr. Larsen was associated with the Signal Corps Engineering Laboratories, Fort Monmouth, N. J.

OBITUARIES...

William S. Hutchinson, 69, vice president, Bethlehem Fabricators Inc. and Bethlehem Erectors Co., Bethlehem, Pa., died Dec. 22 in that city.

—o—

Samuel E. Lenox, 52, assistant superintendent in charge of tool engineering, International Business Machines' Endicott, N. Y., plant, died in that city Dec. 18.

—o—

Thomas H. McElray, 63, electrical superintendent, Youngstown district, Carnegie-Illinois Steel Corp., died Dec. 25 in Roanoke, Va.

—o—

Edgar A. Blasdell, president and treasurer, Reliance Steel Casting Co., Pittsburgh, died in that city recently. He had been president of the company since 1932.

—o—

Raymond I. Waite, a structural steel engineer with the Buffalo Structural Steel Corp., Buffalo, died at his home in that city Dec. 28. Mr. Waite began and ended his 50-year career in the structural steel industry with the same company. However, he served with other companies throughout the United States during the intervening years.

—o—

George Williamson, 74, research engineer since its organization, McWane Cast Iron Pipe Co., Birmingham, died Dec. 27 in that city.

—o—

Harold Rossum, Wayne, Pa., a sales representative for the Lake City Malleable Co., Cleveland, died Dec. 15.

—o—

Frank S. Warzeski, 61, vice president, Linde Air Products Co., New York, died Dec. 21 at his home in Montclair, N. J. Mr. Warzeski has been with the Linde company since 1912, serving successively as general superintendent, works manager, and vice president.

—o—

Albert C. Nordstrom, 53, vice president, Ellison Bronze Co. Inc., Jamestown, N. Y., died Dec. 26 as a result of injuries sustained in an automobile accident.

—o—

Edward T. Dougan, 70, for the past 35 years engaged in construction work and a builder of blast furnaces, mills and factories throughout the United States and Canada, died recently in Buffalo.

—o—

Dean Higgins, president, Dean Higgins & Co., Toledo, died Dec. 18 in that city. Mr. Higgins was president, Commerce Guardian Bank and was a director of several other organizations.

—o—

Prof. Clifford D. Bushnell, 61, superintendent of the physical plant of Purdue University for 24 years and a member of the faculty of the mechanical engineering department, died Dec. 22.

—o—

Eugene C. Argust, 62, vice president and secretary, Morden Frog & Crossing Works, Chicago, died Dec. 19 in that city.

—o—

Gilbert L. Haines, 51, president, Haines Tool Co., Cleveland, died Dec. 29. Mr. Haines organized the company, shortly after going to Cleveland in 1914, to reclaim high speed cutting tools by a process which he originated.

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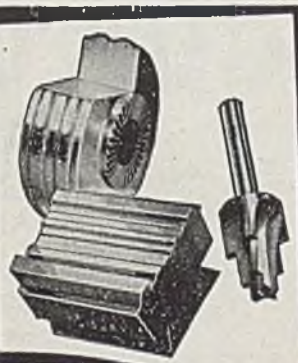

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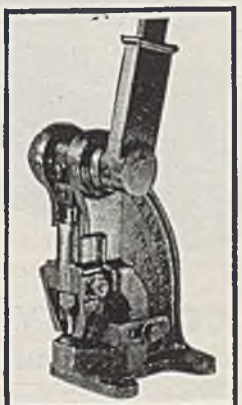

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5/16" x 3/16"	1/2" x 3/16"	1/2" x 7/32"	5/16" x 1/4"	21/64"	7/32"
1/4" x 3/16"	1/2" x 5/32"	1/2" x 3/16"	5/16" x 9/64"	5/16"	3/16"
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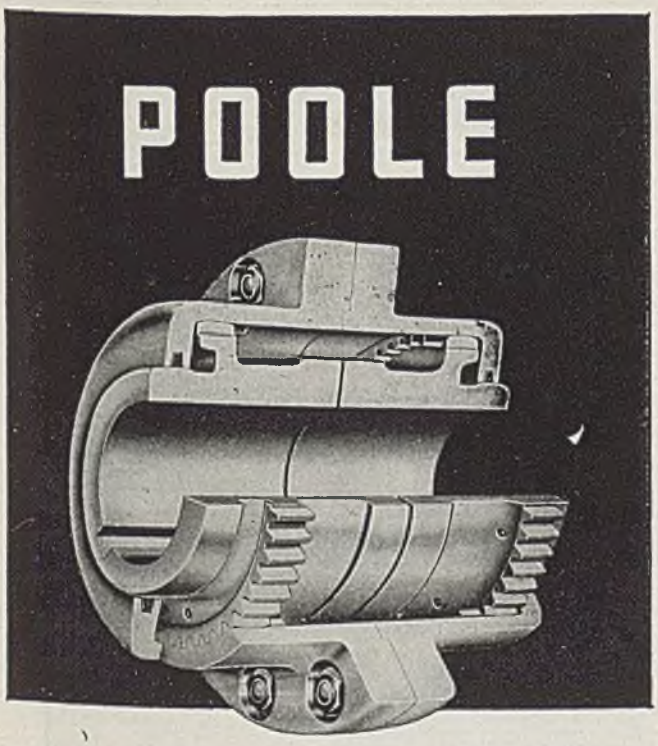

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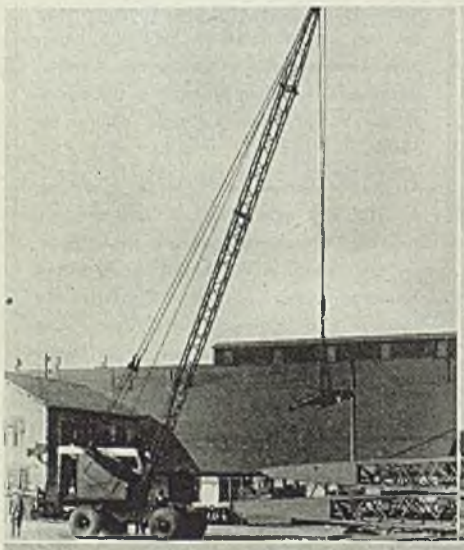

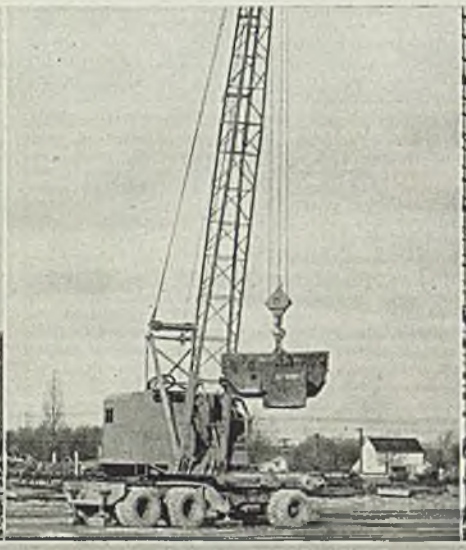

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