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STEEL

The Magazine of Metalworking and Metalproducing

VOL. 117, NO. 11 SEPT. 10, 1945

NEWS

TECHNICAL

FEATURES

MARKETS

NEXT WEEK...

Flash Butt Welding Heavy Sections

Tangent Bending—A New Tool and Art

Eight Ways to Efficiency in Handling

History and Uses of Spiegeleisen

Effect on Coatings of Polishing Steel

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STEEL
September 10, 1945

Object Lesson!

Now that Japan has surrendered formally and occupation of the enemy's territory is progressing smoothly, one can look back over the events of the two wars and examine the points of our weakness and strength as object lessons for the future.

Scores of retrospective analyses of the war are current and in practically all of them certain conclusions stand out clearly. One is that defeat for the Allied nations was averted by the narrowest of margins on several occasions. Mere chance saved England from invasion at the time of Dunkerque. A union of Nazi and Japanese forces came too near to realization for comfort. Had Japan followed up on her initial advantage at Pearl Harbor, our difficulties would have been increased many fold. If Germany had gained a few more weeks of time in which to perfect her "secret" weapons, the result might have been different. In short, there were times when victory for our side hung in the balance.

A second noteworthy conclusion is that the skill, intelligence, courage and mechanical aptitude of the individual American serviceman was a big factor in victory. No other nation had such a high proportion of men in uniform who could act independently in an emergency and could operate things mechanical and electrical as effectively. The heritage of skills that comes from widespread use of mechanical and electrical equipment in normal American life paid great dividends in this war.

Third among outstanding conclusions is that in the final analysis it was our tremendous capacity to turn out superior equipment that turned the tide of battle in favor of the Allied nations. We know now that Germany had great ingenuity and abundant production facilities, plus a head start of nearly a decade. That we overtook her so quickly is a miracle. Japan's industrial capacity, in itself, never was a serious menace.

Examining these conclusions, we find, first, that the close margin by which we escaped disaster on several occasions emphasizes clearly our state of unpreparedness in the earlier stages of the war. Secondly, we find it was the sterling character of our fighting men and the superb support of our productive machinery which enabled us to retrieve the victory that we almost lost as a result of our unpreparedness.

How clearly this points to an object lesson for the future! Now, while peace is fresh, we should store critical materials, equipment, supplies and "know how" so that they will be on tap immediately when danger threatens.

REPRIEVE FOR STEEL: Sobered by the weight of its immediate responsibilities, the Attlee government has decided that all it can tackle in the field of nationalization in the coming year is the Bank of England and coal mining. This is quite a come-down from the Laborites' campaign program, which included nationalization of coal mining, transport, distribution of electricity, the iron and steel industry and the Bank of England.

Postponing action on transport, utilities and iron and steel may prove important. Nationalizing mining and the bank will be simpler than nationalizing the other three fields. But although simpler, they will be difficult. Unless the new system shows beneficial results in mining and banking at a fairly early date, public opinion will begin to question the wisdom of extending the system to other fields.

This is one source of hope for continuing British iron and steel on a free enterprise basis. Another is the fact iron and steel is not sick and inefficient, as is coal mining. Still another is that the industry already had announced an extensive postwar ex-

(OVER)

pansion and modernization program. Also, nationalizing iron and steel would involve endless complications.

While there is life there is hope. In the meantime it is unfortunate that British steelmakers have to operate under the uncertainties of the present situation. —p. 75

° ° °

WLB IS ON WAY OUT: Some rays of hope appear in the manner in which President Truman is approaching the problem of labor policy. At present the War Labor Board is functioning on an interim basis, with full understanding that it will be liquidated as soon as the administration's postwar labor setup has been formulated.

This setup will be influenced considerably and perhaps fully determined by the forthcoming government-management-labor conference to be held about Oct. 15. Secretaries Schwellenbach and Wallace are drafting an agenda for the conference. Eric Johnston, Ira Mosher, Philip Murray and William Green probably will be asked to suggest names of conferees to represent their respective interests—management and labor.

If the conference comes up with a satisfactory postwar labor program, then the President can disband WLB and the Department of Labor can carry on as the government's sole labor agency. Should this come to pass, the Department of Labor for the first time in 12 years will be functioning on the job it was created to perform. —p. 84

° ° °

ERASING WAR'S SCARS: Editorial Correspondent George R. Reiss, returning from a 20,000-mile tour of devastated Europe, paints an impressive picture of the ruin that Allied bombing inflicted upon the cities and industries of Germany. The cost of rebuilding Berlin alone is estimated at 10 billion marks. Hamburg is 85 per cent destroyed, Bremen 50 per cent and Cologne almost completely wrecked.

Rehabilitation will be slow, because great quantities of materials, equipment and supplies are being shipped to Russia and other United Nations countries to facilitate reconstruction there. One large metalworking company had 1500 machine tools in operating condition after bombing ceased. Of these 1400 were shipped to Russia.

The havoc of war in Russia, France, Italy, England, China, Japan and other countries is but a duplication of the German scene. Can all the world, working to the best advantage, repair the physical damage alone in a decade? —p. 88

POSTWAR POSTSCRIPTS: Unemployment is not an immediate postwar problem in the San Francisco bay region. Its big reconversion shakeout occurred last spring and early summer. Today the bay area has jobs available for 24,000 persons. In Los Angeles, where reconversion is somewhat more difficult (p. 82), for every three persons laid off, jobs are waiting for two. . . . Cancellations of steel orders on the books of Pittsburgh steelmakers since V-J Day, while substantial (p. 81), have been considerably less than expected. . . . WPB has issued a report showing the expansion of industry during the war years. The period 1940-1944 marked the greatest expansion of industry—manufacturing, mining and construction (p. 80)—of any five-year period in the history of the country. Industrial output more than doubled, whereas the most rapid peacetime expansion has never exceeded 12 per cent. . . . Machine tool builders are shipping at the rate of $32 million per month (p. 78) and have sufficient unfilled orders on hand to assure production at the present rate for seven months. . . . Electropolishing processes now are in use and available on a commercial scale in production. On some applications, it can compete with mechanical methods (p. 104), but it is not a cure-all and each installation must be custom-built. . . . Congress will be asked to authorize publication by the government (p. 87) of a standard commodity catalog to list everything that is on the market. . . . Ford and Hudson, first automobile builders to get their assembly lines moving are stymied by strikes (p. 91) and the prospect for labor harmony in motordom is anything but good. . . . Isaacson Iron Works in Seattle has obtained 178 heats from the roof of a 40-ton electric furnace. The method of laying up the roof lining (p. 124) and the precautions taken to avoid unnecessary temperature variations will be interesting to every electric furnace operator. . . . OPA has prepared a chart (p. 97) intended to show as simply as possible its ceiling price policy for reconverting manufacturers. It explains how various alternatives to existing ceiling prices can be determined. . . . Coal production is mounting again and in the week ending Aug. 25 (p. 198) was only slightly below output in the corresponding week of 1944. . . . Magnets, which require precision casting and finishing (p. 92), constitute 99 per cent of the weight of a completed atom-smashing cyclotron.

E. L. Shaner

EDITOR-IN-CHIEF

STEEL WITHOUT PRIORITY

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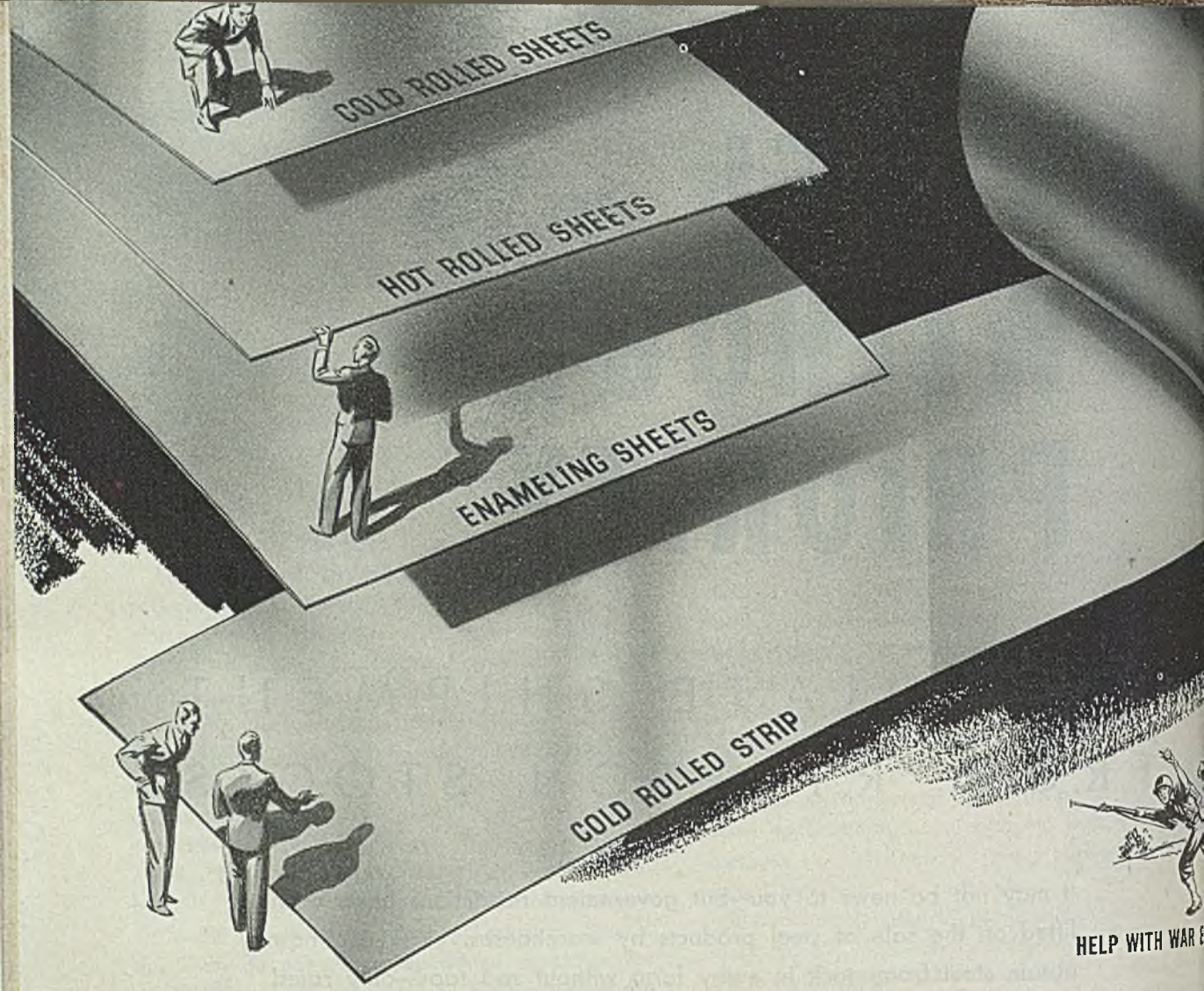

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STEEL
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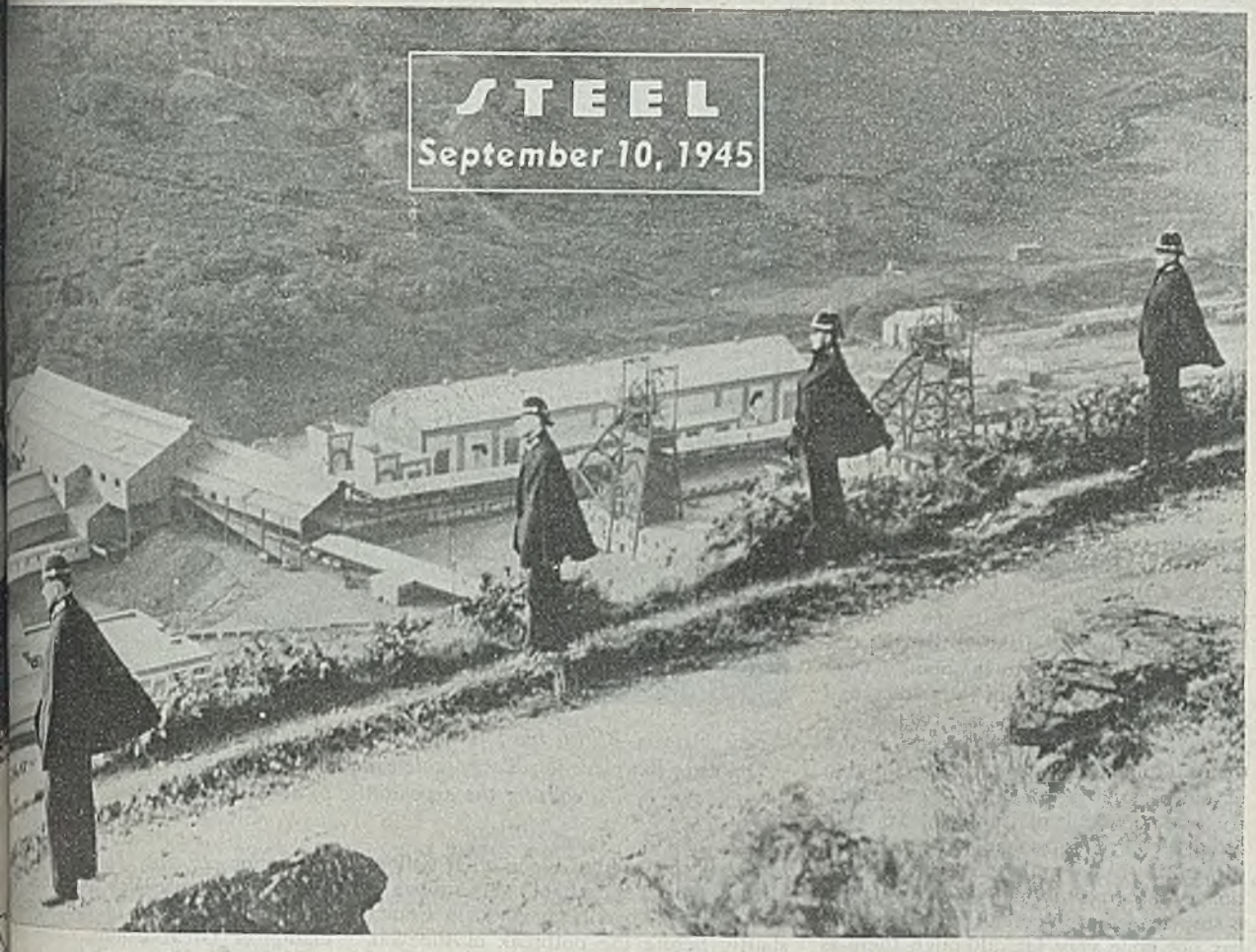


Britain's coal mining industry long has been a scene of strife, which accounts in large measure for the coal industry being given the No. 1 position in the Labor party's program for nationalization of industry. Here British "bobbies" police a Welsh coal mine during a bitter strike.
NEA photo

itish Steel Industry Not Slated or Early Nationalization

Coal mining and Bank of England are first on Labor government's program of socialism. Taking over of metal producing and metalworking industry scheduled for some future date, but plans are not yet well defined. Party to maintain strict controls

By VINCENT DELPORT
European Editor, STEEL

LONDON

N and steel is not scheduled for talization during the forthcoming n of the British Parliament, accordn the declaration of policy made in King's speech by the new Socialist ent at the opening of Parliament 15. This does not mean that the and steel industry has been altoether removed from the Labor party's gram of nationalization, which they d to carry out while they are in e.

rding to custom, the King's speech embodies the program of legislation that the government intends to submit to Parliament during the session to come, and this covers the best part of a year, unless the government is overthrown, in which case another election would take place, and, presumably, a new party would come into power with a different program.

Obviously the new cabinet has found that all it could tackle in the field of nationalization in the course of the first year of parliamentary activities was the Bank of England and coal mining. Cabinet members found themselves already facing the immediate issues of demobilization, rehousing, transition to peacetime problems of reconstruction and necessary legislation to be passed to put into effect the new national insurance, health service and education programs already agreed upon under the late coalition government.

So the iron and steel industry is in the undesirable position of a patient waiting to be told when a major operation is to be performed upon him. Still, while there is life there is hope.

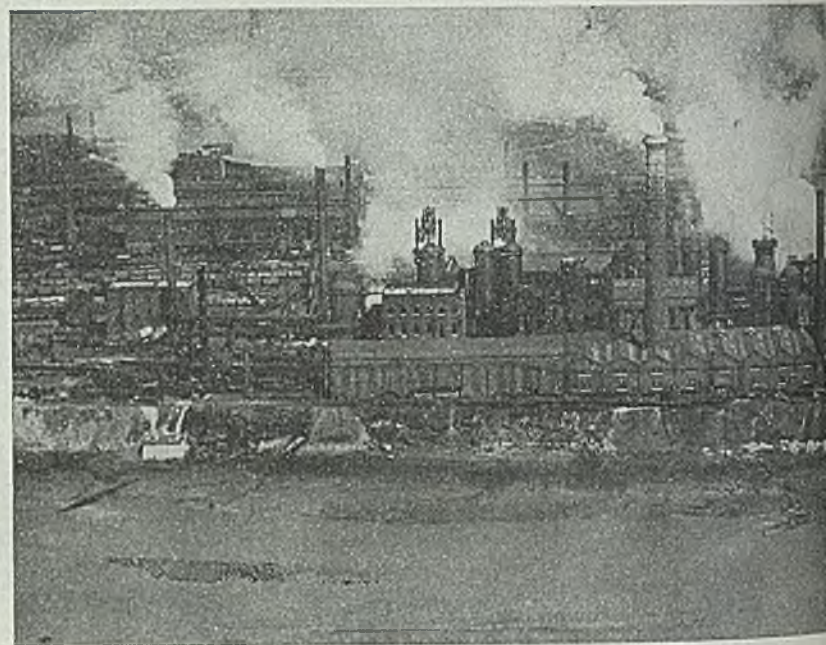
The astonishment that spread over the country when it became evident that the electorate had given a sweeping overall majority to a Socialist government was shared to the full by Labor itself; in fact, there is reason to believe that the

Socialist leaders were not overconfident about the result. However, the first reaction of surprise was quickly overshadowed by the terrifying and momentous announcement of the fall on Japan of the first atomic bomb, followed by the no less memorable notification of Russia's declaration of war against Japan. This succession of staggering events culminated in the announcement of the end of the World War, and the opening of the British Parliament with the pronouncement of the King's speech fittingly coincided with the first outbursts of peace celebration. The actual statement of the more immediate government program came almost as an anticlimax, as the intentions of the Labor party, if it came to power, were already known to the public through publication of the party's manifesto, "Let Us Face the Future."

It already has been stated that the victorious party intends to maintain a tight control of the economy of the nation, and that it is prepared to go to the extreme limit of nationalization in regard to coal mining, transport, distribution of electricity, the iron and steel industry, and the Bank of England. To what extent detailed plans had been prepared to realize these ambitions and revolutionary schemes is not known, but it is suspected that in certain fields planning has not gone very far, although there is little doubt that a pretty comprehensive "blue print" exists for coal mining.

Secures Financial Control

That the Bank of England should be the first organization to be taken in hand, concurrently with the coal mining industry, is hardly surprising. For one thing, it is a strategic move to get control of the purse strings; secondly, the Bank of England is an individual entity, which can be taken over by the state and placed on the altar of public ownership without the complications that surround diversified industries operated by numerous concerns of varying importance. Already the "Old Lady of Threadneedle Street" is almost completely controlled by the Treasury, and her removal from the secluded circle of private ownership to the public square will hardly affect the lives of individual members of the public. The thing that matters is, what will be the new government's banking policy in regard to insuring credit for industry and for combatting possible unemployment? The declaration of government policy also mentions provision to be made for "the effective planning of investment," and one may wonder to what extent investments in the form of new capital to nourish industry may be controlled and directed; whether on broad general lines or by inquisitive methods to be applied to individual issues of industrial concerns. These questions cannot be answered until the government experts disclose more accurately what is in their minds. It might be mentioned in passing, that the Attlee government is not altogether breaking new ground, since other nations already have a state bank, and a move in that direction had been made in France shortly before the outbreak of the war.



Air view of British blast furnace plant at Barrow. The British iron and steel industry has plans for a large-scale expansion and modernization program which calls for the expenditure of about $500 million

Nationalization of an industry such as coal mining is quite a different matter. In this field the new government had to take position without any delay, because the coal mining industry is very sick, and there is a widespread impression that a fair proportion of miners are unlikely to increase their efforts unless they are given the incentive of knowing that coal extraction is no longer a source of private profit. The demand for nationalization of coal mining is of long standing, and was already insistent before the war, although in a more subdued tone than at present. Already the mines themselves have passed into public ownership, the original royalty holders having been compensated to the extent of £70 million.

Plans Originated Years Ago

Plans for the operation of mines under complete state control were elaborated many years ago. More recently a committee of members of the Miners' union and of the Labor party has been sitting to go into more detail and, no doubt, to perfect the plans in the light of recent experience. The new minister of fuel and power, Emanuel Shinwell, was chairman of this committee, until he took office in the cabinet.

A bill probably will be placed before Parliament soon to put the new plans into effect, and, with its majority of almost 150, the new government is bound to get its bill through, despite the strong opposition that is likely to arise from the Conservative benches.

Retrospectively, it is interesting to note that in January, 1945, a plan of reorganization of the coal industry u private enterprise was published by R ert Foot, chairman of the Mining A ciation of Great Britain. This plan acceptable to the association, but was jected by the miners' leaders. Later the year, a White Paper was issued Maj. Lloyd George, minister of fuel power in the coalition and caretaker ernments, which also embodied a of reorganization, but while preserv the principle of private enterprise, provided for a certain measure of con this plan would have been acceptabl the industry, but did not go far enou to please the miners' leaders and Labor party. Whatever may be the p ent government's plan, it must face essential necessity of providing fuel power to industry in sufficient quan and at an economic price, while at same time providing for the ordinary p lic's needs. That will be the crucial

Will the iron and steel industry nationalized? It is earmarked for s treatment at some future date, but answer to the question is not sim Coal mining, in comparison with iron steel, is a well defined industry, and can visualize such an industry as be subjected to a process of centralizat But what of iron and steel? Will tionalization be circumscribed to pig and steel ingots? Will it be extended semifinished products? Or will it incl structural steel, rails, merchant s sheets, etc.? If the latter, where going to stop? It is doubtful whe those who proposed the schemes made up their own minds.

How will nationalization affect a cern, and there are many such, that o iron ore deposits, operates blast furn and steel furnaces, rolls its own steel

...ctures such finished products as ...te, nuts and bolts, and even um... frames? If merchant steel comes ... the scope of nationalization, what ...ppen to the small rerolling firms? ... question is particularly compli... in regard to castings. Some large ... have their own blast furnaces, ... their pig iron to manufacture ... pipe on a large scale, all in one ... of works, but taking the iron foundry industry as a whole, there are some 1800 foundries in Great Britain, comprising large integrated groups, down to small privately owned foundries employing no more than a dozen men. There is the case of the jobbing foundry that plays an essential part in handling repairs for local undertakings, shipyards, etc. And let it be said here that there are some small foundries that do work very efficiently. The complication of the iron foundry industry already came to light when an attempt was made during the war to concentrate the industry, and it was found impracticable to do so.

Is there any reason to nationalize the iron and steel industry on account of alleged general inefficiency? This does not appear to be the case. During the war, in the face of the greatest difficulties, such as labor shortage, bombing, difficulties of transport, shortage of raw materials, the industry reached a peak production of 13 million tons of steel ingots and castings, as against an average annual output of 11,256,000 tons in the years 1935-38. Before the war the industry had reached a high degree of organization, and the process of integration, modernizing, adoption of new and more economic processes has been continuing throughout the war years, and would have proceeded at an accelerated rate had it not been for the war. Only recently, as reported in these columns, the British Iron & Steel Federation announced a plan of reconstruction to be spread over the next five years, that would call for an expenditure of £120 million. These plans were prepared by the industry in the confident expectation that the money would be found, and that the industry itself, by "running its own show" would achieve its object.

It has also been stated that a new research organization, the British Iron & Steel Research Association, had been set up, which will have the benefit of utilizing research laboratories associated with the industry and the universities, and will be able to call upon the services of the leading scientists and technical people. The industry is prepared to set aside a sum of £200,000 per annum, which, together with a grant from the Department of Scientific and Industrial Research and other sources of revenue, will mean a total of £400,000 per annum placed at the disposal of the research association; this in addition to the large sums already spent by industry on research and development in its own laboratories and works.

Would nationalization do better for the iron and steel industry and achieve the end more efficiently than the industry is doing itself through its own resources? The answer may be found in a recent manifesto issued by the Iron & Steel Trades Confederation, in which it was stated that the expenditure involved for capital equipment necessary to modernize and expand the industry could not be left to private enterprise. It also asserted that

(*Please turn to Page* 217)

...graphed on the lawn at No. 10 Downing Street, London, ... members of Britain's Labor cabinet. *Front row, left ...ght:* Viscount Addison, secretary of state for dominions; ... Jowitt, lord chancellor; Sir Stafford Cripps, president ... Board of Trade; Arthur Greenwood, lord privy seal; ... Bevin, foreign minister; C. R. Attlee, prime minister; ...bert Morrison, lord president of the council; Hugh Dal... chancellor of the exchequer; A. V. Alexander, first lord ... admiralty; J. Chuter Ede, secretary of state for the home department; Ellen Wilkinson, minister of education. *Back row:* Aneurin Bevan, minister of health; G. A. Isaacs, minister of labor and national service; Viscount Stansgate, secretary of state for air; G. H. Hall, secretary of state for colonies; Pethick Lawrence, secretary of state for India and Burma; J. J. Lawson, secretary of war; J. Westwood, secretary of state for Scotland; Emanuel Shinwell, minister of fuel and power; and Tom Williams, minister of agriculture and fisheries. NEA photo

Changeover Progress Is Rapid

Civilian industries meeting challenge of transition. Dollar value of production by year's end to exceed that of prewar years

RECONVERSION is progressing faster than anticipated and civilian production in key industries promises to exceed the 1939-41 base rate by the end of the year.

Highly encouraging reports on the progress of reconversion are being received from many industrial centers by the Committee for Economic Development. These reports indicate industry is reconverting its plants from war to peace production much more quickly and easily and that reconversion unemployment is smaller than anticipated.

A survey by the War Production Board of 62 peacetime industries indicates that output of goods by the end of the year will be slightly above the level of the three prewar years, that employment will be only slightly below the base period and that by the middle of 1946 both production and employment will be higher than in the prewar years.

"This survey on production and employment expectations for the next ten months shows that the industries reporting are going ahead with ambitious production and expansion plans and that they are meeting no greater difficulties than were to be expected during this transition period, and they already are surmounting such difficulties with typical American ingenuity," according to WPB Chairman J. A. Krug.

Accepting either 1939, 1940, or 1941 as a normal year, depending on the industry, the following are industries' estimates of production in terms of dollars and employment:

1. In July, 1945, production was at 46 per cent and employment at 51 per cent.
2. It was estimated that production in August would be up to 48 per cent with employment rising to 57 per cent.
3. By December of this year, their production will be 112 per cent and their employment 96 per cent.
4. And that by June of 1946, their production may skyrocket to 187 per cent with employment up to 133 per cent of the base period.

The industries indicated one reason for the optimistic forecasts is the rapid relaxation of WPB controls following closely on the huge military cutbacks and the speed with which these cutbacks are beginning to be reflected at mill level.

Moreover, many of the shortages of tools or components which loomed up in August are expected to be eased or eliminated in the last quarter of this year.

In addition, manufacturing construction is expected to be in full swing soon, adding further impetus to production and employment.

Indicative of the expectations of civilian industries are those of 11 automobile builders. Average monthly output during the base period was 313,678. During July, output was 359. For December, production is estimated at 223,656 and for June, 1946, at 504,452.

Twenty-eight domestic laundry equipment manufacturers, which had an a age monthly production valued at 489,000 during the base period, ex output valued at $12,574,000 in Dec ber, and $22,044,000 by next June.

Sixteen vacuum cleaner makers ported average monthly output of 270,000 during the base period, expe $7,875,000 in December, and $9,100, in June, 1946.

To train war workers now employed for the production of civilian goods, Casc Products Corp., Bridgeport, Conn., has set up a "reconversion school." Here employees attend a demonstration on the assembly of electric heating pad one of the company's peacetime products. NEA photo

Machine Tool Backlogs Adequate For Seven Months' Production

MACHINE tool builders are shipping at the rate of $32 million per month, and, according to a spokesman for the National Machine Tool Builders Association, the industry has sufficient unfilled orders on books to assure seven months' production at the current rate.

Shipments now are reported higher than the 1939 average and just under the 1940 mark when heavy sales were being made to England. Among orders on builders' books are many from France, Belgium and China. However, American demand is getting first attention.

The American machine tool industry expects sale of government-owned machinery eventually may deal it a severe blow. Up to the present, however, this government machinery has come onto the market only in driblets so that it has been particularly disturbing. Actually impact of this surplus machinery on market may be less severe than gener expected. For one thing a large part o has no peacetime application. Then, a there is the fact that much equipm will be held by the government in sta by condition for a future emergency. top of this, much of the governm owned machinery has seen such hard it will be difficult to market. Special pose tools will not be readily adapt to peacetime production.

Tool builders plan to push export b aggressively. Several noncompeting panies are understood to have ban together to set up offices in S America, planning to offer a wide r

STE

American machine tools. Before the American tool sales in South America presented only a small fraction of the industry's export volume.

As a general thing the machine tool industry was in good shape to go ahead on peacetime production when the war with Japan ended. Since last April war tool business had been shrinking and many builders had turned to subcontracting on a broad scale to keep their plants occupied. For several months past the industry has been permitted to book unlimited orders. Starting Sept. 30, all tools will be listed as unrated and available to the open market.

Smaller War Plants Corp. is sending a questionnaire to all small metal-working plants registered with it—some 35,000—asking them to report on their machine tool needs. This is the first survey of this type undertaken by the SWPC in conformity with instructions in the Surplus Property Act. In the letter to the 35,000 companies, Maury Maverick, SWPC chairman and general manager, says to find needed machine tools in government surplus stocks and also to lend money when needed to expedite purchase of the tools. One of the purposes of the inquiry, Mr. Maverick says, is to ascertain the size of the overall small plant machine tool requirements. In urging small plant managements to list their needs, Mr. Maverick states in his letter that the average machine tool in small plants is 15 years old, and that tools in these plants are over 30 years old. If small plants hope to survive in the postwar era, the letter says, they must be modernized.

New Steel Wage Demands Will Be Made This Week

Move for higher steel wages, to offset loss of overtime pay due to the 40-hour work-week, will be opened officially this week when the wage policy committee of the United Steelworkers of America convenes in Pittsburgh, Sept. 11.

While details of the steelworkers' demands have not yet been revealed, and are only not formulated, recent statements of union officials indicate the union will start with a demand for a 25 per cent increase in hourly rates. This would give workers the same take-home pay for 40 hours' work that they have been receiving for 48 hours.

Such increases already have been won by the United Automobile Workers and other CIO unionists.

In announcing the policy committee action, President Philip Murray said the union will ask the companies to engage in collective bargaining and declared flatly that it was the union's intention to kick the Little Steel wage formula "out the window."

The last meeting of the steelworkers' wage policy committee was held in December, 1943, and out of it came demands for a 17-cent hourly increase and other demands, which after extended hearings before the War Labor Board resulted in an 8-cent increase through fringe issues.

This and other increases have so raised steelmaking costs that industry earnings have decreased steadily during the war, despite capacity operations and despite high demand for premium-priced war products. Actual losses have been incurred on many carbon products which will form the bulk of peacetime demand and the industry now has pending before the Office of Price Administration a request for adjustment of prices.

Truck Producers Must Still File Production Reports

Although restrictions on quantities and types of trucks and truck trailers have been removed, producers are still required to report on production and forecast of production. Production of both military and commercial trucks will continue to be reported on form WPB-4291 or some other form designated by the War Production Board.

Use of Lead in Batteries Cut Further by WPB

Many prewar users of lead will not be able to obtain a sufficient supply of that metal in the immediate future, despite the end of the war, War Production Board said recently. Order M-38, which restricts delivery and controls the use of lead and lead products, has been amended to limit the antimonial lead that may be used for storage batteries to 9 per cent antimony content, except where specified for contracts for the Army, Navy, Maritime Commission, or the War Shipping Administration in which an alloy with a higher antimony content is mandatory.

Present, Past and Pending

■ PONTIAC BEGINS RECORD EXPANSION PROGRAM

DETROIT—Pontiac Motor Division, General Motors Corp., has begun an expansion program which will enable it to produce 500,000 automobiles a year. Expansion of the foundry alone will cost $3,081,365, following a $1 million program four years ago. Engine, axle, assembly and sheet metal plants and heat-treating and car shipping departments will be enlarged.

■ $10 BILLION WAR PRODUCTION SCHEDULED TO MID-1946

WASHINGTON—War production still scheduled to the middle of 1946 totals about $10 billion, or about one-third of the total in force as of Aug. 1, WPB reported last week. Total contracts will not fall below $2 billion until the first quarter of next year. September production is scheduled at $1.6 billion. 1945 production is now estimated at about $39,200 million.

■ FORD'S BUFFALO PLANT PLANS RECORD OPERATIONS

BUFFALO—Ford Motor Co.'s plant here will reach a new output peak of more than 450 vehicles a day and a new employment peak of 2200 workers before the year end, Robert F. Leonard, plant manager, said last week.

■ ATOMIC POWER EVENTUALLY MAY DRIVE GAS TURBINES

NEW YORK—Application of atomic power to drive gas turbines is visualized by many members of ASME committee as one of first industrial uses. New source of energy will supplement present fuels.

■ BURLINGTON ORDERS TWO ZEPHYRS, TEN LOCOMOTIVES

CHICAGO—Chicago, Burlington & Quincy railroad has ordered more than $6,500,000 worth of new passenger car equipment, including two Zephyrs to be built by the Edward G. Budd Mfg. Co. The railroad has ordered ten new 4000-horsepower diesel locomotives from Electro-Motive Division, General Motors Corp.

■ STEEL MILL SOFT COAL ESTIMATED NEEDS REDUCED

WASHINGTON—Estimated soft coal needs of steel mills for coke ovens during year ending March 31, 1946, have been lowered to: Beehive, 5,700,000 tons; by-product, 86,500,000; rolling mills, 10,000,000; coal gas retorts, 1,500,000. Total industrial needs of 585 million tons may not be produced due to manpower shortage.

■ REYNOLDS METALS TO BUILD $1 MILLION LABORATORY

RICHMOND, VA.—Reynolds Metals Co. plans to construct a $1 million research laboratory at Cambridge, Mass., according to R. S. Reynolds Sr., president.

■ HIGH-ALLOY CASTING PRICE SCHEDULE REVISED

WASHINGTON—Office of Price Administration has established foundries' ceiling prices on sales of "short orders" of high-alloy castings.

Tremendous Industrial Expansion During War Shown in WPB Report

Years 1940-1944 witnessed greatest expansion of industry in any five-year period in history. Output more than doubled. Growth in metalworking gives it greater proportionate share of total employment and national production

ACHIEVEMENT by the United States of a volume of war production that astounded the world, while at the same time total civilian production was maintained at prewar levels, is pictured in a report released last week by the War Production Board.

The report covers in detail United States production from 1939 through 1944, with tables and charts.

The years 1940 through 1944 marked the greatest expansion of industry—manufacturing, mining and construction—of any five-year period in the history of the country. Industrial output more than doubled. This compares with a long-term average growth of about 4 per cent a year, with a 7 per cent annual increase during the last war, and with an 8 to 12 per cent rate during the years of most rapid peacetime expansion.

The report attributed this expansion to three factors: (1) Increased utilization of available production resources (two and three-shift factory operations, longer hours for labor, etc.); (2) the diversion of resources from other sections of the economy to industry; and (3) an increase in productivity of the resources used in industry (more production per man-hour, per machine-hour, per ton of raw materials).

From 1940 to 1944, over $25 billion was invested in new plants and equipment, increasing the country's industrial capacity by at least 40 per cent. In addition, utilization of industrial facilities, as measured by machine-hours per week, rose well over one-third above prewar levels.

Raw Materials Production Rose

The production of industrial raw materials increased more than 60 per cent during the war. For example, 1944 production of steel ingots was more than 70 per cent greater than in 1939 and nearly 50 per cent above the previous peak year of 1929, while the output of light metals and certain chemicals soared to many times their prewar levels.

Between 1939 and 1944, the total number of persons available for either civilian employment or military service increased nearly 20 per cent. Industrial employment rose at more than twice that rate in the aggregate, and the employment rise in the munitions (metal and chemical) industries was no less than 150 per cent. This expansion in industrial employment, plus an increase of about 20 per cent in the work week, meant that total man-hours worked in industry in 1944 were about 75 per cent greater than in 1939.

Wartime expansion of output led to a very pronounced improvement in the financial position of American industry, the report continues. Profits before taxes rose about 350 per cent, and profits after taxes, 120 per cent, far exceeding the 1929 level. Net worth increased about one-third. Net working capital doubled. Smaller firms have, on the whole, bettered their financial position about as much as the larger businesses, the report said.

The expansion of the last five years was much greater for some segments of the economy than for others. Particularly significant was the growth of the industrial sector, which accounted for 38 per cent of the national income in 1944, compare with 29 per cent in 1939. Within i dustry itself, the outstanding shift w from civilian-type commodities to mu tions. Late in 1944 about one-third of t total output of manufacturing industr consisted of combat munitions and oth special military items as against o about one per cent in 1939. In additi the armed services received large quan ties of civilian-type industrial co modities. Expansion of total industrial o put, however, was so large that in t aggregate the civilian market was ab as amply supplied in 1944 as in 19 although somewhat less well than in 19

While almost all industries expand to some degree—virtually the only exce tions were printing and publishing, a parel and shoes—the sharpest occurred in aircraft, shipbuilding, plosives and light metals, in which p duction multiplied from 20 to 35 ti between 1940 and 1944. As a result, th industries came to employ over 20 cent of the total industrial labor force the latter part of 1944, compared w an almost negligible proportion in 1939

Regional shifts, the report points o were much less marked. Although Pacific Coast states made the most st ing advances, the center of United Sta

HEALTH IN INDUSTRY: A new program to explore industrial hazards and control tuberculosis is sponsored by New York City Department of Health and New York State Department of Labor, utilizing equipment provided by U. S. Public Health Service. Production line techniques are being applied here with a mass-chest-radiography unit developed by North American Philips Co. Inc., Dobbs Ferry, N. Y., to handle large numbers of plant workers rapidly

facturing has remained where it was re the war, in the northeastern and central states. Shifts among cities e been somewhat more pronounced, ough only a relatively few of them—ely shipbuilding and aircraft centers ave expanded much more than the al average.

The report notes that only certain ects of the wartime expansion of in-try seem in line with the trends ob-ed in the 30 to 50 years before the . The higher productivity, the shift dustry toward the West and South-, the rising proportion of women in abor force, and the increase in the of large plants in total employment ue prewar trends. But many of the s that have accompanied the wartime sion of industry do not seem to be eeping with long-term tendencies: example, the increasing share of in-y in providing employment and in ributing to the national income, ex-n of the work week, and the rising tion of the population at work. e most important of the shifts run-contrary to long-term trends is the rdinary expansion of the metal-ng industries, giving them a greater of total employment and national t than ever before. Hence, the re-uggests either the rest of the civilian my or exports, or both, would have and after the war to permit the facilities and labor force of the industries to be fully utilized.

Steel Order Cancellations Less Than Expected at Pittsburgh

STEEL order cancellations have been substantial since V-J Day, but they have not been in the volume anticipated. As a matter of fact a surprisingly large tonnage has been retained on mill books, consumers seeking to hold their positions on rolling schedules wherever tonnage on order can be utilized in the production of civilian goods.

The bulk of cancellations at Pittsburgh has been in far forward delivery tonnage. This has enabled producers to get their schedules in order to accommodate the flood of civilian business which has been pouring in on them. So heavy has been demand in certain items, such as sheets and strip, that some producers are understood to have set up a sort of quota system so as to assure equitable distribution of available tonnage.

Last week the War Production Board announced that manufacturers need not return allotment tickets for controlled materials when they are no longer needed. It pointed out that as the result of freeing steel, copper and aluminum through cancellations and the imminent expiration of the Controlled Materials Plan, scheduled for Sept. 30, the allotment routine was no longer necessary. WPB effected the action by issuing Direction 77 to CMP regulation 1. The provisions of the direction supersede contrary provisions of CMP regulation 1, concerning the return of unneeded allotments.

The main problem in war contract settlement at present is to make sure contractors with terminations file their claims promptly.

To facilitate settlement of war contract claims, contracting agencies have been directed to provide direct settlement on a company-wide basis. Under this program a contractor has all of his termination claims settled by a single settlement team of a single contracting agency. Claims under both prime and subcontracts and against all agencies and their contractors are covered. Company-wide settlement will be extended only to a limited number of contractors.

Army Service Forces are stockpiling triple alloy scrap, containing over 1 per cent alloying material, that cannot be sold at near ceiling price levels, at Ravenna, O., and a number of other centers throughout the country, to conserve the nickel, chromium and molybdenum for possible future use.

eel Industry's First-Half Earnings Show First Rise since 1941

OR the first time since 1941, the industry's net earnings increased first six months of 1945 over those e corresponding period of the pre-a year.

mbined net earnings of 16 com-, representing 84 per cent of the y's ingot capacity, for the first of 1945 totaled $87,316,316, a 12 cent increase over the $78,149,175 ed by the same producers in the like period of the previous year.

The increase results largely from reduction in the amount of funds set aside for federal taxes and from a decline in expenditures for interest on debt.

Of the 16 companies, 14 set aside $158,644,893 for federal taxes for the first half of 1945, compared with $172,039,042 in the corresponding period of 1944. This represents an 8 per cent decline and marks the third consecutive year that provision for federal taxes by the industry for the first half year has been lower than that in the corresponding period of the previous year.

Combined net earnings in second quarter of 1945 for the 16 companies amounted to $45,377,042, exceeding those of the second quarter of 1944 by $6,371,713 or 16 per cent and surpassing those of the first quarter of 1945 by $3,437,768 or 8 per cent.

	Net Profits					Federal Taxes	
	First Quarter 1945	Second Quarter 1945	Second Quarter 1944	First Half 1945	First Half 1944	First Half 1945	First Half 1944
d States Steel Corp.	$15,379,171	$16,774,202	$15,354,917	$32,153,373	$32,382,533	$30,500,000	$49,000,000
erem Steel Corp.	7,695,909	8,041,682	6,733,843	15,737,591	13,166,381	42,550,000	49,800,000
ublic Steel Corp.	3,084,548	3,271,703	2,058,654	6,356,251	4,275,265	21,725,000	16,950,000
s & Laughlin Steel Corp.	2,013,489	2,357,524	1,879,835	4,371,013	3,588,187	6,948,000	5,178,000
stown Sheet & Tube Co.	1,959,412	2,190,260	1,798,017	4,149,672	3,434,386	8,680,000	8,423,000
ional Steel Corp.	3,429,988	3,453,183	2,863,315	6,883,171	5,413,458	17,725,000	9,725,000
ard Steel Co.	2,472,734	2,943,490	2,659,022	5,416,224	5,171,418	8,706,000	9,546,000
erican Rolling Mill Co.	1,875,503	2,071,925	1,212,456	3,947,428	2,441,491	7,424,110	4,390,542
ding Steel Corp.	1,201,881	1,131,710	1,068,671	2,333,591	2,061,616	3,096,000	2,524,000
Steel Co. of America	803,558	397,721	1,482,517	1,201,279	2,761,819	6,185,783	12,155,000
on Steel Corp.	301,760	364,793	141,233	666,553	307,745	1,740,000	1,070,000
Wood Steel Co.	8,893*	74,958	126,404	66,065	204,233	38,000	289,000
eny Ludlum Steel Corp.	936,690	1,027,097	800,110	1,963,787	1,665,175	.....	5,841,000
ental Steel Corp.	151,892	208,672	167,574	360,564	323,380	315,000	228,500
Iron & Steel Corp.	448,914	638,381	470,921	1,087,295	1,024,989	3,012,000	2,760,000
ugh Steel Co.	192,718	429,741	187,840	622,459	72,901*	.....	.....
Totals	$41,939,274	$45,377,042	$39,005,329	$87,316,316	$78,149,175	$158,644,893	$177,880,042

*Loss.

Numerous Job Openings Reported In the San Francisco District

Unemployment is not an immediate postwar problem in area for several reasons. Region had its big reconversion shakeout months before the war ended. More positions now available than there are workers to fill them

SAN FRANCISCO

UNLIKE many another war-boomed center, unemployment in the San Francisco area is not an immediate postwar problem. There are several reasons.

Most important is the fact that this region had its big reconversion shakeout months before other parts of the country. Last spring and in early summer shipyards began nearing the end of their contracts and started laying off men in large numbers. Most of these discharged workers were absorbed quickly in other industries, and approximately a fourth left the area to return to their prewar homes in other sections of the country.

As a result, when the end of the war came, San Francisco had already passed the worst of its dislocation.

Secondly, there is the fact this area still is chief port of embarkation for occupation and replacement forces being sent to the Pacific and the supplies necessary to support them while they remain there. It also is the homecoming port for thousands of soldiers and sailors who will be coming home during the next year or two.

Third, San Francisco is the chief ship repair base on the West Coast, an activity which is expected to continue at a high rate for months to come.

Meanwhile, industries which had been pressing for workers during the war years are absorbing laid-off workers. Even so, more jobs remain available than there are people willing to work at them.

24,000 Workers Needed

It is estimated that the immediate need for labor totals 24,000 persons in the San Francisco Bay area.

A large part of this total is in service industries. However, essential operations also still need men. For example, 3000 to 4000 railroad workers could be placed immediately. Skilled mechanics are needed badly and building trades are facing an acute shortage of laborers.

Needs of civilian industries are expected to increase steadily during the next year and it is likely that 50,000 more workers will be required in addition to the 24,000 people immediately needed.

Two well-defined trends have become apparent in re-employment thus far. Employers are becoming more selective in the choice of workers. Workers themselves, after the first war's end rush to get settled in new jobs, are tending to be a little more choosey too.

Generally there hasn't been too much argument over wages. Most individual workers have shown a tendency to accept lower peacetime scales. However, union leaders have been taking a firmer stand in demands for pay raises to keep take home wages at wartime levels now that the 40-hour week is replacing the previous 48 hours.

There is considerable discussion of CIO proposals that workers fight for a 40-hour week with 48-hour pay. Nothing definite in the way of demands on this score has been made up to now however.

Shipyard unions have started a campaign for a 30 per cent increase in wages, which would figure out to an average raise of about $20 a week in pay. It is said such an increase would just about offset the loss of 8 hours a week in th time readjustment.

Building trades also are negotiating fo wage increases which average out about 15 per cent.

Expect Rapid Reconversion In Pacific Northwest Area

SEATTL

War plants in this area are reducin working forces and terminating subco tracts, and as soon as adjustments a completed, it is expected reconversi will be rapid.

The Army has canceled 186 constru tion jobs and purchase orders totali about $2 million, including a flight t hangar at Boeing Field estimated to c $1,283,000. The Navy's cancellatio have been equally heavy and inclu shipyard, machine shop, fabricating, a plane and other plants.

The effect of the surrender of Jap has been cushioned by the large numb of war workers who have voluntarily t minated here and left for their hom in the East and South. In the first we after V-J Day, there were 9700 termin tions at Seattle, 6750 at Vancouv Wash., 6500 at Tacoma, 1400 at the Na Yard, 650 at Everett, 400 at Spokan 200 at Chehalis, 100 each at Mt. Ve non and Aberdeen.

Many Idle Workers Ignore Job Openings i Southern California Because of Lower Pay

LOS ANGELES

IN A breakdown by communities of employment terminations in southern California, the Los Angeles office of the War Manpower Commission last week concluded that for every three persons discharged, jobs for two await the taking.

A total of 83,000 layoffs have been reported since the Japanese surrender. Last week 15,000 workers were placed in new jobs and job openings remain at 50,000, according to Raymond Krah, acting WMC director in southern California.

In addition, 10,000 have been laid off in San Diego.

Many jobs still remain unfilled because former war workers in many cases refuse to accept wages less than those paid by munitions plants.

Checks at border stations show that war workers are still departing from southern California in large numbers, headed for midwestern and eastern states.

According to official estimates, about 75 per cent of the migrants will return to the West Coast after visiting relatives and home town areas in their native states. This is based upon questions asked typical travelers at variou border points.

Complete listing of war plants in th Los Angeles area regarded as availab for possible sale are being compiled b the Chamber of Commerce. James Bone, manager of the chamber's indu trial department, said last week th engineers of his staff will leave short on trips to the Midwest and East to pr sent findings in person before interes ed groups.

The study includes sources of raw ma terials and markets for finished product It covers eleven western states and man foreign countries within easy shippin distance of Los Angeles county harbor

About 6 per cent of the national wa time production of ships was center in Los Angeles, although the city h but 4 per cent of the national wartim expansion.

This comparison keynoted a talk b Louis M. Dreves, southern Californ head of the WPB, before the Los A geles Rotary Club last week. Mr. Drev declared Los Angeles now is ready f an industrial growth as large as, for i stance, that registered in Cleveland Toledo.

eel Institute Technical Papers iscuss New Production Problems

Increased use of pig iron in open hearths to offset lack of scrap, progress report on hardenability bands, Witter process for shell forgings, and manufacture of fine steel wire are among subjects in 1945 yearbook

RTIME need for using more pig n making open-hearth steel to off- e reduced supply of scrap imposed roblems of raw materials selection, ing to Clyde Denlinger, Bethlehem Co., in a paper prepared for the Yearbook of the American Iron & Institute, New York.

er papers to appear in the Year- are "Progress Report on Hardena- Bands," by John Mitchell, metal- al engineer, Carnegie-Illinois Steel Pittsburgh; "The Witter Process ell Forgings and the Spinning Proc- Bombs," by J. L. Johnson, chief ch engineer, National Tube Co., y Park Works; and, "Manufacture e Steel Wire and Some of Its War tions," by J. R. Thompson, man- metallurgical department, Ameri- el & Wire Co.

Denlinger points out that the selec- the iron ores used in the open- furnace to counteract the addi- amount of carbon present in pig as compared with the amount of present in the conventional scrap- , has presented several problems. oncerns the grade of the ore, such (fine), hard (lump), briquetted er grades. Another relates to the s. Some ores contain more moisture hers; some are relatively high in ted compounds such as silica. A ype covers the preliminary treat- of some ores to get them into suit- ndition for use in the furnace. A s can be mixed with blast furnace and then heated to yield a satis- porous sinter. Others can be mixed oll scale, an iron oxide that forms h temperature on rolled steel.

Mitchell announced that con- and producers of alloy steels, their wartime experience, have ded the first phase of a joint in- of an improved method of ing and testing various types of eels.

purpose of the investigation is to consumers to describe more com- what conditions of hardness they in finished alloy steel products so eelmakers can supply exactly what ted to a greater precision than . The study is being conducted esentatives of the Society of Auto- ve Engineers and the American Iron Institute Technical Committee on Steel.

joint study is developing a method of specifying how hard the steel should be, at the center of various sized rounds, after specimens of the steel are heated and quenched according to a detailed procedure. This method approximates actual conditions of use, for a large part of the alloy steel used is hardened or otherwise heat treated by the consumer.

Output of shells and bombs was trebled in steel plants and important savings in manpower and steel were effected as a result of the introduction of the Witter process for making shells and the spinning process for bombs, according to Mr. Johnson.

In making a 3-in. shell the Witter process starts with a heated steel slug shaped like a thick tube closed at one end. Three rolls "cross-roll" or knead the heated metal to reduce the wall thickness and lengthen the slug. The resulting "cup" is pushed through a sizing die to give it the desired dimensions before it is machined to the finished dimensions.

The spinning process for making 100 and 200-lb aerial bombs from steel tubes gets its name from the way it spins or forms the nose and tail sections of the bombs. One end of a seamless tube is placed in a furnace until it is hot enough for forgings. The tube is then placed in a machine which spins it at a high rate of speed. A shaping wheel or tool, rotated by frictional contact with the spinning tube, forms the desired contours.

Communication systems that kept personnel and supplies on the move along Pacific battle fronts required tremendous amounts of fine steel wire, reports Mr. Thompson. About 1,300,000 miles of one size of wire, almost as thin as a playing card, are required for a month's production of the Signal Corps' 7-wire strand used in communications.

Steel wire 0.013-in. in diameter is used for the communication strand. As four of these wires are twisted around three copper wires to make the strand, the wires must be tough enough to twist satisfactorily. Each individual wire must be able to support a load of 37 pounds, equivalent to a strength of about 140 tons per sq in. of wire cross section.

TRANSITION TOPICS

BRITISH SOCIALISM— Labor party's program calls for eventual nationalization of iron and steel industry, but plans are indefinite, may never mature. Coal mining and Bank of England are first on party's agenda. See page 75.

MACHINE TOOLS— Sales of government-owned surplus items not yet affecting new tool sales. Builders' backlogs sufficient for seven months' operations at present rate. See page 78.

WAGES— New steel wage demands to be formulated by union this week. Steelworkers will seek to maintain wartime take-home pay with shorter work-week. See page 79.

WAR LABOR BOARD— Agency for settling wartime disputes and controlling wages prepares to disband, but some policies established during emergency will linger on. See page 84.

DEVASTATED EUROPE— Huge reconstruction task necessary on war-torn Continent. Cost of rebuilding Berlin alone estimated at 10 billion marks. See page 88.

AIRCRAFT— Planemakers designing in terms of function. New development will make great commercial air fleets possible. Present military craft will be made obsolete quickly. See page 98.

ELECTROPOLISHING— Summary of current status of electrolytic polishing process shows why some producers of consumer articles may use it for new finishing effects and possible economies. See page 104.

"CANNED" GUNS— Open-field storage of ordnance items, with full protection for any period up to 50 years, promised by new method of packaging. See page 112.

ACTION X-RAYS— Field emission technique used to study action of projectiles may lead to radiography of valve components in operation and other industrial subjects. See page 120.

WLB Prepares To Disband After Postwar Labor Policy Is Evolved

Management, union and government representatives to discuss new set-up for handling labor disputes at forthcoming conference. United States Conciliation Service expected to be built up within Department of Labor

EAGER to wind up their wartime service and move back to the companies, labor organizations and various institutions by which they normally are employed, members of the National War Labor Board have decided on a course of action aimed at complete liquidation of this agency. They hope it can be disbanded immediately after the pattern of postwar labor policy of the government is set at the coming management-labor conference to be held at the invitation of President Truman.

At a White House conference Secretary of Labor Lewis B. Schwellenbach and Secretary of Commerce Henry A. Wallace have been asked by the President to draw up the agenda of the meeting. Preliminary talks by the two secretaries have resulted in a tentative agreement that the meeting will be held in Washington, and that arrangements should be made in time to permit it to be held around Oct. 15.

Tentative plans provide for limiting attendance to a comparatively small number—possibly not to exceed 24. There is a possibility that the invitations to attend will be issued at the assignment of Eric Johnston, president, Chamber of Commerce of the United States; Ira Mosher, president, National Association of Manufacturers; Philip Murray, president, Congress of Industrial Organizations, and William Green, president, American Federation of Labor.

It is understood that the conferees will not be asked to renew their no-strike, no-lockout pledge since, in the administration's opinion, it would not be proper under our democratic form of government, to seek such a pledge now that the period of war emergency is over.

But all indications are that the administration will hand the conference a large assignment. It will ask for nothing less than a complete proposal as to what functions shall be set up by the government with reference to settling management-labor disputes in the postwar period. In a statement on Aug. 16, President Truman revealed a plan to bui up the United States Conciliation Ser ice in the Department of Labor, and t plan is to be submitted for discussion the conference.

Under the President's executive ord of Aug. 18, on reconversion, the NWL will continue to function during t interim period. Under instructions this order it is to approve wage increa during this period in order to corr gross inequities or maladjustments "wh would interfere with the effective tra tion to a peacetime economy." At t same time, the President's statement Aug. 16 made it clear that the NWL is to serve only until the postwar gove ment setup has been formulated at coming conference. To carry out President's program, and also to has their return to their normal activit members of the board, according to announcement by Chairman George Taylor, have agreed on the follow policies:

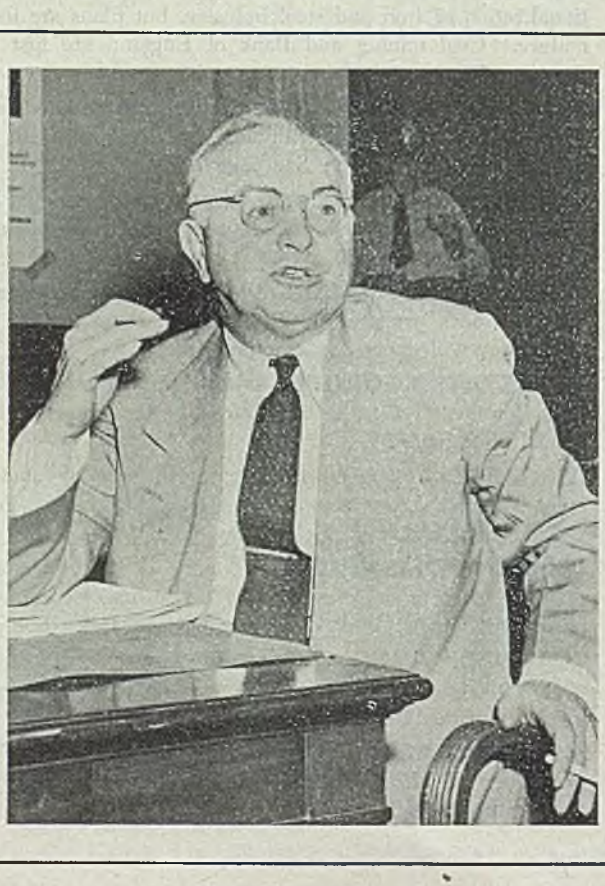
1—The board has instructed its gional boards to redouble their efforts decide speedily the approximately 3(dispute cases now pending which w certified by the Department of La prior to Aug. 18. The regional boa will request the parties involved to to settle their cases by direct negotiati under the revised wage stabilization li licy which permits wage or salary creases without WLB approval as l as they are not made the basis of quests for price increases.

2—In new dispute cases the part will be urged to reach agreement throu collective bargaining procedure and wi out recourse to governmental pro dures; if the parties involved cann negotiate a settlement, they will be urg to refer the dispute to arbitration where the dispute lends itself to t method of disposition. The regio boards of the WLB and the Departme of Labor's Conciliation Service will wo together to encourage the parties to all means of reaching a settlement wi out recourse to the government.

3—If the foregoing measures fail, t parties to a dispute should, if they d sire further governmental participati in their settlement, agree to submit to the War Labor Board for final a binding determination.

Originally the War Labor Boa largely to expedite liquidation of program, declared its unwillingness accept new dispute cases from the sec tary of labor unless the parties in ea case agreed beforehand that they wou abide without question by the WL decision. Previous experience had d monstrated that when either of t parties in a dispute hesitates to acce the decision of the board, much del results.

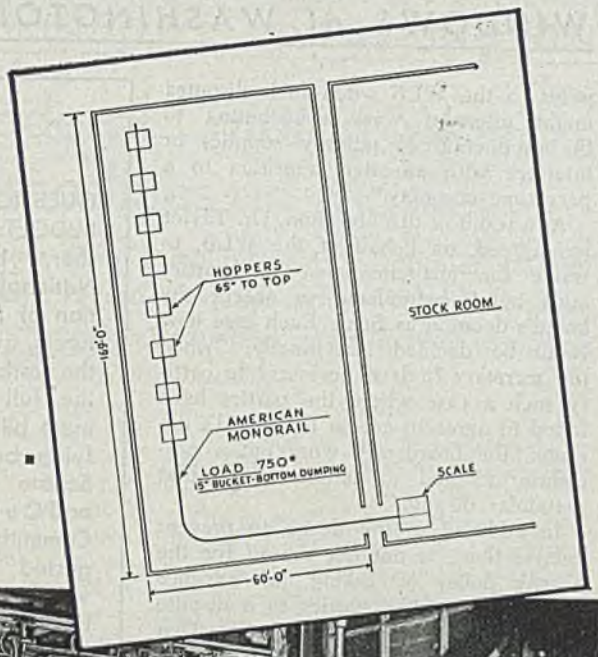
Judge Schwellenbach objected to t stipulation on the ground that the Pre dent's executive order of Aug. 18 l him no choice but to refer labor d

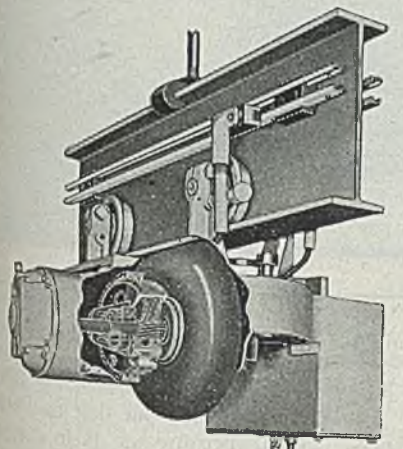


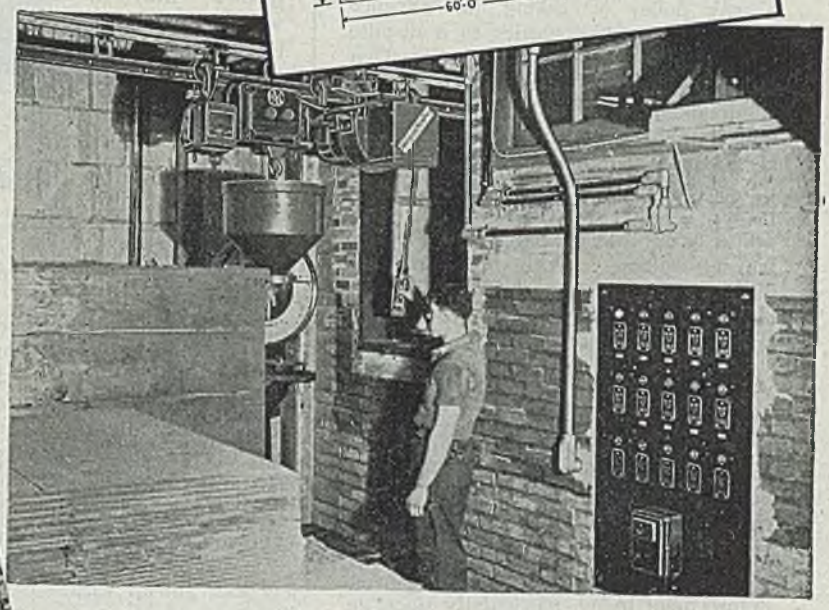
WOULD UP JOBLESS PAY: Sen. Harley M. Kilgore (Dem., W. Va.) is author of a bill which provides for the federal government to supplement state unemployment compensation payments up to $25 a week, in line with President Truman's recent recommendation. NEA photo

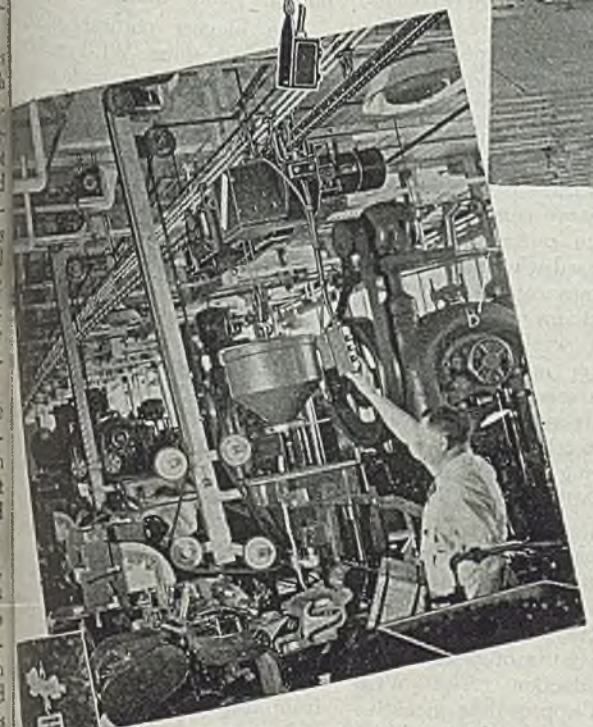
American Mono Tractor *Automatically*

Feeds 15 Stations . . . . .









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putes to the WLB when such disputes might interrupt work contributing to the production of military supplies or interfere with effective transition to a peacetime economy."

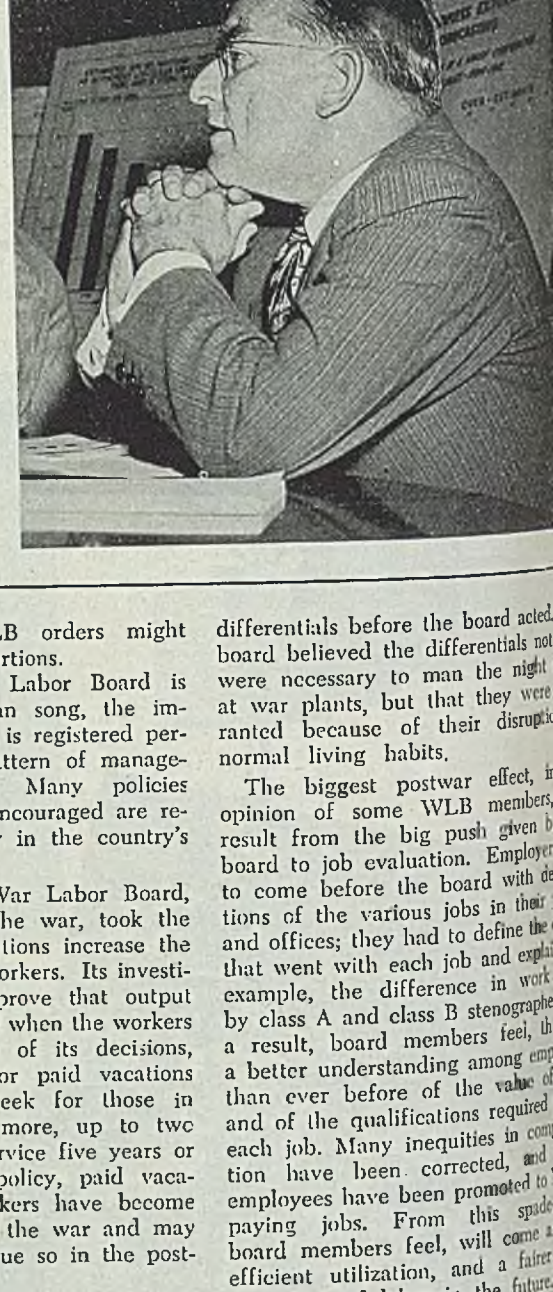
As a result of this objection, Dr. Taylor has agreed, on behalf of the WLB, to waive the insistence that the parties must agree beforehand to accept the board's decision as final. Each case now is to be decided individually; "when the secretary finds it necessary to certify such a case where the parties have failed to agree to accept the board's decision, the board will work out a procedure adapted to settlement of that particular dispute."

In addition to the desire to prevent delays, there is another reason for the board's policy of asking an advance agreement that the parties to a dispute will abide by the board's decision. That is the board's fear that a wave of noncompliance might develop at any time now that the war is over. On numerous occasions WLB spokesmen have made it clear that the only authority for expecting "voluntary" compliance with its orders was the wartime no-strike, no-lockout pledge. Although President Truman, in his statement of Aug. 16, declared that "I shall expect both industry and labor in that period (the interim period) to continue to comply voluntarily, as they have in the past, with the directive orders of the War Labor Board," and although the President called upon both labor and industry to renew the no-strike, no-lockout pledge for the interim period, the fact remains that no such pledge is in existence today.

In other words, there is no means of enforcement today, particularly since the President has intimated that no more plant seizures would be ordered in cases of noncompliance. Without any basis for demanding enforcement, excepting upon moral or patriotic grounds, therefore, the desire of the board for advance agreements that its decisions will be accepted is readily understandable.

Uncertainty in Reconversion

This matter of obtaining compliance might be complicated in the near future by the board's authority to grant wage increases even when they might force price increases. Dr. Taylor recently indicated that even the Little Steel formula now may be thrown out the window. In looking ahead to the immediate future it is generally realized that the reconversion period will be a period of uncertainty at best and, while great prosperity generally is expected in the real postwar period ahead, the reconversion period may reflect decided changes in attitude from one week to another. For instance, a wage increase that might seem desirable today might seem less desirable a week or so ahead, or a wage increase that looks good today might seem too small in the near future. In such a fluid situation noncompliance with WLB orders might reach substantial proportions.



QUESTIONS JOB BUDGET: Ira Mosher, president, National Association of Manufacturers, questioned the workability of the full employment bill in testifying before the Senate Banking and Currency Committee, suggested that it would put a brake on free enterprise. NEA photo

Although the War Labor Board is about to sing its swan song, the imprint of its handiwork is registered permanently upon the pattern of management-labor relations. Many policies which it initiated or encouraged are reflected quite generally in the country's industries.

For instance, the War Labor Board, at the beginning of the war, took the view that annual vacations increase the efficiency of factory workers. Its investigations appeared to prove that output of war plants increased when the workers had vacations. Many of its decisions, therefore, provided for paid vacations ranging from one week for those in service one year or more, up to two weeks for those in service five years or longer. Under this policy, paid vacations for factory workers have become rather general during the war and may be expected to continue so in the postwar era.

The WLB also gave its blessing to incentive wage systems. It threw out many so-called "phony" demands where straight pay increases were recommended under the guise of being aimed at increased production. The WLB uniformly gave its approval to incentive wage systems where it could be shown that increases in pay to the workers increased production without increasing unit labor costs.

The board also established a policy of paying higher wages for night workers than day workers. It evolved a general rule of allowing a differential of 5 cents an hour for the second shift and of 10 cents for third shift — with variations in communities which had established differentials before the board acted. board believed the differentials not were necessary to man the night at war plants, but that they were ranted because of their disruptic normal living habits.

The biggest postwar effect, i opinion of some WLB members, result from the big push given b board to job evaluation. Employer to come before the board with de tions of the various jobs in their and offices; they had to define the that went with each job and explai example, the difference in work by class A and class B stenographe a result, board members feel, th a better understanding among emp than ever before of the value of and of the qualifications required each job. Many inequities in com tion have been corrected, and employees have been promoted to paying jobs. From this spade board members feel, will come a efficient utilization, and a fairer pensation, of labor in the future.

WLB spokesmen point with pr their record of accomplishment. I time lost from labor disputes, they out, was 0.1 per cent of total worked whereas in 1937 the tim from disputes was 0.5 per cent times as much. In the years 1939 and 1941 the average strike laste days; in 1944 it lasted 5.5 days. members are not at all dismayed o reminded that there were 4496 st 1944—the largest number in they reply that there were more working in 1944 than ever be history and the chances for strik more numerous.

WLB spokesmen contend al

pay increases they authorized were ch smaller in amount than popularly posed. Their statistics show that the rage increase they allowed in dis- ng of about 500,000 applications ring the entire war was close to 6 cents hour. The average increase they al- ed in settling some 18,000 dispute es was about 5 cents an hour.

eelworkers Wait for eport on Annual Wage

ited Steelworkers of America-CIO not renew its demand for a guaran- wage in the steel industry in the diate future but will wait until such as the director of war mobilization reconversion, William H. Davis, sub- a report as called for last year by ident Roosevelt. All that the USA-CIO n mind at this time in reopening con- in the steel industry is to take up possibility for higher wages as per- under the Aug. 18 executive order President Truman.

ur S. Meyer and Murray Latimer, ly appointed by the OWMR's ad- y board, at the suggestion of a study ittee headed by Eric Johnston to do search work on the guaranteed wage al, are still in the organizational Indications are that considerable at least six months to a year—and s longer—will be required to reach ard conclusions as to the practica- of the guaranteed wage plan if ed by any important cross-sections stry. To permit a successful guar- wage plan, for example, a certain of economic stability is regarded as ; to cover the subject matter thor- , therefore, it may be necessary to the study out to include a wide of economic experience and in- ion.

study is to be conducted along lines, Mr. Meyer is slated to explore bilities in conferences with repre- es of industry. Mr. Latimer will the possibilities as they may be re- ed by analysis of economic factors in- .

p Murray, president of the United kers, as well as of the CIO, is associated with the supervision guaranteed wage study; he is a er of the study committee at whose ion Messrs. Meyer and Latimer ed their appointments.

vers 81 Per Cent on plus Marine Item Sales

and used surplus marine prop- disposals, including transfers to agencies, amounting to $11,599,746 reported returns of $9,385,275 for ery of 81 per cent of reported ge announced last week by the ed States Maritime Commission for ded June 30, 1945. Inventory bal- on that date was $8,845,311.

Proposed Federal Catalog Would List All Commodities on Market

Listing would include some 5 million items. Designed to provide more systematic records and procedures for government procurement, statistical and accounting agencies, but would be adaptable for use by private industry

CONGRESS this fall will be asked for authorization and an appropriation to permit execution of a project which not only will make for more efficient statistical work and bookkeeping by federal agencies but which should prove of value to private industry. This is the preparation of a United States Standard Commodity Catalog to list millions of commodities which the federal government now procures. Inasmuch as the federal government today buys every product that is produced, the proposed catalog will list every product that is on the market.

The move to compile a United States Standard Commodity Catalog originated in a letter in which the late President Roosevelt, on Jan. 18, 1945, pointed out that the government was in need of more systematic records and procedures for use in all transactions requiring a description of items of real and personal property.

"The large number of actions relating to the acquisition, care, use, and disposal of federal property," he wrote, "has greatly accentuated the need for this improvement in governmental practices, both for the effective prosecution of the war and for the more orderly conduct of peacetime affairs . . . . This plan should include a uniform property classification and a uniform item identification system, covering all commodities . . . . for use throughout the government in all relevant activities involving the procurement, storage, issue, disposal, or intra-government transfer of property, the listing or cataloging of property, and the collection and tabulation of commodity information."

Valuable to Private Industry

While the contemplated United States Standard Commodity Catalog is to be compiled specifically for use by government procurement, statistical and accounting agencies, those working on the project say that the catalog will be of great usefulness to companies in private industry which frequently spend hundreds of thousands of dollars to work up identification systems for controlling production, sales and inventory, and for compiling needed statistical records. When the new United States catalog is published, Budget Bureau spokesmen say, private companies will find it a complete list of commodities, and commodity identification numbers, available at the price that will be charged for copies of this book when available from the Government Printing Office. Furthermore, the work will be kept up-to-date as a result of continuous study by a permanent inter-agency board.

The undertaking breaks down into two distinct jobs. One is the actual creation of the catalog. The magnitude of this endeavor can be suggested by explaining that the new work is to supersede 17 existing federal catalogs which have been compiled in years past by such agencies as the Treasury Procurement Division, the Army Quartermaster, the Army Surgeon-General, the Army Air Forces, Navy Bureau of Ships, etc. The 17 existing catalogs list some 5,000,000 items altogether.

How long it will take to replace these existing lists by one comprehensive catalog can only be estimated. There not only is a huge amount of strictly clerical work to be done. In addition, careful checks will have to be made with manufacturers, engineers and others from private industry, as well as with representatives of all the interested federal agencies, to make certain that all products, particularly new products, are listed. Assuming that Congress authorizes the work, and grants an adequate appropriation without delay, it probably will be 1947 or 1948 before the unified catalog is published.

Commodity Classification Revision

The other of these two jobs is that of bringing up-to-date the United States Standard Commodity Classification. Fortunately, most of the spade work in setting up such a classification has been done as a result of co-operation by the Bureau of the Budget, the War Production Board and the Treasury Procurement Division early in the war. This led to the publication, in 1943, of the current Standard Commodity Classification, Vol. I, and, in 1944, of Standard Commodity Classification, Vol. II. The first volume combines related products into consistent and logical groupings of commodities—as iron and steel scrap, metallic ores and concentrates, steel, ferro and nonferrous additive alloys, nonferrous metals, fabricated metal basic products, general-purpose industrial machinery and equipment, electrical machinery and apparatus, metalworking machinery, etc. These listings are selected only for purposes of illustration; the book lists approximately 30,000 classes of products. The second volume covers the same ground as the first volume; it is an alphabetic index of the items, listed in Volume

Huge Reconstruction Job Posed

Industrial areas largely ruined by Allied bombing attacks. Cost of rebuilding Berlin alone estimated at 10 billion marks. Defeated enemy lacks tools to tackle task. Much equipment taken by Russians. Preliminary rehabilitation underway. Railroads have lost cars, locomotives and other equipment

By GEORGE R. REISS
Editorial Correspondent, STEEL

GERMANY's big cities have been virtually crushed under an avalanche of high-explosive and fire bombs. They represent the world's greatest disaster—and the biggest reconstruction job in history—a building equipment salesman's dream.

If Germany is to become an industrial nation again, those cities will have to be rebuilt, and in most, that means a complete rebuilding job. There's so little left of most of these cities that one newsman aptly put it:

"What's the use of trying to rebuild? It would be cheaper to cover over the wreckage and build new cities somewhere else."

Recently, I flew a 20,000-mile air tour of Europe, which took me into or over most of Germany's larger cities and I found them a monotonous succession of ruins, wreckage as complete as that in the ruined city of Pompeii, and on a much grander scale.

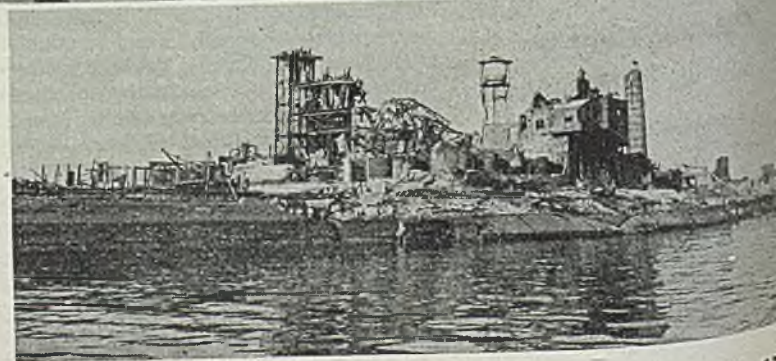
For example, Berlin, the world's fourth largest city is also the world's most thoroughly smashed city—unless it is equalled by Tokyo. It is also the No. 1 object lesson of the fury of air power.

Berlin is symbolic of the destruction wrought in other German cities. Hamburg, once a proud port city of 000, is 85 per cent destroyed; B Germany's second port city, is half out; virtually all of Cologne, "cap the Ruhr Valley" and the bigges centration of heavy industry i world, is almost entirely down; in munde, only 2500 of the 50,000 still remain standing.

Hardly an acre of Greater Be city of some 4,400,000 people, e some damage—and most of thos were pounded to rubble. U. S. gic Air Forces, bombing with pi tactics by day, smashed factori rail yards and rail stations; the R Forces, using night area bombi tics, smashed cities, on the theo workers, killed, wounded or made less, wouldn't do their bit in the f Their ideas apparently worked Germany was completely paraly dustrially, when the war ended.

Berlin today is trying to make back, just as is virtually every German city. But it is still a wi of wreckage that once was fine ings. It still has the smell of decaying bodies in the air. street cars, subways and busses ning after a fashion; a few trai begun moving on the railroads; streets are filled with motor and traffic. Electric lights are blazin and there's water in its mains And that, too, is true of the othe

Despite its devastation, Berlin a big and busy city. Big crow through the wrecked areas— afoot, on bicycles, in wheezy t automobiles. Many are German



Bucket brigades of women clean up rubble in Berlin, above. A lack of modern equipment to help in a reconstruction program in Germany, formerly one of the most highly mechanized countries of the world, is one of the paradoxes of the war. At right is a wrecked oil refinery at Hamburg

ombed Cities of Reich

GEORGE R. REISS

Who recently returned from a 20,000-mile tour over Germany and other parts of Europe. Mr. Reiss is business editor of the Youngstown, O., Vindicator and editorial correspondent for STEEL

ct their normal business; the big bulk composed of refugees, many dragging e meager belongings on crude carts carrying them on their heads.

A Berlin newspaper, *Berliner Zeitung*, ently estimated cost of repairing or ilding Berlin's wrecked homes and ness and industrial buildings will cost billion marks (the mark's prewar ex- ge rate was 40 cents) at prewar con- tion costs, or about half the cost l new dwellings built in all Germany n 1924 to 1937.

reported Greater Berlin had had 0,000 dwellings in the spring of by the summer of 1944, bomb- had destroyed 400,000 and dam- 800,000 others—and Berlin had ed its worst damage after the sum- of 1944, in this spring's air raids by d forces.

Reconstruction Has Started

eady Berlin has begun reconstruct- A contract for reconstructing the Ministry building, one of Berlin's t and least damaged structures, has been awarded a German firm. One ed workers were put on the job, ng the building for use as head- ters for occupying forces. It is ated 40 per cent will be finished by mber, the building will be restored out one year.

dolph Luebeke, commercial man- of the Reichsmetal Borsig Corp., a Berlin concern which made boilers, parts and numerous other war ma- estimated his company suffered million reichmarks damage in bomb in its seven Berlin area plants.

e of the most acute reconstruction ems facing Germany, even for the diate task of trying to rig up homes e millions of homeless, will be lack ol and equipment. Much of Ger- 's construction tools and equipment used for war work; little new ment was made during the war uch was destroyed—and now the ians and other occupying forces are much of what is left.

t the Germans are doing their best what they've got. For example, in n, I saw bucket-brigades of women g to clean up the rubble. One fills cket, passes it to the next woman— it goes from hand to hand—a slow ess.

t the same kind of a job is going elsewhere in Germany—and slowly surely the rubble is being cleaned of the streets, pavement is being hed up, and bricks are being piled eatly in the doorways or windows the shattered buildings.

In Berlin, before the war, more than 500 long distance trains had originated daily for various parts of Europe; the bombing raids were so effective that this was cut to only two or three trains daily at the worst of the raids. Most of the trains operating in and out of Berlin still are being used only for Russian troop movements, although an occasional milk train—usually equipped with a locomotive resurrected from the scrap pile—gets through now.

Some executives of the Reichsbahn, the German national railway system, estimated that the railway system into Berlin could be rehabilitated sufficiently to care for present needs in five to six months—if materials, equipment, and manpower were available; but he assured it will not be.

"Why not?" he was asked.

He shrugged unconcernedly. It developed the Russians have thoroughly stripped the railroads within the territory they occupy. They've taken the best cars, locomotives, even the signal systems, and they're doing the same with the industrial plants.

Luebeke told us even after the bombers got through working over his plants, it had had 1500 machine tools left in various stages of operating condition—lathes, drop hammers, planers, cutting machines, shapers and so on. The Russians moved in, carefully packed up and shipped back to Russia 1400 of these, valued at 80 million marks. The other 100 aren't in very good shape.

Had Developed New Jet Engine

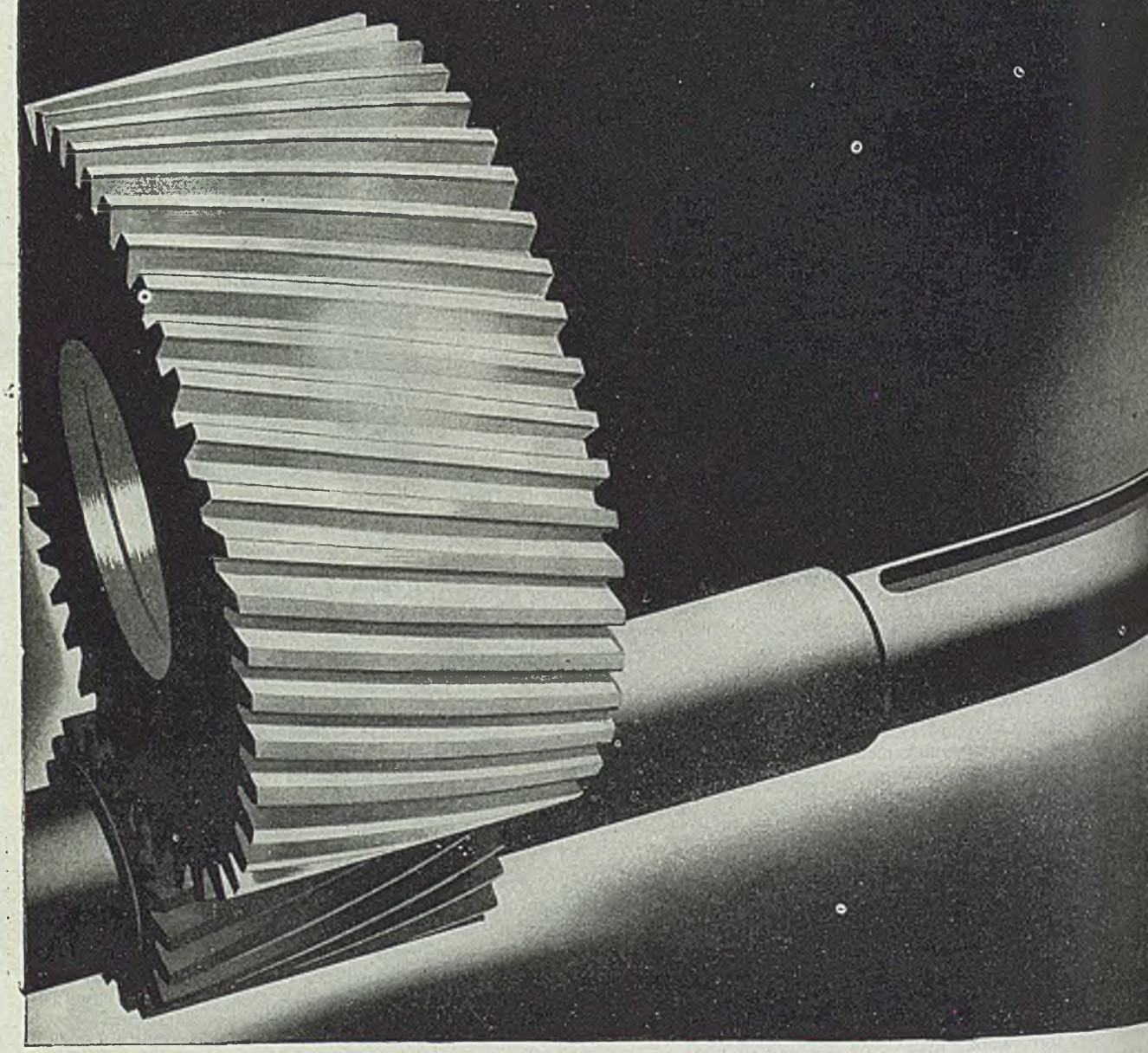
We also visited the BMW's Spandau Works in Spandau, a Berlin suburb. This plant which had had 6800 employees and had made engines for Focke-Wulfe 190 fighter planes, had just developed a new jet engine, designed for a new type Nazi fighter plane.

Executives at the plant explained that the Russians had taken many completed parts for the engine, drawings and equipment, and had invited Walter Schile, chief engineer, to come to Russia, to direct them in building the engines. Schile, they explained, had demurred—then disappeared unexplainably several days before our visit.

Hamburg was a No. 1 target in Germany for the bombers—chiefly because of its big oil refineries, shipyards, and submarine pens—and also because it was the biggest city in Germany that the air bombers could reach easily before they got Berlin's range. Hamburg had seven huge refineries—and oil was the top priority target; it also had four of Europe's largest shipbuilding yards. All seven refineries have been thoroughly smashed to junk—including one that had been a German-American financed concern before the war. An estimated 43 large ships were smashed or sunk in the raids on Hamburg harbor, while hundreds of U-boats in various stages of fabrication were destroyed on the docks or in the water. Besides hundreds of smaller vessels—tugs, barges or small self-propelled cargo vessels—were sunk or wrecked in the harbor. One of the wrecked vessels was a new passenger ship, larger than the huge *Europa* or *Bremen*, which was to be Germany's largest ship and a new flagship for the Hamburg-American line. Today she's a rusty hulk, pierced by bomb bursts in many places, twisted grotesquely out of shape. Incidentally, we saw the huge *Bremen*, a 49,000-ton vessel that used to ply between New York and Germany, lying half sunk on her side at Kiel, along with the wreckage of many other vessels. The *Europa* is silted in at Bremerhaven and will be soon put into service as a troop ship for the Allies.

This is the first of a series of articles recounting the author's observations on a recent 20,000 mile tour of Europe, part of it by airplane and part by jeep. Mr. Reiss visited London and in Germany toured Hamburg, Brunswick, Munich, Sulzburg, Berchtesgaden, Regensburg, Nurnberg, Schweinfurt, Bad Kissingen, Frankfurt and Berlin. His trip also took him to Oslo, Norway; Copenhagen, Denmark; Paris and Marseille, France; Naples, Venice, Milano, Verona, Florence and Rome in Italy.

Molybdenum gives steel the strength and toughness necessary to make long-lived gears.



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y A. H. ALLEN Detroit Editor, STEEL

MIRRORS of MOTORDOM

First automobile builders to resume passenger car production plagued by labor troubles. Excuses given for walkouts flimsy, but apparent cause is desire of unionists to obtain increase in hourly rates to offset shorter work-week

DETROIT

MONTHS before the termination of production in the automotive industry, many of its top executives were giving serious thought to their immediate postwar labor problems and they were quick to admit some troublous times were in the making. Developments of the past two weeks bear out their contention, and if a postwar pattern for labor is now being traced in Detroit, then the outlook for the future, in a word, ain't good. Ford and Hudson, the first two producers to get assembl.ies rolling, are both closed at the moment by virtue of strikes, and the virus of unrest is spreading throughout plants in this area. Walkouts are based on the flimsiest of excuses, but basically stem from the fact working people apparently have decided they will not remain on the job unless their war-time wage level is maintained. This goal is not in the cards, yet union leaders seem to imagine they can enforce it by calling out their sheep.

Supplier's Strike Closes Ford

The Ford shutdown, for example, is the result of a protracted strike at Kelsey-Hayes Wheel Co., supplier of wheels and brake drums to the Ford assembly line. There has been no opportunity to build up a decent bank of parts ahead, so the Kelsey strike was not many days old before lines at the Rouge were forced to close, just at the moment they were building up steam to get production to a respectable level. On the face of it, the Kelsey strike is said to result from the refusal of the company to reinstate a group of employees who last April had tossed a couple of foremen out of the plant because they did not like them.

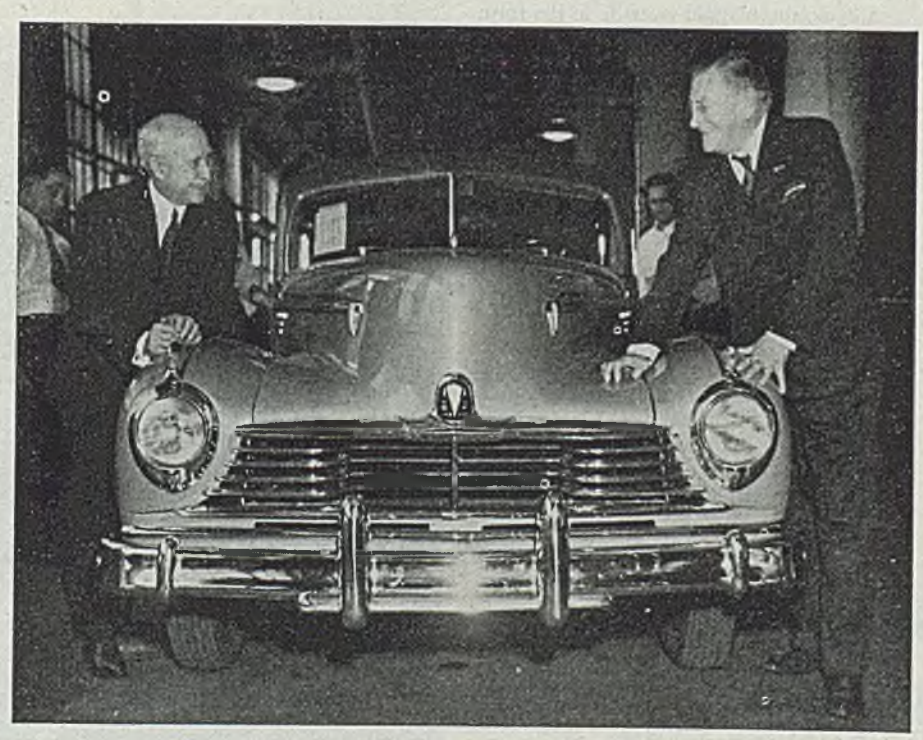
The company's position is clear. There is no question of working hours—of rates of pay—or working conditions. It is solely and simply a matter of the right and ability of Kelsey to control and discipline its employees when acts of violence are committed. At least that is what the company maintains in advertisements which it caused over last week-end. But there is a suspicion that much more actually is involved, not only at Kelsey-Hayes, but at other plants in the industry. It is briefly this: Certain people, perhaps at the instigation of union leaders who are always looking for some excuse to develop a "good cause," are walking off their jobs because they are not receiving the take-home pay which war jobs had provided. Others are throwing their lot in with the first for demands for a 30 per cent increase in basic wage rates, which would bring their gross weekly earnings up near the point enjoyed during the wartime period.

This is not going to work. But in the meantime, Detroit is wondering how many protracted plant shutdowns will be necessary to convince employees their unreasonable demands just are not in the cards. Today it is only Ford and Hudson which are closed, with thousands laid off because of labor unrest. Tomorrow it may be General Motors, Chrysler, Packard and all the rest which are closed just as their assembly lines near the point of providing the jobs which all America is asking. If this is going to be the pitch, there is small use talking about full employment or any of the other panaceas for working people currently being aerated. If the jobs are there, and the working force doesn't want them because they are not on their terms, then it is best to forget about the whole thing.

Forgetting these more mundane matters for the moment, it may be of interest to take a squint at the future prospects of the automotive industry through the eyes of a New York observer, E. F. Hutton & Co., which obviously channelizes its outlook in terms of security values and earnings prospects, but which nevertheless may contribute something to the overall outlook. At any rate, the company avers that a survey of prospects of the industry points to the possibility of some important surprises, the first of which is a real comeback effort by Ford, which has been discussed in these columns at an earlier date. The second, according to the Hutton crystal-gazers, is the speed with which the industry gets production up to the optimum levels. They figure it this way:

	1946	1947	1948	1949
	(passenger car units in millions)			
Estimated demand beginning of year	15.0	11.6	7.6	3.4
Estimated production	6.2	6.8	7.0	3.4
Estimated deferred demand — year-end	8.8	4.8	0.6	0
Estimated normal demand	1.8	2.8	2.8	2.8

The Hutton statisticians go on to say that during the war years a number of independent producers in the industry have been given a blood transfusion through large war orders. Financial positions have been improved and skilled personnel acquired. Through the existing "sellers" market for cars, some of these smaller producers hope to improve their competitive position sufficiently to enable them to build a dealer organization to withstand future cyclical changes, but as the foregoing tabulation suggests, the time in which to do so may be greatly shortened, should present intentions be fully realized. At the end of three years, the industry would return to normal demand burdened with huge excess capacity, and only those companies with the strongest financial position could hope to maintain



Orville Wright, left, and Sen. Homer Ferguson of Michigan inspect the first new Hudson passenger car to roll off the assembly line at the company's Detroit plant. NEA photo

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their competitive position. Therefore, postulates Hutton, Chrysler offers the best opportunity for capital appreciation and the shares of marginal producers, as a group, are over-valued marketwise.

A new aircraft engine, rated at 200 horsepower, has been developed by the Research Division of the General Motors Corp. Designed for installation in private air cruisers of the future, the new engine is an outgrowth of studies started eight years ago—and subsequent war contracts—in connection with the development of military robot planes.

The engine has undergone extensive flight testing for six years and is considered an important contribution to aircraft development.

The new engine is a radial type having four cylinders and operates on the two-cycle principle. Its unique feature is that a supercharging blower is used to increase performance and power reserve for take-off and altitude. There are no valves, this function being performed by the pistons themselves. Although the piston displacement is only 250 cubic inches—the size of an automobile engine—it develops normally 200 horsepower with a high safety factor, and the weight dry is only 275 pounds. It is probably the only small engine having liquid cooling and may be installed for the same weight as an air cooled engine. It is only 35 inches in diameter.

Oil consumption is extremely low, a quart of oil serving for six hours' running. Fuel consumption is comparable to engines of similar power, about 13 gallons an hour using 91 octane fuel.

Plans for erection of a manufacturing plant near Elyria, O., have been announced by C. E. Wilson, president, General Motors. The plant will be occupied by a new division which will produce products similar to those produced in Syracuse, N. Y., prewar.

The new plant will be situated on 175 acres on the New York Central Railroad's main line near the Elyria-Milan road. Construction will start when materials are available. The plant will include 400,000 square feet of manufacturing floor space and an administration building. It is expected the plant will be in full operation in about a year and it will, when operating fully, employ approximately 2000 people. Hub caps, bumper guards, grilles and similar products will be manufactured.

Mr. Wilson said General Moto planning to turn over the plant at cuse, now operated by the Brown-Chapin Division, to the Harrison diator Division, which will produc heaters, defrosters and similar pro This multiple-story plant is more ed to the manufacture of these than of the products to be manufa at Elyria.

It will be several months befo plant at Elyria will be ready for pancy and it will be about the length of time before the new pr can be produced in Syracuse.

New pictorial instructions us streamline wartime training of tho of G.I. mechanics are being put t to simplify peacetime installatio service problems for the nation's motive mechanics. Displacing types of complex engineering dr and lengthy written instructions, "installograph" developed by the Products Division, Bendix Aviation allows auto service men to gras glance the "how to install it" in tion they need to give fast, efficien ice to vehicles employing Bendix carburetors, hydraulic systems, e

Magnets for Cyclotrons Involve Precise Casting and Finishing

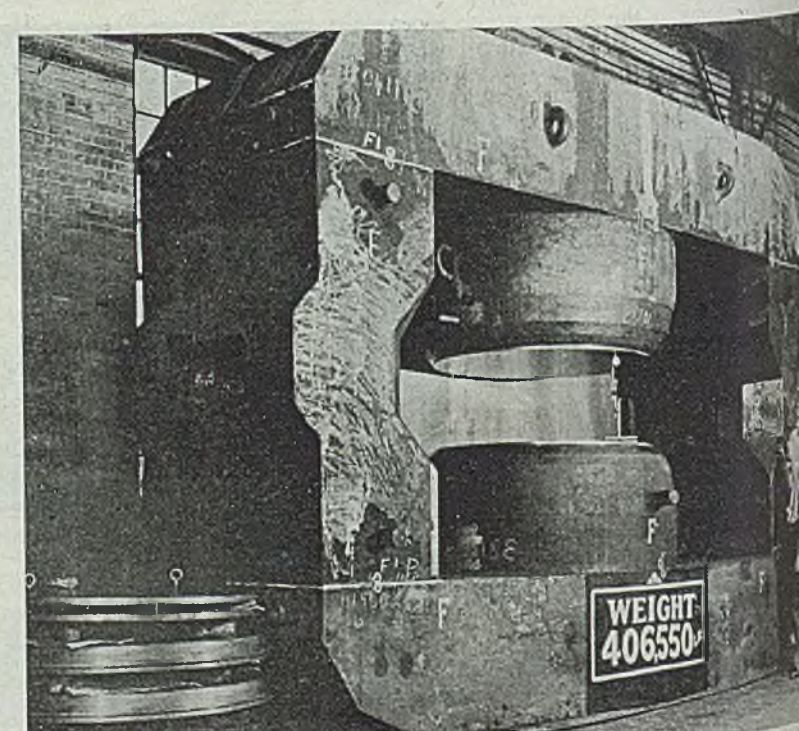
MAGNETS for the "atom-smashing" cyclotrons, which were basic to research leading to the harnessing of atomic power, are estimated to constitute 99 per cent of the weight of the complete cyclotron. The casting and finishing of these magnets involve precise and delicate work.

A cyclotron magnet is made in the form of a great hollow square of steel. From the top and bottom members of the square, the poles of the magnet—large heavy disks supported by heavy steel necks—project toward the middle of the square. Ordinarily the magnet is cast in six pieces, the four members of the hollow square and the two disks with their supports.

Even the first step in producing such a large magnet involves many difficulties. The magnet of the Carnegie Institution of Washington cyclotron, for example, weighs 406,550 pounds. Castings for this magnet were made by the American Rolling Mill Co., Middletown, O. Castings were made of high-grade carbon steel and had to be perfect, without fractures, blow-holes or other flaws. Once cast, they were examined by X-ray, and if a fault had been found it would have been necessary to make new castings.

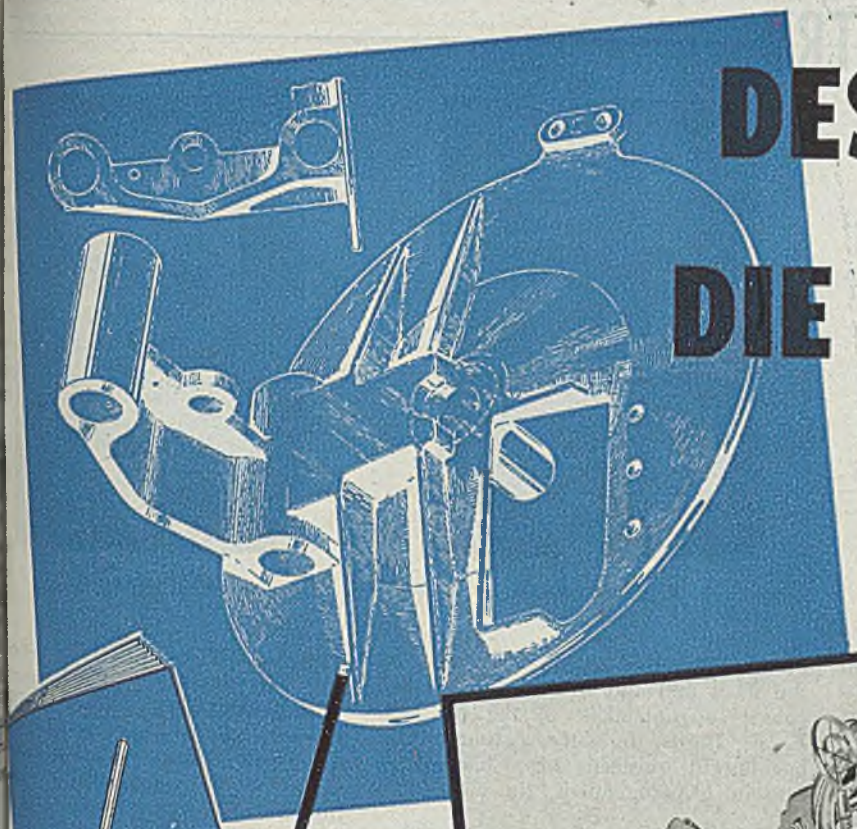
Mosler Safe Co., Hamilton, O., was given the job of finishing the castings. The faces of the two great poles, which were 42 inches in diameter, had to be absolutely smooth and parallel so that all magnetic lines of force would travel in exactly the same direction. Since the speeding electrons, by nature, travel precisely perpendicularly to the magnetic field in which they move, crooked plates and a resulting angled magnetic field would cause the electrons to deviate from their pure circular motion, hit the walls of the acceleration chamber of the cyclotron and disrupt the generation of the beam.

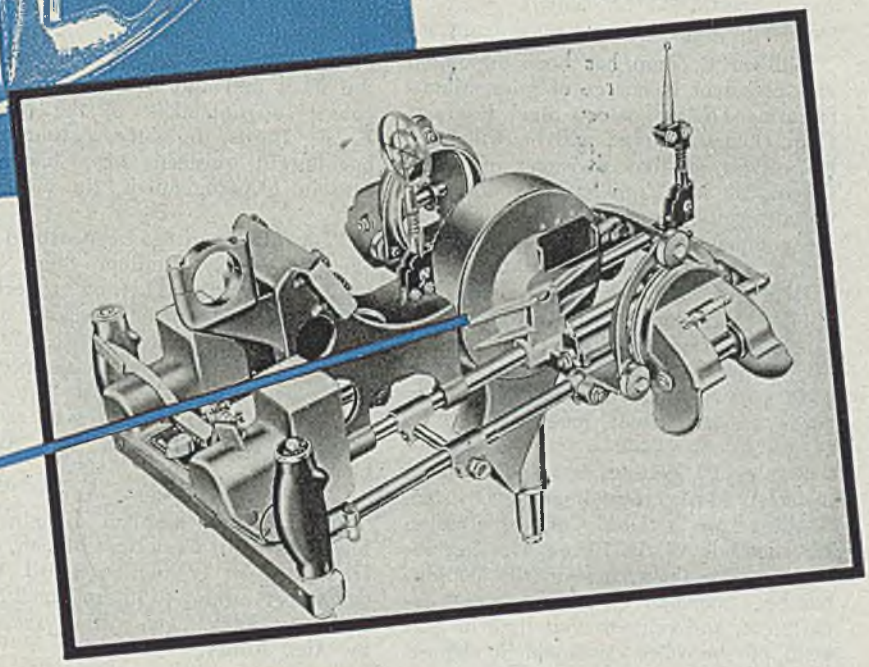
Fifteen men worked for five months finishing the Carnegie magnet, first with silica carbide then with emery and finally polishing by hand. finished to watch-like precision, th net was dismounted, shipped to t negie laboratory and reconstructe The cyclotron was then ass around the magnet.



Surfaces and adjustment of the pole faces of the cyclotron magnet for Carnegie Institution of Washington are checked in the shops of Mosler Co. where the magnet was machined

DESIGNING FOR DIE CASTING





RIBS

In designing die castings, consider the use of ribs where one or more of the following results are desired:

1. *Maximum strength, especially in resistance to bending.*
2. *Decreased weight.*
3. *Avoidance of warpage under stress.*
4. *Uniformity in section thickness.*
5. *Adequate stress distribution.*
6. *Assurance of filling out thin sections.*

All of these results have been obtained in the ZINC Alloy Die Casting for the aircraft machine gun mount shown here. Through the intelligent use of ribs, this casting has ample strength with a minimum section thickness—thereby decreasing weight and cost. The section thickness is substantially uniform and the chance of warpage is minimized. The ribs also help to distribute stresses applied at the steel shank which has been cast in place at the center of the casting. This shank serves as a pivot pin on which a pair of guns and their mounts are supported and about which they rock.

For more detailed information on this and other design considerations which will enable you to get the most for your die casting dollar, ask us—or your die casting source—for a copy of DESIGNING FOR DIE CASTING.

ZINC
FOR DIE CASTING ALLOYS

E NEW JERSEY ZINC COMPANY, 160 Front St., New York 7, N. Y.

The Research was done, the Alloys were developed, and most Die Castings are specified with

HORSE HEAD SPECIAL (99.99+% Uniform Quality) ZINC

MEN of INDUSTRY

WILLIAM E. ZIPP

T. A. MOORMAN

K. H. GAYLE JR.

William E. Zipp has been appointed vice president in charge of sales, Manufacturing Division, Ceco Steel Products Corp., Omaha, Nebr., and he will have his offices at that division's plant in Cicero, Ill. Mr. Zipp has been manager of sales since June, 1944, and he joined the company in 1933.

—o—

Henry A. Bourne recently was appointed sales manager, Republic Steel Corp., Cleveland, in the Tulsa district. Mr. Bourne, who joined Republic in 1943 as a salesman in that district, succeeds the late **Hoyle Jones.**

—o—

Stanley P. Watkins has been named manager, Market Development Division, Rustless Iron & Steel Corp., Baltimore. He succeeds W. B. Pierce who has resigned. For the past year Mr. Watkins has been manager, sales engineering department, and prior to that time he was head of the sales development department, serving also as an engineer in that department. He joined the company in 1931.

—o—

Donald L. Chaffee has joined the sales engineering department, Copperweld Steel Co., Glassport, Pa. Mr. Chaffee comes to Copperweld from the wire branch, Signal Corps Engineering Laboratories, U. S. Army, Camp Coles, N. J.

—o—

J. K. Miller, formerly assistant director, Ferroalloy and Alloy Steel Branch, War Production Board, Washington, is returning to Bethlehem Steel Co., Bethlehem, Pa.

—o—

J. W. Graves, for 12 years with American Steel & Wire Co., Cleveland, and more recently with Central Steel & Wire Co., Chicago, has joined the staff of the Great Central Steel Co., Chicago.

—o—

C. R. Bottenfield, superintendent, Fairfield, Ala., tin mill, Tennessee Coal, Iron & Railroad Co., Birmingham, has been named general superintendent in charge of the tin mill and sheet mill. **R. E. Sturdy** continues as superintendent of the sheet mill and **A. H. Chalmers** becomes superintendent of the tin mill. **E. F. Harris,** formerly assistant chief metallurgist, succeeds Mr. Chalmers as assistant superintendent, tin mill.

—o—

T. A. Moorman has been named manager, Allegheny Ludlum Steel Corp., Forging & Casting Division at Ferndale, Mich. Mr. Moorman was one of the founders of that division in 1929, and has been associated with it since that time except for the past two years during which period he served as manager of the company's Los Angeles plant.

—o—

H. J. French, assistant director, Raw Materials and Facilities Branch, Steel Division, War Production Board, Washington, is returning to International Nickel Co., New York. He will be succeeded by **Alex Miller.**

—o—

Harry A. Winne, vice president in charge of engineering, General Electric Co.'s apparatus department, has been appointed vice president in charge of the company's engineering policy. **Ernest E. Johnson,** assistant engineer, Aeronautics & Marine Engineering Division, has been named successor to Mr. Winne. **G. L. Crow** has been named manager, marine section, Pacific District Industrial Division.

—o—

W. S. Dawson, recently appointed first vice president and general manager, Romec Pump Co., Elyria, O., has been elected president, succeeding **H. D. Stecher,** resigned.

—o—

H. Wickliffe Rose has been elected president, American Tariff League, New York. Mr. Rose is assistant to the president, American Viscose Corp.. Wilmington, Del., and he succeeds **Frederick K. Barbour,** president, Linen Thread Co, Inc., New York, who has become chairman of the league's executive committee. **Roy C. McKenna,** chairman, Vanadium-Alloys Steel Co., Latr Pa., was elected first vice presid **Wheeler McMillen,** editor-in-chief, *Journal,* was elected to the execu committee. New board members clude: **J. H. Schermerhorn,** presid Joseph Dixon Crucible Co., Jersey N. J. and **D. Joseph O'Connor,** president, Acme Shear Co., Bridge Conn.

—o—

Kenneth H. Gayle Jr. has been el ed vice president in charge of Nort Division sales and exports, Ingalls Works Co. and its subsidiary, Construction Co., Birmingham. Gayle has served as Northern Divi sales manager since 1939 and ex manager since early last year. established the companies' offices in York as district manager in 1927 and been in charge there since that except for a short period when he general manager of the Ingalls fab tion plant at Verona, Pa.

—o—

A. Carl Tiedemann recently was e ed president, Dockson Corp., De Mr. Tiedemann joined the corpor less than a year ago as executive president and general manager.

—o—

Brig. Gen. Tom C. Rives, retu to Wright Field, Dayton, O., afte absence of nine years, has been n chief, radio and radar subdivision gineering Division, Air Technical ice Command. He replaces Col. H R. Yeager who is now enroute to tion in the Pacific.

—o—

Sigfried A. Olson Jr. has been n industrial manager at Stockholm, Sw Brown Instrument Co., Philadelph division of Minneapolis-Honeywell ulator Co. Mr. Olson has been York sales engineer for the Brown pany for the past nine years.

—o—

Eric S. Carlstein has been appo general manager and assistant to F. Bower, president, Pines Engine

STE

E. D. WACKER

ROBERT S. MARS

, Aurora, Ill. Mr. Carlstein formerly s chief engineer, Batavia Metal Prod- Corp. C. F. Coats, previously with tern Condenser Co., Watseka, Ill., been appointed purchasing agent.

—o—

. D. Wacker recently was appointed ral manager C. J. Tagliabue Divi- , Brooklyn, N. Y., Portable Products . Mr. Wacker for the past eight has been general sales manager has been associated with the Tag- Division for 22 years.

—o—

ungstown Fireproofing Co., Youngs- O., has re-elected its officers who W. H. Foster, chairman; G. C. Brain- president; Walter Bender, vice pres- in charge of operations; E. A. Pur- vice president in charges of sales, ge R. Farrell, vice president in e of purchases; W. D. Skinner, sec- treasurer; and D. K. Phillips, troller.

—o—

deric S. Cross has been appointed esident legal counsel, Glenn L. Co., Baltimore. Since 1941 Mr. had been resident representative of company's general counsel, Jones, Cockley & Reavis, Cleveland.

—o—

rman Wunderlich has been named sales director of radio equip- and allied products, Federal Tele- & Radio Corp., Newark, N. J. erly he was with the Galvin Mfg. , Chicago, where he was manager Communications & Electronics sion.

—o—

pt. Ralph L. Tompkins, recently turned to inactive duty by the Marine s, has been appointed manager, e Plains, N. Y., branch, Mack Trucks Long Island City, N. Y.

—o—

rnold H. Smith has been appointed ger, foreign department, Monsanto ical Co., St. Louis, succeeding ert M. Hodges who is retiring 1. Mr. Smith will be succeeded as assistant director of the foreign department by **Marshall E. Young**, formerly general export manager. **John E. Gurvin**, plant engineer at Monsanto, Tenn., has been advanced to vice president, Merritt Engineering & Sales Co. Inc., Lockport, N. Y., a Monsanto subsidiary. **H. J. Heffernan** has been named assistant general manager of sales, Merrimac Division, Boston. He suceeds the late **Horace Burrough III. J. J. McCarthy** has been promoted to division sales department as manager of textile sales development. Three assistant sales managers have been advanced to sales managers of their respective departments: **W. R. Minchin**, heavy chemicals department; **T. C. Jesdale**, Organic & Phosphate Division; **P. O. Huntington**, Merrimac Division's alcohol department.

—o—

Robert S. Mars, partner and general manager, W.P. & R. S. Mars Co., Duluth, machine tool distributor, and a director from the eighth district, United States Chamber of Commerce, recently was appointed to the Labor Relations Committee and Domestic Distribution Department Committee of the national chamber at Washington.

—o—

Col. Ralph L. Hart, until recently with the office of chief signal officer, Washington, has returned to Western Electric Co., New York, as distribution manager, Telephone Sales Division.

—o—

Richard E. Marx, has been appointed a vice president, Detecto Scales Inc., Brooklyn, N. Y., and will continue as sales manager, Infants & Clinical Scale Division.

—o—

Harry M. Francis has returned from three years' service, War Production Board, Washington, to resume his duties as assistant vice president, sales, American Steel & Wire Co., Cleveland. He served in the WPB as deputy director, Steel Division. Mr. Francis joined American Steel & Wire Co. in 1915 and held various sales posts in Philadelphia, New York, Boston and Cleveland, before being appointed assistant vice president in December, 1938.

—o—

Walter P. Jacob has resigned as president, General Bronze Corp., Long Island City, N. Y.

—o—

Carl P. Sorenson recently was appointed consulting standards engineer, Cherry Rivet Co., Los Angeles. He formerly was with Glenn L. Martin Co., Baltimore.

—o—

John P. Barclay, who served as chief, Wire Rope and Strand Branch, War Production Board, Washington, has returned as president, Wire Rope Corp. of America, New Haven, Conn.

—o—

Capt. Ralph E. Lee, recently discharged from the Army Air Corps, now is manager, export department, Trane Co., LaCrosse, Wis.

—o—

R. H. McMann has been appointed eastern district manager, Home Radio Division, Westinghouse Electric Corp., Pittsburgh, and will have his headquarters at the company's New York offices. He formerly was procurement control director, Republic Aviation Corp., Farmingdale, L. I., N. Y.

—o—

Lt. Col. H. Neely Henry has rejoined the industrial development department, Alabama Power Co., Birmingham, following service overseas as an artillery officer in the European theater.

—o—

Lynn Mahan has been appointed assistant to the president, in charge of public relations, American Locomotive Co., New York.

—o—

H. M. Jaquays, Montreal, vice president, has been elected president, Ontario Steel Products Co. Ltd.,Gananoque, Ont., succeeding the late Dr. N. C. Jones. J. T. Richardson has been elected vice president.

—o—

F. B. Millham has been appointed director, General Industrial Equipment Division, War Production Board, Washington, succeeding **William M. Haile**, who is returning to private industry.

—o—

L. O. Sweval, for the past two years, assistant to the president, Methods Engineering Council, Pittsburgh, has been named manager of the council's newly opened Eastern Division office, New York.

—o—

B. J. Brugge, welding engineer, has been named district manager of sales and service, of its recently opened sales office in St. Louis, Lincoln Electric Co., Cleveland.

—o—

Arthur Smith Jr. has been named manager of the recently organized cathodic protection sales department, Dow

J. M. SYLVESTER

Who is general manager, Bethlehem, Pa., plant, Bethlehem Steel Co., as noted in STEEL, Aug. 27 issue, p. 88.

FRANK J. LASKEY

Now manager of purchases and raw materials, Republic Steel Corp., Cleveland, in STEEL, Sept. 3 issue, p. 104.

DAN A. FARRELL

Recently named supervisor of safety, Corn Illinois Steel Corp., Pittsburgh, STEEL, 30 issue, p. 66.

Chemical Co., Midland, Mich. Mr. Smith formerly was director of magnesium sales, southwest territory, with offices in St. Louis. H. A. Ellis will continue to handle magnesium sales in that territory. The cathodic protection sales department has representatives in New York, Chicago, Tulsa, Houston and San Francisco.

—o—

Dr. Eugene Lieber has joined the Nox-Rust Chemical Corp., Chicago. He formerly was with Standard Oil Co. of New Jersey where he was chemical director of the para-plant, Bayonne refinery, Bayonne, N. J.

—o—

Albert M. Harper, manager of specialty sales, Carnegie-Illinois Steel Corp., has retired at the age of 70, after 57 years of service with United States Steel Corp. **C. T. Siebert Jr.**, will succeed Mr. Harper.

T. F. Geraghty has been named eral sales manager, Milwaukee Stan Co., Milwaukee, succeeding B. A. C retired. Mr. Geraghty has been wit company for 26 years.

—o—

James H. Rasmussen has resigne general sales manager, Manufact Division, Crosley Corp., Cincinnat become a vice president, United Paper Factories Inc., Chicago.

OBITUARIES . . .

Sir Allan Macdiarmid, 64, chairman and managing director, Stewarts & Lloyds Ltd., and president, British Iron & Steel Federation, died in London recently. He started his career with a Glasgow firm of accountants in 1898 and in 1900 he was appointed secretary, Stewarts & Lloyds company. He became a director of that company in 1918 and chairman and managing director in 1926. Mr. Macdiarmid was elected president of the British Iron & Steel Federation in March, 1944 and he was knighted in January of this year.

—o—

David Denton Hull, 73, president, Virginia Iron, Coal & Coke Co., Roanoke, Va., died recently at his home.

—o—

Thomas J. McLaughlin, 61, traffic manager, American Radiator Co. & Standard Sanitary Corp., New York, died Aug. 31 in Pittsburgh, in which city he made his home.

—o—

Edwin G. Fisher, 59, founder and president, National Steel Co., Chicago, died Sept. 1 in that city.

—o—

Robert B. Harper, 63, vice president in charge of research and testing, Peoples Gas Light & Coke Co., Chicago, died Aug. 29 in that city. Mr. Harper had been associated with the company since 1905. He was a trustee of Illinois Institute of Technology and served as its representative on the board of the Gas Institute of Technology.

—o—

William Watson Wells Jr., 62, president, W. W. Wells Ltd., Toronto, Ont., died recently. He had been engaged in the business, founded by his father, more than 40 years.

—o—

Mason Phelps, 60, president, Pheoll Mfg. Co., Chicago, died Sept. 2. Mr. Phelps founded the company in 1907 and had been associated with the company for the past 38 years.

—o—

Henry Disston, 71, chairman and former president, Henry Disston & Sons Inc., Tacony, Pa., died Aug. 29 in a hospital at Bar Harbor, Me. He became president in 1930, and retained that position until 1939, when he became chairman of the board.

—o—

Arthur M. Brewster, 65, for ten years sales engineer with Advance Pressure Castings Corp., Long Island City, N. Y., died Aug. 30 in Port Chester, N. Y.

—o—

Herman Cope, 64, sales manager, J. E. Rhoads & Sons, Philadelphia, died at his home in that city Aug. 30.

—o—

Hal B. Hayden, former treasurer, David J. Joseph Co., Cincinnati, died Aug. 26. Mr. Hayden served wit Joseph company 40 years and reti 1940.

—o—

Harry W. Bails, purchasing age 33 years, Barber-Colman Co., Roc Ill., died recently.

—o—

John B. Patterson, 82, at one sales manager at St. Louis and A Midvale Steel Co., Philadelphia, Aug. 27 in New York.

—o—

George A. Jacobs, 68, an engine was active in development of e ing wire for insulation, died rece his home in San Marino, Calif. Jacobs had been associated with the General Electric Co., Schen N. Y., and Phelps-Dodge Corp., York.

—o—

Frank A. Donaldson, 55, preside founder, Donaldson Co. Inc., St died Aug. 26 at his home in Minn

—o—

Martin Heineke, 83, president, & Co., Springfield, Ill., and an in died Aug. 29 in that city.

—o—

Harry M. Swigart, 53, presider gear Co., Milwaukee, died rece Star Lake, Wis. Mr. Swigart joi organization, founded by his fa 1923, served as vice president fro to 1928 when he was elected pr

OPA's Reconversion Price Program

…Y RECONVERTING MANUFACTURER IS FREE TO SELL AT EXISTING CEILING PRICES. However, in …y case where price adjustments are necessary to provide a prospect of good profits when production …'s rolling, OPA WILL PROVIDE RECONVERTING MANUFACTURERS WITH NEW PRICES in one of …e following ways:

I- INDUSTRY-WIDE ACTIONS

…IS IS THE BASIC PART OF OPA's RECONVERSION PRICE PROGRAM FOR RECONVERTING INDUSTRIES.

OPA CONSULTS WITH INDUSTRY:

① AT MEETINGS
② BY CORRESPONDENCE

NECESSARY PRICE ADJUSTMENTS ARE MADE IN THE FOLLOWING WAY:

…KE 1941 COSTS...	ADD ADJUSTMENTS FOR LEGAL INCREASES IN: MATERIALS AND PARTS PRICES	BASIC WAGE RATES SCHEDULES	THEN ADD 1936-39 AVERAGE PERCENTAGE MARGIN OF PROFIT ON COSTS	THIS GIVES THE NEW CEILING PRICE (1941 Price was $97.00)	IN THIS EXAMPLE, THIS WORKS OUT TO AN "INCREASE FACTOR" OF 11.1%	ANY FIRM IN THIS INDUSTRY CAN INCREASE ITS 1941 PRICE BY THIS PERCENTAGE (11.1%)
			8% of $101.00			
$90.00	$4.00	$7.00	$8.08	$109.08	11.1%	

…IVIDUAL FIRMS THAT NEED BIGGER ADJUSTMENTS MAY APPLY FOR THEM UNDER THE INDIVIDUAL-FIRM ADJUSTMENT …OVISIONS AT THEIR OPA DISTRICT OFFICES.

II- INDIVIDUAL-FIRM ADJUSTMENT PROVISIONS

…re are three circumstances under which a particular reconverting firm may apply for necessary individ-…l adjustments.

① A firm that needs bigger adjustments than the industry-wide price increase factor allows.

② A firm returning to civilian production before its industry requests and receives an industry-wide price increase factor.

③ A firm in an industry which will not have an industry-wide price increase factor because the industry as a whole never converted to war production.

HOW FIRMS OF VARIOUS SIZES FIGURE THEIR INDIVIDUAL PRICE ADJUSTMENTS

…MS EXPECTING GROSS ANNUAL SALES OF LESS THAN $50,000

① TAKE TOTAL CURRENT PRODUCTION COSTS . . .

② ADD OWN PROFIT MARGIN FOR FIRST OF FOLLOWING YEARS — 1939, 1940, OR 1941 — FOR WHICH FIRM HAS FIGURES

OR

OPA'S INDIVIDUAL ADJUSTMENT PROFIT FACTOR * . . .

RESULT— NEW CEILING PRICE

FIRMS EXPECTING GROSS ANNUAL SALES BETWEEN $50,000 & $200,000

① ADJUST OWN 1941 COSTS FOR

A. INCREASES IN OWN STRAIGHT-TIME FACTORY LABOR RATES . . .

B. LEGAL INCREASES IN OWN MATERIALS AND PARTS PRICES . . .

② ADD OWN 1936-39 PROFIT MARGIN . . .

OR

OPA'S INDIVIDUAL ADJUSTMENT PROFIT FACTOR * . . .

RESULT— NEW CEILING PRICE

FIRMS EXPECTING GROSS ANNUAL SALES OVER $200,000

① ADJUST OWN 1941 COSTS FOR

A. INCREASES IN OWN BASIC WAGE RATES SCHEDULES . . .

B. GENERAL LEGAL INCREASES IN OWN MATERIALS AND PARTS PRICES . . .

② IF THESE ADJUSTED COSTS ARE HIGHER THAN EXISTING CEILING, ADD OPA'S INDIVIDUAL ADJUSTMENT PROFIT FACTOR * . . .

RESULT— NEW CEILING PRICE

*Individual adjustment profit factors will be provided by OPA District Offices along with application forms.

WING TIPS

Aircraft industry is designing in terms of function as it plans the airplanes of tomorrow. New developments will make great commercial air fleets possible and will make present military air forces obsolete in five years

By I. M. LADDON*

WHEN the Wright brothers flew the first powered airplane a little more than 41 years ago, they got off the ground in what was appropriately called a flying machine. That was all it was—a machine that flew. From that small beginning, the airplane has developed into a mode of transportation. Everything done since then in the way of engineering and operations has been aimed at just one primary objective: To make the flying machine a more efficient, and therefore more economical, means of transport.

Economical transportation is the result of a balance between load, speed and cost. What is happening to the design of the commercial airplane is comparable to what happened to the automobile. For instance, the race cars at Indianapolis have just one job: To circle a 2½-mile brick track at high speed. Load carrying ability is not important. Neither is the cost of the operation. If a driver can get a car speedier than any other car on the track, he has achieved economical transportation in terms of auto racing, for he comes in first and wins anywhere from 35 to 40 thousand dollars. But if that same driver then decided to take a contract for hauling bricks with his racing car, he could not deliver economical transportation in terms of commercial trucking.

What automobile manufacturers have done with the motor car, we have begun to do with the airplane. We are designing in terms of function. We are rapidly making present models obsolete. Military aircraft are already demonstrating the great diversification the airplane of the future will amplify. Here again we are faced with the question of building not a cheap plane, but one economical in the fullest military sense.

Obsolescence Comes Fast

Since no one can measure the cost of losing a war, the military simply asks the aircraft industry to produce a better plane for each special purpose than any other nation is flying; and to produce it in equal, or greater, numbers. As the war has progressed we have seen certain ships specially designed for dive bombing, other ships for low level bombing, still other planes for high level bombing. Fighters also have become specialized. In the maelstrom of actual combat, all these planes have performed other types of work. But primarily each military plane is designed today for a specific job, and gives maximum performance that job. When it comes to obsolesce the military plane is even more sub to competitive deterioration than commercial models.

From the standpoint of design e neering, the form of the airplane been reasonably well stabilized for past ten years, except as it has marred by military requirements. In sign, we have dealt with four elem A fuselage, a wing, an empennag tail, and a power plant. We have proved the design of each; we have proved the interaction of each with others or decreased and minimized mutual interference. But we have discarded any of these on a prac basis.

True, experimental "flying wings" been built and flown—planes that carded the tail—and they have achi a measure of stability. But the cos been high. Part of the price paid the necessity more or less to freeze center of gravity. In the "flying w you cannot carry a mobile load. either cargo carrying or passenger t port, this is a serious handicap.

The B-24 Liberator, for instanc reasonably stable—that is, it ca flown and controlled within a rang 20 per cent of the average wing c This means that you can shift your around somewhat, if you are car cargo, and still handle your plane. if you have passengers, they can necessary trips aft occasionally wi causing the pilot serious trouble. B a "flying wing" everything has to put. Small boys, for instance, wou a difficult problem in a "flying win

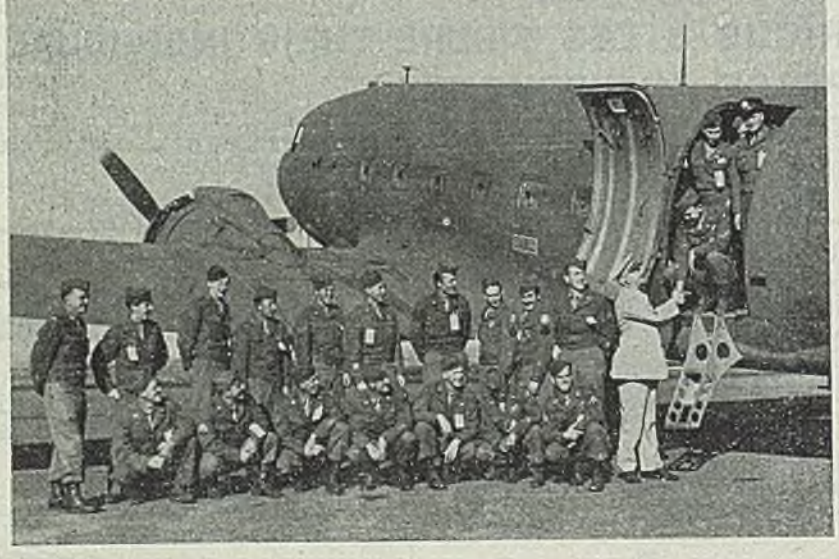
Two-Element Machine Design

There remains another fundam about an airplane to remember. think of an airplane, for instance, air machine. That is only partly The airplane is also a land or a machine. During takeoffs and lan the airplane is earthbound. An air then is really a two-element mach ground and air.

This matter has an important ing on design. Primarily we desi plane for optimum performance in air. But we also have to put on ing gears, and design airfoils and Flaps are used on landings and ta to augment lift and increase drag. when we are airborne, they are ret to reduce drag and increase cr speed. By means of wing flaps, and ous other means of temporarily c ing the airfoil, we are able to satisfy the earthbound and the airborn quirements of design.

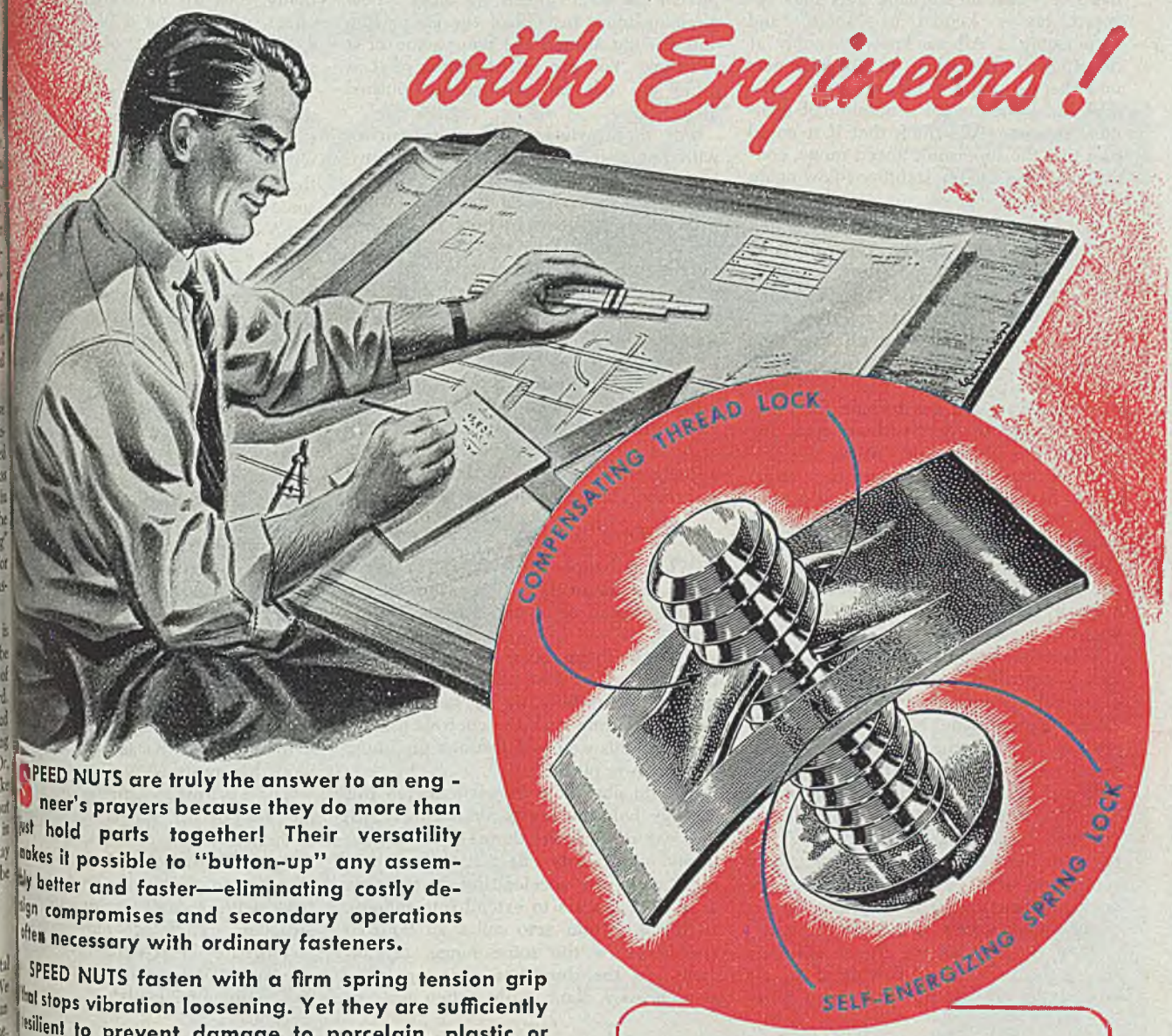
To these requirements "som new" is about to be added. We soon have to redesign airplanes in of "sonic and supersonic" speeds. is where the trouble starts. For n not even among today's aeronautic

*Excerpted from *Plane Talk*, August, 1945. The author is executive vice president, Consolidated Vultee Aircraft Corp.



PLANES REDEPLOY VETERANS: Initiating an airborne transportation program to carry thousands of soldiers across the country to Army camps for processing, the Army hopes to relieve rail congestion as well as speed the processing. Photo shows first group of soldiers leaving Newark, N. J. NEA photo

WHY SPEED NUTS ARE FIRST with Engineers!



SPEED NUTS are truly the answer to an engineer's prayers because they do more than just hold parts together! Their versatility makes it possible to "button-up" any assembly better and faster—eliminating costly design compromises and secondary operations often necessary with ordinary fasteners.

SPEED NUTS fasten with a firm spring tension grip that stops vibration loosening. Yet they are sufficiently resilient to prevent damage to porcelain, plastic or glass. Some SPEED NUTS are self-retaining, thus eliminating expensive welding, riveting or clinching. They compensate for a wider range of commercial tolerances or misalignment. Having no threads, they cannot "freeze" to bolts or screws . . . a mighty important point in servicing or repairing your product.

Chances are, you'll be able to find the RIGHT fasteners among more than 3000 shapes and sizes in the SPEED NUT line. If not, we can come up with new ones specially designed for your particular needs. In either case, SPEED NUTS will improve your post-war products and reduce your net assembly costs. Send in your fastening specifications for analysis . . . TODAY!

NOTHING LOCKS LIKE A SPEED NUT

Only SPEED NUTS provide a COMPENSATING thread lock and a SELF-ENERGIZING spring lock. As the screw is tightened the two arched prongs move inward to lock against the root of the screw thread. These free-acting prongs COMPENSATE for tolerance variations. Compression of the arch in prongs and base creates a SELF-ENERGIZING spring lock. These two forces combine to definitely prevent vibration loosening.

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In Canada: Wallace Barnes Co., Ltd., Hamilton, Ontario

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FASTEST THING IN FASTENINGS . . . OVER 3000 SHAPES AND SIZES

search engineers, knows for sure what happens when an airplane gets into the speed ranges known as "sonic" and "supersonic." All we know certainly at this time is that when an airplane gets into the sonic speed ranges it may take a physical beating for a number of technical reasons. We think that if it could pass into the supersonic speed range, conditions of reasonably stabilized flow again would prevail.

We should not have to worry much about these high speeds except for one factor. After being powered by a reciprocating engine for its entire life span of slightly over 41 years, coasting more or less comfortably along all this time at subsonic speeds, the airplane has suddenly acquired a new type of power plant. This is the gas turbine driving a propeller; or the gas turbine operating as a jet propulsion unit. With this new type of motive power we can attain much higher speeds economically than with the reciprocating engine. These speeds offer new problems of aeronautical design. It is likely the wings on the new airplanes will be much thinner, and will have sharper leading edges than wings of today's planes.

When an airplane approaches sonic speed—so-called because it is the speed of sound—strange new problems arise. While the airplane is flying at today's ordinary speeds, the air flows over and under the wing, around the fuselage and tail, and around the tips of the wing. The flow in general is fairly smooth. If you will think of a boat displacing water at moderate speeds and creating bow waves and stern waves, you will have an analogous picture. The airplane creates many similar waves as it parts the air.

Now as long as we fly at subsonic speeds this parting and flowing of the air around the aircraft proceeds on a fairly even basis. But when we begin to approach the sonic speeds we meet a new phenomenon. Instead of the air parting and flowing around the wing some of it piles up. You can at least think of it as piling up out in front, being pushed along.

For those who have had experience with boats, it may be helpful to translate what happens to the airplane approaching sonic speeds into what happens to a displacement boat in the water at relatively slow speeds. This piling up action of the water at the bow of a displacement boat begins at low speeds, and becomes substantial at speeds from 25 to 40 miles an hour, depending upon the lines of the hull. In hydrodynamic terms this is called the hump. The drag, which starts out by rising gradually, suddenly increases radically as we increase speed. To get only a little more speed, we have to pour in a much larger amount of power.

"Drag" Builds Up Rapidly

What is happening is this: The faster we go, the larger the wall of water we are pushing ahead of us and the greater the drag.

Now in flying boats when we reach the point in our take-off where the drag on the hull is building up fast, we gun the engines and rock the controls a little. By doing this we break through the hump and begin to plane.

We do not know to what degree this analogy holds so far as air is concerned, but we do believe there is some similarity. The early effect is the same in each case—an accelerating increase in drag that appears to extend into infinity. In the air, from zero miles an hour to speeds below the sonic range, the increase in the drag has gone up on a smooth easy slant. But when we approach the sonic speeds, that slant su
denly goes up in a sharp curve. T
effect, when flying a plane, is describ
as being like that of hitting a br
wall.

No one has yet taken an airpl
through this sonic speed range, which
called the "area of compressibility." I
we have fired rockets and project
that have gone through it and into sup
sonic speed ranges. A rifle bullet
the V-2 rocket bombs, for instance, b
travel at speeds much higher than t
of sound.

How we are going to get an airpl
through that sonic speed wall and i
the supersonic speed ranges, where c
ditions will get back to a predicta
normal, is something we have not sol
yet. We are making experiments
wind tunnels, but for technical reas
they are not entirely satisfactory.
is possible we shall do our first exp
mental flying in the sonic speed ran
with pilotless radio controlled pla
that will register their instrument i
ings on the ground.

All of this deserves mention fo
most important reason. It shows t
progress in the design and produc
of aircraft is not ending, but just
ginning. We have a practically new
dustry on our hands today. The exc
ment of pioneering, the satisfaction
helping to find the answers to new p
lems, has returned.

The gas turbine engine which is f
ing designs for supersonic speeds u
us heralds other changes, too. For
thing, we are going to have much
vibration in gas turbine airplanes than
have with today's reciprocating eng
airplane. That not only means m
comfort for the passengers, it also me
we can cut down the weight of airfra
and increase payloads.

PANAMA'S FUTURE AIRPORT: Main entrance to proposed Panama national airport administration building, showing passenger ramp to upper deck. F. H. McGraw & Co. of Panama designed this new airport, which will cost approximately $7 million. The two story reinforced concrete terminal building is 625 fee long and contains approximately 300,000 square fee of space. It will be air conditioned

STE

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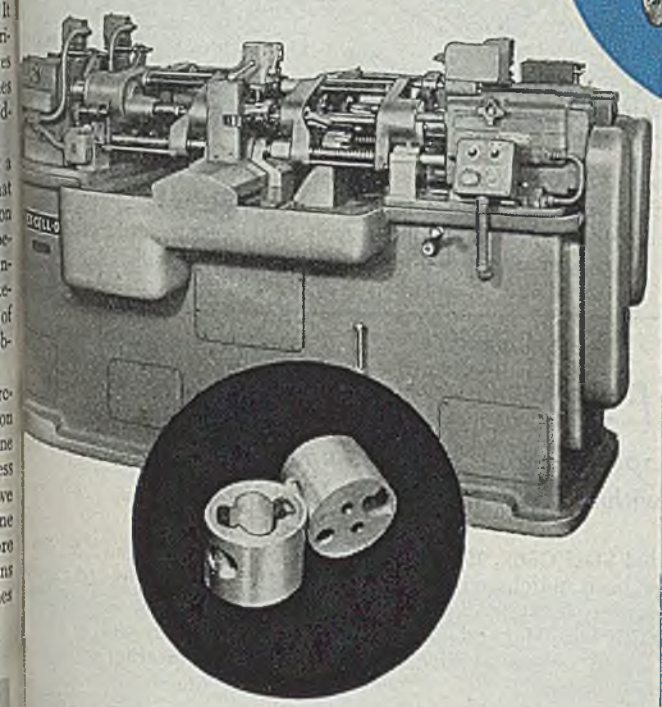
HOW EX-CELL-O HYDRAULIC POWER UNITS CAN FIT INTO YOUR PRODUCTION PROGRAM



Above: Ex-Cell-O Hydraulic Power Unit Style 28-A.

●

To left: Ex-Cell-O Small Style No. 21 Hydraulic Units being used for accurately drilling holes in oil pump bodies. This small unit makes for less floor space. It has all the features of the larger units and can be operated individually or in combination.

Where high production, accuracy, and economy through multiple operations are required, consult EX-CELL-O

Ex-Cell-O Hydraulic Power Units are standard and produced in quantities, but in nearly every case where the unit is used it becomes a part of a special, high production type machine for a specific operation. These units are economical because, as applications change, the units can become a part of the new machine even though entire base is redesigned . . . The units can be mounted on any plane—horizontally, vertically, or angularly—on a temporary or a permanent base, and they can be arranged so that it is possible to use them in connection with guide bars and multiple drill heads . . . Find out today how Ex-Cell-O Special Machines and Ex-Cell-O Hydraulic Power Units can fit your program for today's and tomorrow's production. Write Ex-Cell-O today.

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- Multiple Drilling and other Special Purpose Machines
- Precision Thread Grinding Machines
- Precision Lapping Machines
- Broaches and Brooch Sharpening Machines
- Continental Cutting Tools
- Tool Grinders
- Hydraulic Power Units
- Grinding Spindles
- Drill Jig Bushings
- Fuel Injection Equipment
- R. R. Pins and Bushings
- Pure-Pak Paper Milk Bottle Machines
- Aircraft and Miscellaneous Production Parts

Steel Company Has $5 Million Expansion Plan

Allegheny Ludlum announces work will be started soon on new research laboratory and cold rolling mill

A $5 MILLION research and production expansion program has been approved by the directors of Allegheny Ludlum Steel Corp., Brackenridge, Pa., Hiland G. Batcheller, president, announced last week.

An ultra-modern research laboratory and related experimental and pilot plant equipment will be built at company headquarters at Brackenridge to intensify studies of the structure, melting, processing and further development of high alloy steels.

At the West Leechburg, Pa., plant will be constructed a cold rolling mill of latest design, for rolling stainless and silicon strip steels. It will add materially to the capacity of the plant and will bring new precision and uniformity of quality in the production of the special strip steels made there.

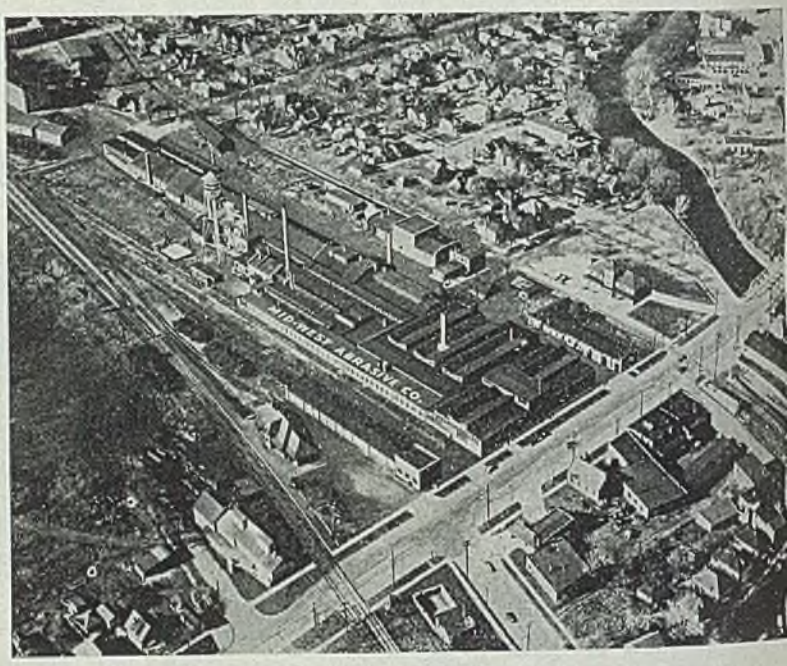
"Work on these projects will get underway rapidly," said Mr. Batcheller, "and will provide additional employment for both communities. The joint research and production expansion program will enable the company to meet the needs of its postwar markets, with more and better alloy steels.

"As the manufacturer of complex special steels, Allegheny Ludlum always has considered itself challenged to serve the most advanced needs of modern industrial technology, at each new upward level of progress. By this program, we are marking our acceptance of the postwar challenge," Mr. Batcheller said.

Expansion Plans Evidenced By Chicago Area Spending

Land purchases for later construction of new plants has marked recent industrial development activity in the Chicago area. In addition, many existing plants have announced expansion programs, and several new concerns are planning to enter the area.

Total values represented in construction and land purchases during August amounted to $7,373,026, according to the industrial department of the Chicago Association of Commerce. Addition of August figures brings industrial development spending for the first eight months of this year to a total of $99,431,141.



MIDWEST ABRASIVE'S PLANT: Central executive offices of the Mid West Abrasive Co. have been established at its plant in Owosso, Mich. and transfer of headquarters from Detroit has been completed. Abov are shown plant and offices at Owosso

BRIEFS . . . .

Paragraph mentions of developments of interest and sig cance within the metalworking industry

Bates Expanded Steel Corp., East Chicago, Ind., has been purchased by E. S. Christiansen, president, Aluminum Alloyers of America Inc., Magnesium Co. of America Inc., and owner of Edw. S. Christiansen Co., Chicago.

—o—

Douglas T. Sterling Co., Stamford, Conn., has completed a survey of incentive wage plans now in use, and a booklet summary of the survey is available upon request.

—o—

Philco Corp., Philadelphia, developed 48 different radar systems for the Army and Navy during the war, and the company's production of radar equipment totaled over $250 million.

—o—

Cooper-Bessemer Corp., Mt. Vernon, O., has announced that one of its turbocharged gas-diesel engines has set a new record in engine thermal efficiency for internal combustion or heat engines, with a thermal efficiency of over 40 per cent.

—o—

Pittsburgh Plate Glass Co., Pittsburgh, has prepared a new series of booklets explaining the use of color to control mental and physical reactions of employees and clients for better production or more satisfactory business relations.

Robert Hetherington & Son Sharon Hill, Pa., has opened a West office at 5607 West Adams Boule Los Angeles. Sales will be under Fisher, and engineering under the d tion of L. E. Massie.

—o—

Hewitt Rubber Corp., Buffalo, ha quired a controlling interest in R Conveyors Inc., Passaic, N. J., pur ing approximately 90 per cent of the ins stock.

—o—

Briggs & Stratton Corp., Milwa has agreed with the War Contracts Adjustment Board to refund $2,866 less credit for federal income tax excess profits taxes, to the governm

—o—

Remington Rand Inc., Buffalo, moved its Systems Division from Bu to the Remington Rand building, Fourth Avenue, New York 10.

—o—

A. P. Green Fire Brick Co., M Mo., has moved its advertising public relations department fro general offices and plant in Mexico, to offices in the Railway Exc building, St. Louis.

—o—

Westinghouse Electric Corp.,

STE

e Division, Mansfield, O., is planning market a new fully automatic dish-sher, designed to be available to the rge home, and an electric sink-at-ed unit which grinds up kitchen es and flushes them down the drain.

—o—

Clark Equipment Co., Buchanan, ch., has printed a pocket-size booklet ining the complete text of the ed Nations charter. The booklet is ilable to businessmen upon request.

—o—

ison General Electric (Hotpoint) iance Co. Inc., Chicago, is making ric water heaters for the first time early 1942, with first output slated emergency U. S. Navy housing in Hawaiian Islands.

—o—

sley Corp., Cincinnati, is planning produce 1,400,000 home radio re-s and 450,000 electric refrigerators first full year of peacetime pro-m.

—o—

eaves Machine Tool Co. and Cin-i Yacht Supply Co., Cincinnati, been purchased by Walter E. and J. Schott. The firms, whose prod-include gears and machine tools, continue under management of the owners, William A., George B. William H. Greaves.

—o—

Equipment Co., Bryan, O., has ted nine new jobbers to handle dustrial pneumatic tools as follows: ee Supply Co. Inc., Utica, N. Y; rn Co., Toledo, O.; Cleveland Tool & Supply Co., Cleveland; J. Ernest Stroud & Co., Amarillo, Tex.; Russ Chamberlin Co., Portland, Oreg.; Industrial Engineering Equipment Co., Davenport, Iowa; Electrical Appliance & Equipment Co., Wilmington, N. C., and Electric Home Headquarters, Minneapolis.

—o—

United States Bureau of Mines is expected to contract immediately for engineering surveys of the Coosa, Ala., coal fields, Congress having appropriated $100,000 for exploration of the fields, which state geological surveys several years ago indicated possessed rich coal deposits.

—o—

Philco Corp., Philadelphia, last week started assembly line production of refrigerators, and President John Ballantyne expects prewar production volume in six or eight weeks.

—o—

Eversharp Inc., Chicago, is planning to employ 1000 additional workers in a new plant within 100 miles of New York city, for production of a new ball-bearing writing instrument.

—o—

Nox-Rust Corp., Chicago, has changed its name to Nox-Rust Chemical Corp.

—o—

Marmon-Herrington Co., Indianapolis, is entering the transit equipment industry with a line of trolley coaches.

—o—

Trane Co., La Crosse, Wis., is planning an expansion program more than doubling present facilities.

EEKING POSTWAR NEEDS: Sir Oliver Simmonds, right, a member of the British Parliament and head of Simmonds Accessories Ltd., is shown nversing with George Tinnerman, Tinnerman Products Inc., Cleveland. Oliver told Mr. Tinnerman that England will look to America for ny of its postwar needs, predicted England's postwar housing program ll be the greatest construction program ever undertaken by peacetime England

Help Offered On Problems of Reconversion

Chicago Association of Commerce has program to assist businessmen in shifting to peacetime operations

WAR PROBLEMS service department of the Chicago Association of Commerce, formed in 1941 to keep Chicago businessmen abreast of governmental regulations affecting their affairs and aware of the war problems which would affect their postwar programs, has been converted into a reconversion problems department.

It has conducted more than 225 war problems school sessions, hundreds of smaller group meetings and many thousands of individual conferences. These were supplemented by bulletins, books and other publications.

In coming months when Chicago business is shifting to peacetime operation, the reconversion problems department will carry on a program to keep businessmen informed of the latest developments affecting contract termination, reconversion pricing, disposal of war surplus goods, dismantling of the structure of War Production Board regulations, employer problems in re-employing veterans, and wage and other economic government controls.

The association's wartime educational program won national recognition and brought from the Sixth Service Command of the U. S. Army a citation for distinguished service, the only such citation given to a similar civic or business group.

Foreign Trade Lists To Be Revised by Commerce Dept.

The Department of Commerce plans complete revision of its trade lists of foreign firms that bought American goods before the war. To do this, the department will form a division dealing with changes that occurred during the war. A preliminary study of the changes in trade channels has indicated that thorough revision of the lists is needed.

The file of trade lists maintained by the department, now to be brought up to date, records the names and addresses of potential purchasers of American-made merchandise, as well as the sources of essential materials for import into this country in approximately 100 principal foreign areas. European countries in which trade data have been greatly affected will be given first consideration in the revision of the lists.

ELECTROLYTIC

This summary of the current status of the electropolishing process shows why some producers of consumer articles may find it a tool for new finishing effects and possible economie

THERE is no real reason from the technical standpoint, why every common metal used in industry may not lend itself to electropolishing. Electropolishing is an established commercial process and is solving a variety of production problems. The ultimate place for electropolishing in industrial finishing operations will probably depend, as would be expected, upon the costs relative to mechanical methods as considered in each particular application.

Like any new development the early history of electropolishing was filled with some misunderstanding and, oftentimes, too much wishful thinking; there was frequently a lack of understanding and recognition of its shortcomings. It is not the cure-all that some have claimed. There are in industry certain applications where grit finishing cannot compete with electropolishing; conversely, there are other operations where electropolishing cannot compete with mechanical methods. In between these limits are found applications where electropolishing and mechanical polishing overlap, supplementing or complementing each other.

Electropolishing processes are now available for and in use on a commercial scale in production. The process is no longer simply a laboratory tool, as was the case a few years ago, for use by metallurgists in preparing samples for metallographic examination, where the first important applications were found. Interesting future possibilities are opening up, particularly for stainless steel, nickel, copper, brass, monel and aluminum, as well as plated metals which also can be electropolished. Although there are general conditions which relate quite widely to the process of electropolishing there is still an element of having a solution more or less tailormade to fit the particular application.

John S. Crout of Battelle Memorial Institute, which institution has done considerable work in the development of commercial electropolishing processes, states that each application of electropolishing requires individual study and each installation must be custom-built. Furthermore, conditions which make the process technically and economically desirable in one plant make it entirely unacceptable in others.

Finishing for Appearance

The most obvious application for electropolishing and the one most frequently thought of today, is finishing for appearance where brilliance and color tone can be achieved to exceed what is possible by mechanical means, such as by wheel polishing and buffing or by tumbling. Electropolishing offers a new method for imparting a "finished" or a "quality" appearance to classes of work previously left unfinished because of shape factor or extreme macro-roughness. There is no other way at present by which articles of complex shape or as-cast and as-sandblasted surfaces can be given a very brilliant finish without extensive work. An example of the above possibilities opened up by electropolishing is found in the case of stainless steel castings and for intricate formed objects less accessible, if at all, to wheel work.

A sandblasted finish, which is normally a dead, gray tone, can be dressed up to a brilliant new type appearance that literally sparkles. Stainless steel castings can be brightened readily by electropolishing because the solution gets into the base of the pits, cleans them out and produces a bright surface. As they have a dull, unattractive appear and cannot be brightened by any chanical means which will reach in the pits and brighten the entire face. As a result, electropolished less steel castings have an unusual l even in the rough state, which them more attractive than unpol castings and thereby enhances their value.

Many combinations of two-tone relief effects are possible and practical to produce. Lacquers are to "stop-off" areas or sections tha not to be anodically attacked. U these also permits etched designs produced that are polished on the attacked. The raised areas either c polished or left natural as desired. 2 shows a unique two-tone deco effect obtained on stainless ste "stopping-off" prior to electrolytic p ing[3].

Designers and finishers may b fluenced by the fact that heretofore mirror-bright surface has been a w buffed or cold-work surface. The automatically, the planeness of a w buffed surface has been associated great brilliance. Design and fini requiring brilliant surfaces had to into account the mechanical pol that was previously the only w achieve the result. By electropoli unique, bright frosty, to mirror bril can be obtained.

The rating of decorative finish in general, not subject to quanti evaluation, but is more a matter o sonal opinion with people havin duty of passing on sales appeal. A ing to recent reports[3], such auth have given high approval to el polished finishes on those produc which final finish is of utmost impo —in such articles as ironers, to percolators, domestic equipment costume jewelry. Final finishes a portant on products such as these are viewed at close range and minor defects become prom Electropolished finishes have a su

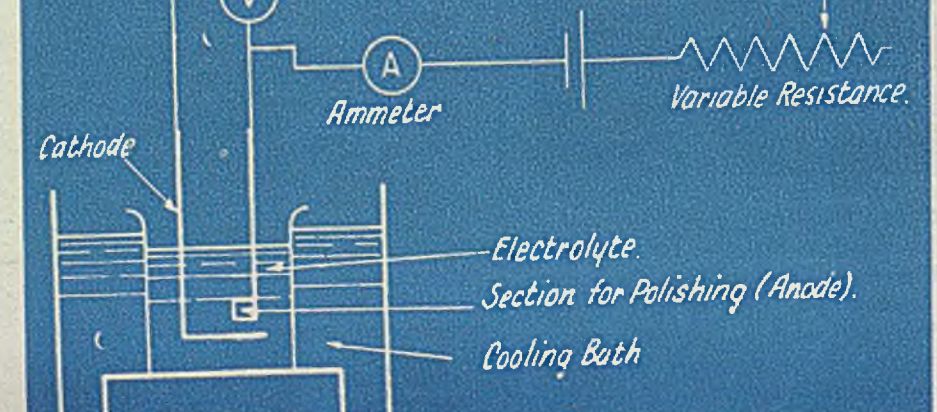


Fig. 1 (left)—Typical circuit electropolishing

OLISHING

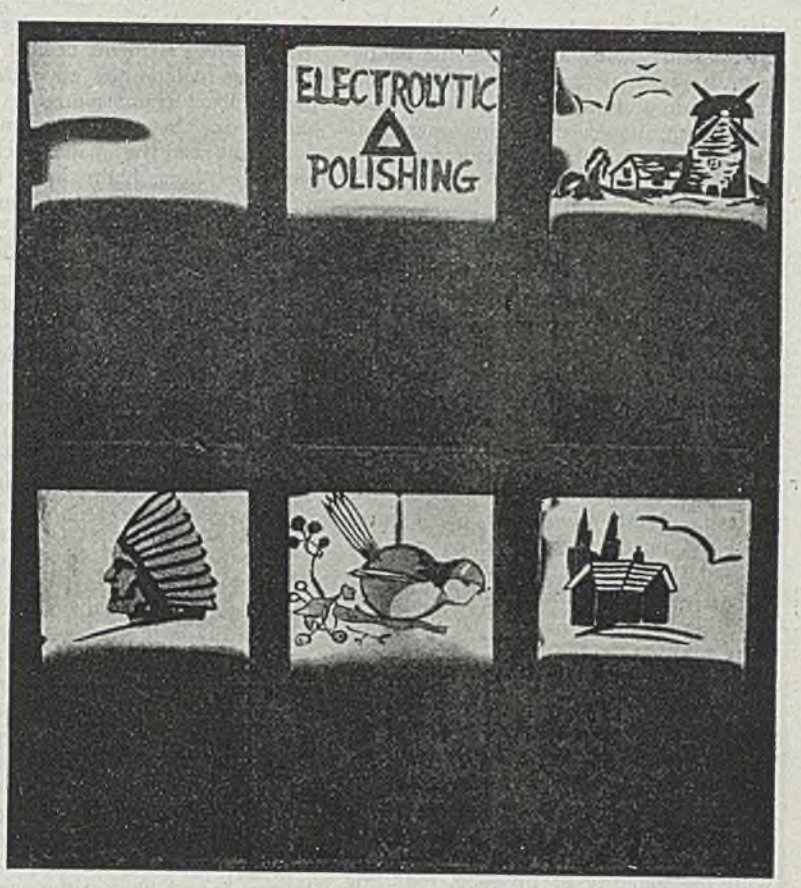


Fig. 2 (above)—Two-tone decorative effect on stainless steel obtained by use of stop-off lacquer prior to polishing.—From "Sheet Metal Industries"

er rating resulting from a complete ence of wheel marks.

According to Faust[2], there is some estion whether electropolished sur- s have improved tarnish or corrosion stance. In some atmospheres electro- shed stainless steel is more corrosion stant than wheel polished and nitric ssivated. This effect is attributed to eavier, denser, more resistant or more formly covering film.

n addition to its utility for metal finish- electropolishing offers interesting practical applications in machining al where appearance is not of primary rm but where uniform metal re- l is. Faust[2] gives an example of nstallation in which several thousand are electropolished by two oper- s in a single shift to simply and mly remove 0.005-in. of metal. same production formerly required e men, three shifts on machines. e are many instances where sawing, ing, and stamping burrs, etc., are economically removed by electro- hing. Since burrs are at the edges, are at the location of most rapid l removal during electropolishing. with poor accessibility for me- al removal can thus be more easily ved.

Benefits of Electropolishing

e benefits of electropolishing prior avy electroplating have been stress- Faust, particularly with iron, nickel, omium[2]. These benefits are due e fact metal is removed without panying mechanical work, which duces heat effects, strains, tearing duranging of the crystal structure of ce layers. As a result, the electro- ng surface (1) is as free from strains e original metal; (2) has a structure e characteristic of the body of the . (3) is free from metal fragments layers of broken-down crystal ure; and (4) is not influenced by g effects from mechanically work- e metal. All of these factors are eat interest where the bond zone ected to high stresses during ional use of a part having a heavy plate.

early work by Blum[8] it was shown n those cases where the crystals of electrodeposit represent a continu- e of the crystals of the base metal, perfect adhesion is obtained. after electropolishing, the base presents its true crystal structure depositing metal in the subsequent g process. The plated metal then can continue the crystals of the base metal as well as the relative crystal habits of the two metals will permit. A metal-to-metal bond is realized in which the atomic forces provide the adhesion. Better bond strength than that which results cannot be obtained.

After many of the common surfacing operations such as machining and grinding, the strength of the surface layer of steel or other metal can be appreciably less than that of iron, nickel, or chromium plate. For instance Faust[2] cites the example that tensile specimens by the Ollard method[9] for heavy nickel plate or machined SAE-1010 steel broke at only 35,000 psi for the steel having a strength of 100,000 psi and nickel plate of 90,000 psi. Thus it would appear that the bond of nickel plate to steel failed at 35,000 psi.

Removal of this layer by electropolishing or mild mechanical polishing (as used by metallographers) and then nickel plating, provided bonds of such strength that failure in tension came at 90,000 psi entirely in the nickel plate. Thus, as perfect a bond as could be expected was obtained. However, it should be pointed out that there are mechanical methods for surfacing metals without the introduction of excessively weak metal layers, such as honing, or other light abrasive finishing; however, these are not always applicable to a surface of irregular shape. In such cases electropolishing does the job.

Faust[2] points out that machining, deburring and polishing can be accomplished in one operation and predicts wide commercial use. The term *"mechanical cleanliness"*, meaning the absence of layers of mechanically damaged or strained metal, is used to describe the surface condition of the metal. This term probably will stand beside *"chemical cleanliness"*, referring to freedom from oxides and scale, and *"physical cleanliness"*, meaning freedom from oils, greases and dirt.

Another application of electropolishing before plating that has been pointed out[2], and which probably comes under the heading of appearance involves the electropolishing of base metal, then bright plating, electrobuffing the plate and using as it comes out, or following with chromium plate. Electrobuffing of plated metals is thought to be entirely practical and generally involves removal of no more than 0.0002-in. of metal to achieve full color.

Processes

There are several different electropolishing processes, including such solutions as mixtures of perchloric and acetic acids; sulphuric and citric acids based on process and patents held by the Rustless Iron and Steel Corp[7].; phosphoric acid and glycerine as proposed in work by Uhlig[5]; and phosphoric and sulphuric acid developed by Pray and Faust and associates and covered by patents owned by Battelle Development Corp.[1].

In general, the operating conditions used in electropolishing processes are comparable to those used in chromium

plating. The article to be polished is racked individually and made the anode in a bath of proper composition, and direct current is applied in such a way as to bring about a de-plating operation. Fig. 1 shows a typical circuit for electrolytic polishing.

Reverse of Electroplating

Electropolishing is usually thought of as the reverse of electroplating. In electroplating the work is made the cathode and metal is added; while in electropolishing the work is made the anode and metal is removed. The amount of metal removed in an electropolishing operation depends upon the time of immersion, the current density used and to some extent on the condition of the surface. Most all grades of stainless steel can be electropolished by removal of about 0.0005-in. of metal.

Current densities used in the Battelle sulfuric-phosphoric process are described by Crout[1] to range from 100 to 500 amp per sq ft, with 200 to 250 as a general average. Temperatures are given as varying from 115 to 250° F, with most operations conducted between 125 and 140° F. The voltages are between 2 and 18, with most applications using 6 to 8 v. Time of treatment may be from 1 to 40 min., with the majority of products requiring only 10 to 20 min.

Stainless Steels

A considerable amount of work has been carried out in investigating the possibilities of electropolishing stainless steels. There is obviously a big field here due to the increasing popularity of this material in manufacture of many types of articles. While stainless steel provides varying degrees of corrosion resistance depending to an extent on its constituents, the possibilities that exist for its decoration are strictly limited. Most generally the decoration takes the form of applying as high a polish to the surface as can be obtained by using the available polishing methods. As a rule, most stainless steels are relatively tough and because of this, do not lend themselves to easy polishing by mechanical methods. The polishing operation, as a result, is relatively expensive both in material and labor and hence any other method of obtaining a similar finish which is more economical holds obvious attractions. Electropolishing processes offer a means of expanding the usefulness and lowering the costs of fabricating stainless steels.

The degree of smoothness resulting from the electropolishing of stainless steels depends to some extent on the smoothness of the original surface. An important question then which naturally arises is: At what point and to what extent is mechanical polishing a useful asset as an aid to electrolytic polishing? To obtain the best possible results, some initial mechanical polishing treatment is desirable. The amount of mechanical work that is required varies greatly, and is largely dependent on the type of article and the economics involved.

The direct elements of cost of electropolishing include the chemical solution, power, fixed charges on the equipment and labor. No generalizations on solution costs can be made because some electropolishing baths have finite lives dependent upon saturating the bath with metal, which is fixed on the amount of metal removed from the products treated, whereas other baths have practically infinite lives, losses depending on drag-out.

A major item of cost in electropolishing is labor. This may vary greatly depending on the product being polished and whether complicated racking procedures employing highly skilled labor are required. Crout[1] of Battelle Memorial Institute has reported costs per square foot of area polished to vary between 2 and 90 cents which have proved profitable in both cases. Faust[2] cites that where one electropolishing installation operates successfully at a cost of 2 to 5 cents per square foot of surface, another is entirely practical at $1 per square foot processed. However, it is generally agreed that the most advantageous overall costs are secured when electropolishing can be used to replace several operations such as descaling, deburring, tumbling and wheel polishing.

Electropolishing costs per unit even then may be high, but the overall savings make the process attractive. Electropolishing often permits streamlining of finishing steps preceding and following the operation. A realization of the true value of electropolishing apparently can result only from a complete analysis of each application.

Possibilities

At this time, when reconversion to civilian production is under way, designers, engineers and metal finishers undoubtedly will explore the possibilities of electropolishing in their finishing problems. It may be found that an entirely new tool is available for achieving new effects and new economics in manufacturing operations.

Electropolishing is a new process and sufficient experience has not been gained to reveal all of its advantages or all of its applications as a commercial process. In developing new uses for electropolishing, Crout[1] reports that at Battelle Memorial Institute the following list of products from a number of different companies have been studied: Automobile bumpers, hub caps, radiator caps, horn buttons, windshield wipers, insignia, gears, hardware and dash panels; watch springs, pivots, cases, and gears; refrigerator hardware, trays and shelves; surgical and dental instruments; aircraft and automobile engine spark plugs, piston rings, and valves; cutlery, tableware, vacuum bottles, electric irons, waffle irons, toasters, and various kitchen utensils; saws, files, drills, reamers, bits, wrenches, pliers, cutters, and similar tools; a variety of aircraft parts; metal milk containers; tubing; wire; needles; household and cabinet hardware; costume jewelry, watch bracelets, belt buckles and luggage hardware; telephone parts; dies; molds; pipe fittings, bathroom hardware, and plumbing fixtures; instrument and meter parts; screws; printing and engraving plates; musical instruments; chemical apparatus and machinery; metal office and home furniture.

New applications are constantly being discovered and this list may be expanded as time goes on. Continual research should expand the use of electropolishing, cast additional light on its technical and economic limitations in order that it may become a better tool for the production man. In a large part, success of electropolishing methods depends on intelligent use in the proper places; it has demonstrated that it has economic value and that it can compete successfully with other finishing methods under certain conditions.

Metallic Coating of Hardware

WHEN parts are immersed in a plating solution, such as used for galvanizing, cadmium plating, nickel plating, etc., it is important for the plater and the cost estimator to know how much time is needed for the pieces to obtain the required thickness of metal coating, and current required.

As it is most practical for quantity production to weigh the parts that are to be plated, in preference to counting the number of pieces, the values in accompanying table were computed on a weight basis. They cover standard hexagon-head bolts for sizes ¼ to 4 in. and lengths from ⅜ to 15 in., giving the sum of the areas over the surfaces of the head, the unthreaded and threaded portions per 100 lb of bolts, and also the weight of 100 bolts. (Comments and data in tables were supplied by J. I. Hommel, Engineering Laboratories and Standards, Westinghouse Electric Corp., East Pittsburgh, Pa.)

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[8]Blum and Rawdon, Trans. Electrochemical Society, 44-305, 1923.

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Weights and Surface Areas of Hexagon Head Steel Bolts

1/4 - 20		5/16 - 18		3/8 - 16		7/16 - 14		1/2 - 13		5/8 - 11		3/4 - 10		7/8 - 9		1 - 8		1-1/8 - 7		BOLT LGTH
WT OF 100 BOLTS	AREA PER 100 LB	WT OF 100 BOLTS	AREA PER 100 LB	WT OF 100 BOLTS	AREA OF 100 LB	WT OF 100 BOLTS	AREA OF 100 LB	WT OF 100 BOLTS	AREA OF 100 LB	WT OF 100 BOLTS	AREA OF 100 LB	WT OF 100 BOLTS	AREA OF 100 LB	WT OF 100 BOLTS	AREA OF 100 LB	WT OF 100 BOLTS	AREA OF 100 LB	WT OF 100 BOLTS	AREA OF 100 LB	
LB	SQ FT	LB	SQ FT	LB	SQ FT	LB	SQ FT	LB	SQ FT	LB	SQ FT	LB	SQ FT	LB	SQ FT	LB	SQ FT	LB	SQ FT	
1.03	57.7	1.93	46.5																	3/8
1.16	60.2	2.14	47.0	3.26	39.6															1/2
1.30	62.2	2.35	49.6	3.57	39.4	5.10	34.6													5/8
1.47	59.5	2.62	47.2	3.96	39.4	5.61	33.5	8.13	29.7											3/4
1.60	60.6	2.82	48.5	4.26	40.3	6.06	34.2	8.71	30.0	15.7	24.2									7/8
1.73	62.1	3.06	49.3	4.58	41.0	6.45	35.0	9.23	31.0	16.6	24.4	26.5	19.8							1
2.08	58.4	3.57	47.8	5.33	39.8	7.31	35.9	10.4	31.2	18.4	24.9	29.1	20.2	43.6	17.0					1-1/4
2.43	55.4	4.02	48.2	5.98	40.2	8.38	34.2	11.8	29.8	20.4	24.6	32.0	20.2	46.4	18.2	64.4	16.3			1-1/2
2.77	53.6	4.56	46.4	6.78	38.4	9.45	32.9	13.2	28.8	22.5	23.8	34.5	19.1	50.6	17.7	69.8	15.6	94.8	14.9	1-3/4
3.12	52.1	5.12	44.4	7.56	37.2	10.6	32.2	14.3	29.6	24.5	23.7	37.6	18.7	55.0	17.7	74.6	15.7	101	13.5	2
3.47	51.0	5.63	43.6	8.34	36.1	11.4	32.7	15.7	28.7	26.7	23.0	40.8	18.2	57.6	17.7	80.1	15.3	108	13.2	2-1/4
3.82	49.8	6.17	42.4	9.12	35.4	12.4	31.9	17.1	28.0	28.6	23.3	43.6	18.2	62.8	17.0	85.6	15.0	114	13.6	2-1/2
4.16	48.8	6.70	41.6	9.90	34.5	13.5	31.1	18.5	27.3	30.6	22.9	46.6	17.8	67.0	16.6	91.2	14.7	121	13.3	2-3/4
4.47	49.4	7.26	40.7	10.7	33.9	14.6	30.4	19.9	26.8	32.8	22.4	49.4	18.0	71.2	16.3	96.8	14.4	127	13.5	3
4.81	46.8	7.80	40.0	11.5	33.2	15.6	30.0	21.3	26.3	35.1	22.0	52.6	17.6	76.0	15.9	102	14.5	133	13.6	3-1/4
5.16	47.8	8.34	39.6	12.3	32.9	16.7	29.5	22.7	25.8	37.1	21.8	55.7	18.5	79.8	15.8	107	14.3	140	13.4	3-1/2
5.52	47.7	8.91	39.0	13.1	32.6	17.8	29.0	24.0	25.5	39.3	21.4	58.8	18.2	84.0	15.6	113	14.1	147	13.1	3-3/4
5.86	46.8	9.42	38.7	13.9	32.1	18.8	28.7	25.7	24.9	41.6	21.0	62.0	17.9	88.2	15.4	116	15.1	152	13.6	4
6.55	46.6	10.5	37.8	15.4	31.4	20.9	28.0	28.2	24.6	45.8	20.4	68.2	17.5	96.1	15.4	127	14.6	166	13.2	4-1/2
7.24	45.4	11.2	39.3	16.9	31.8	23.1	27.5	30.9	24.2	50.4	20.0	75.2	17.1	105	15.0	138	14.2	180	12.9	5
7.94	44.8	12.3	38.5	18.4	31.3	25.2	27.1	33.7	23.9	54.6	19.8	80.6	16.8	113	14.7	149	13.9	193	12.6	5-1/2
8.64	44.4	13.4	37.9	20.0	30.8	27.1	27.5	36.3	24.2	58.8	19.2	86.8	16.6	122	14.4	160	13.5	208	11.8	6
9.33	44.0	14.4	37.5	21.6	30.5	29.2	27.0	39.1	23.8	63.4	18.8	93.0	16.4	131	14.2	171	13.4	222	12.2	6-1/2
10.0	43.5	15.5	37.0	23.2	30.3	31.5	26.7	41.9	23.8	67.6	18.6	100	16.0	139	14.1	183	13.0	236	11.9	7
10.7	43.4	16.6	36.8	23.9	31.1	33.5	26.6	44.4	23.4	71.8	18.8	106	15.9	147	14.0	194	13.0	250	11.7	7-1/2
11.4	43.2	17.7	36.4	26.3	29.5	35.7	26.2	47.3	23.1	75.8	19.0	111	16.2	156	13.8	205	12.8	264	11.5	8
12.8	42.6	19.9	35.7	29.4	29.3	39.9	25.9	53.0	22.7	84.6	18.6	124	15.8	172	13.8	227	12.5	292	11.2	9
14.2	42.3	22.0	35.3	32.6	28.9	44.2	25.4	58.6	22.4	93.1	18.3	136	15.7	189	13.5	249	12.3	320	11.1	10
15.6	42.0	24.2	34.9	35.7	28.8	48.4	25.3	64.0	22.2	102	18.2	147	15.6	206	13.3	271	12.1	348	10.8	11
17.0	41.7	26.4	34.8	38.8	28.7	52.6	24.9	69.6	21.9	111	17.8	161	15.3	223	13.2	293	11.9	372	10.8	12
18.4	41.6	28.5	34.6	42.0	28.3	56.8	24.6	75.0	21.8	119	17.8	173	15.1	240	13.0	316	11.7	404	10.6	13
19.7	41.3	30.7	34.4	45.1	26.9	61.2	24.4	80.6	21.6	128	17.7	186	15.0	257	12.9	338	11.6	433	10.4	14
21.2	41.2	32.9	34.1	48.2	28.1	65.4	24.6	86.2	21.6	136	17.6	198	14.9	274	12.8	360	11.5	461	10.3	15

1-1/4 - 7		1-1/2 - 6		1-3/4 - 5		2 - 4-1/2		2-1/4 - 4-1/2		2-1/2 - 4		2-3/4 - 4		3 - 3-1/2		3-1/2 - 3-1/4		4 - 3		BOLT LGTH
WT OF 100 BOLTS	AREA PER 100 LB	WT OF 100 BOLTS	AREA PER 100 LB	WT OF 100 BOLTS	AREA PER 100 LB	WT OF 100 BOLTS	AREA PER 100 LB	WT OF 100 BOLTS	AREA PER 100 LB	WT OF 100 BOLTS	AREA PER 100 LB	WT OF 100 BOLTS	AREA PER 100 LB	WT OF 100 BOLTS	AREA PER 100 LB	WT OF 100 BOLTS	AREA PER 100 LB	WT OF 100 BOLTS	AREA PER 100 LB	
LB	SQ FT	LB	SQ FT	LB	SQ FT	LB	SQ FT	LB	SQ FT	LB	SQ FT	LB	SQ FT	LB	SQ FT	LB	SQ FT	LB	SQ FT	
134	12.1																			2
143	11.8	222	10.3																	2-1/4
150	12.2	235	10.1	342	8.64															2-1/2
158	11.9	248	9.87	357	8.72	510	7.63													2-3/4
166	12.1	256	10.3	372	8.66	529	7.68	725	6.48											3
173	12.2	269	10.1	387	8.59	548	7.75	745	6.60	985	5.82									3-1/4
182	12.0	282	9.91	402	8.47	567	7.80	774	6.61	1015	5.86	1290	5.36							3-1/2
190	11.8	294	9.80	417	8.60	586	7.84	800	6.64	1046	5.90	1327	5.38	1665	4.97					3-3/4
197	12.2	306	9.68	431	8.56	608	7.74	820	6.81	1076	5.96	1363	5.44	1712	5.00	2900	3.99			4
214	11.8	328	9.85	461	8.78	652	7.56	876	6.66	1145	5.81	1448	5.33	1805	5.04	3020	4.04	4265	3.53	4-1/2
232	11.5	353	9.63	491	8.49	697	7.38	934	6.58	1203	6.04	1520	5.46	1890	5.10	3140	4.08	4423	3.56	5
249	11.3	378	9.40	521	8.37	736	7.46	987	6.51	1265	6.05	1595	5.50	1988	5.00	3280	4.03	4600	3.53	5-1/2
265	11.1	396	9.71	551	8.37	780	7.31	1044	6.44	1334	5.94	1677	5.42	2075	5.06	3395	4.08	4760	3.55	6
283	10.9	422	9.56	574	8.33	825	7.18	1091	6.54	1395	6.00	1750	5.48	2170	5.04	3530	4.08	4925	3.55	6-1/2
301	10.7	448	9.37	612	8.16	870	7.06	1146	6.44	1465	5.90	1824	5.42	2258	5.08	3650	4.10	5080	3.60	7
318	10.5	472	9.25	641	8.08	913	7.00	1204	6.26	1535	5.80	1920	5.31	2344	5.11	3770	4.14	5240	3.61	7-1/2
335	10.4	498	9.08	672	7.99	958	6.88	1266	6.22	1602	5.75	2088	5.16	2445	5.05	3900	4.10	5420	3.58	8
368	10.2	548	8.90	732	7.88	1048	6.70	1375	6.08	1740	5.61	2173	5.10	2645	4.92	4180	3.99	5780	3.50	9
404	9.87	598	8.65	794	7.70	1137	6.56	1510	6.04	1880	5.48	2340	5.01	2845	4.79	4450	3.94	6130	3.44	10
439	9.83	647	8.53	853	7.60	1228	6.43	1595	5.84	2018	5.37	2515	4.88	3040	4.70	4720	3.87	6480	3.39	11
474	9.65	698	8.35	915	7.52	1316	6.32	1705	5.76	2158	5.28	2677	4.82	3240	4.62	5000	3.81	6840	3.34	12
508	9.55	748	8.25	975	7.47	1400	6.26	1822	5.66	2295	5.19	2840	4.75	3440	4.54	5260	3.76	7200	3.30	13
543	9.42	798	8.10	1035	7.40	1494	6.16	1935	5.58	2435	5.12	3010	4.68	3650	4.46	5540	3.72	7550	3.25	14
576	9.31	848	8.05	1097	7.32	1584	6.06	2048	5.43	2575	5.04	3180	4.62	3840	4.40	5810	3.67	7900	3.24	15

POLITEC

By G. W. BIRDSALL
Associate Editor, STEEL

Multiple

. . . makes five brazed joints simultaneously in typical small pressure vessel used as insecticide container. Millions of units processed by copper brazing in controlled atmosphere furnaces show process to be extremely effective low-cost mass production method of joining steel parts

POSSIBILITIES of copper brazing assemblies of steel parts so impressed N. M. Salkover some few years ago when he first became acquainted with the process that he formed his own company for the express purpose of furnishing such facilities to other manufacturers.

Designs Cut Costs: "The possibility of making even complicated machine parts from a number of individual pieces stamped out on high speed presses and brazed together to form a unit that functions as single piece of metal is interesting more and more manufacturers looking for postwar methods of production that will lower their costs," points out Mr. Salkover.

"The war has brought forth many outstanding examples of parts redesigned as composite stampings, as units made by this method are called. The article, 'Composite Stampings', STEEL, Oct. 12, 1942, p. 82 explained how typical redesigns increased production rates to as high as 150 times former speeds; cut costs as much as 70 per cent; reduced stock required sometimes to only half former requirements; cut machining costs to a mere fraction; and provided other similar important economies.

"Such parts," continues Mr. Salkover, "have been substituted for forgings and castings with exceptional success. Perhaps one of the most outstanding examples is the composite trigger housing for the .30-caliber carbine. See STEEL, Oct. 11, 1943, p. 194. Here 14 individual pieces stamped from steel strip are brazed together to make an extremely complicated shape that is substituted for a forged part to reduce machining time per part from 28.8 min to a total of only 7.2 min. The great savings in machining time are made possible by using high speed presses to do most of the 'cutting away' of metal, thereby getting the component parts to the shape desired during the stamping operation and thus avoiding the necessity for removing large amounts of stock when machining.

"It is important to note that this design cut overall production costs in half while permitting greater output than could be obtained from a comparable investment in equipment for the previous production method. More output per worker was also found to result."

Simultaneous Joining Easy: Mr. Salkover reports one of the features of copper brazing that interests many manufacturers is the ease with which almost any number of exceptionally strong, gas tight joints can be made simultaneously.

A recent visit to the Salkover Metal Processing plant in Chicago revealed work in process that well illustrates this and other important features of multiple copper brazing. There Larry Jacobsmeyer, plant manager, explained the various steps in assembling insecticide

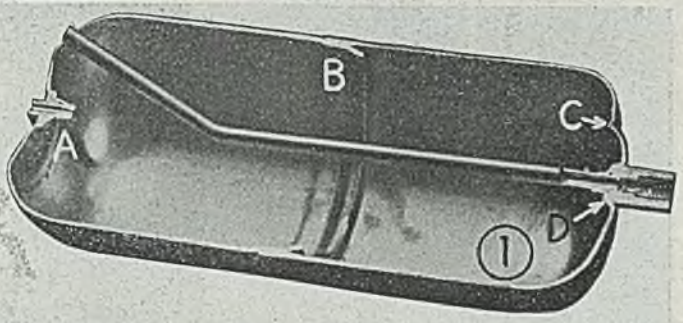
Fig. 1—Completed container sectionalized to show construction. Screw machine part brazed in at A for charging container; B is main joint; C, small pierced hole for "safety"; D, valve body, tube and cap assembled into container head by multiple joint

Fig. 2—Container parts: A—upper half; B—lower half; C, E and H—copper wire rings; D—tail fitting; F—tube; G—cap; K—copper wire slug; M—valve body

Fig. 3—Press assembly of tube, cap and valve body. Figs. 1-8 by G. W. Birdsall

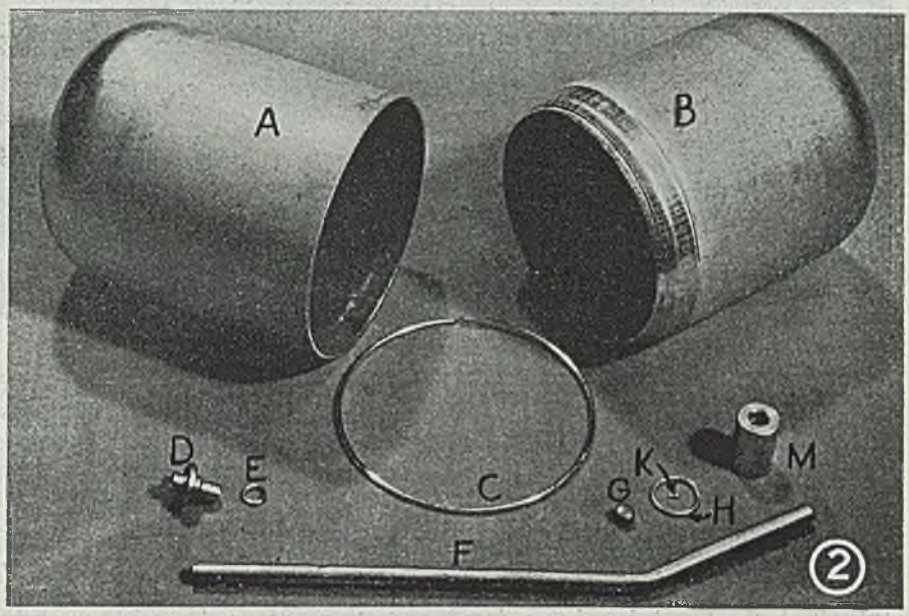
Fig. 4 — Assembling fittings into upper and lower halves of container on separate lines

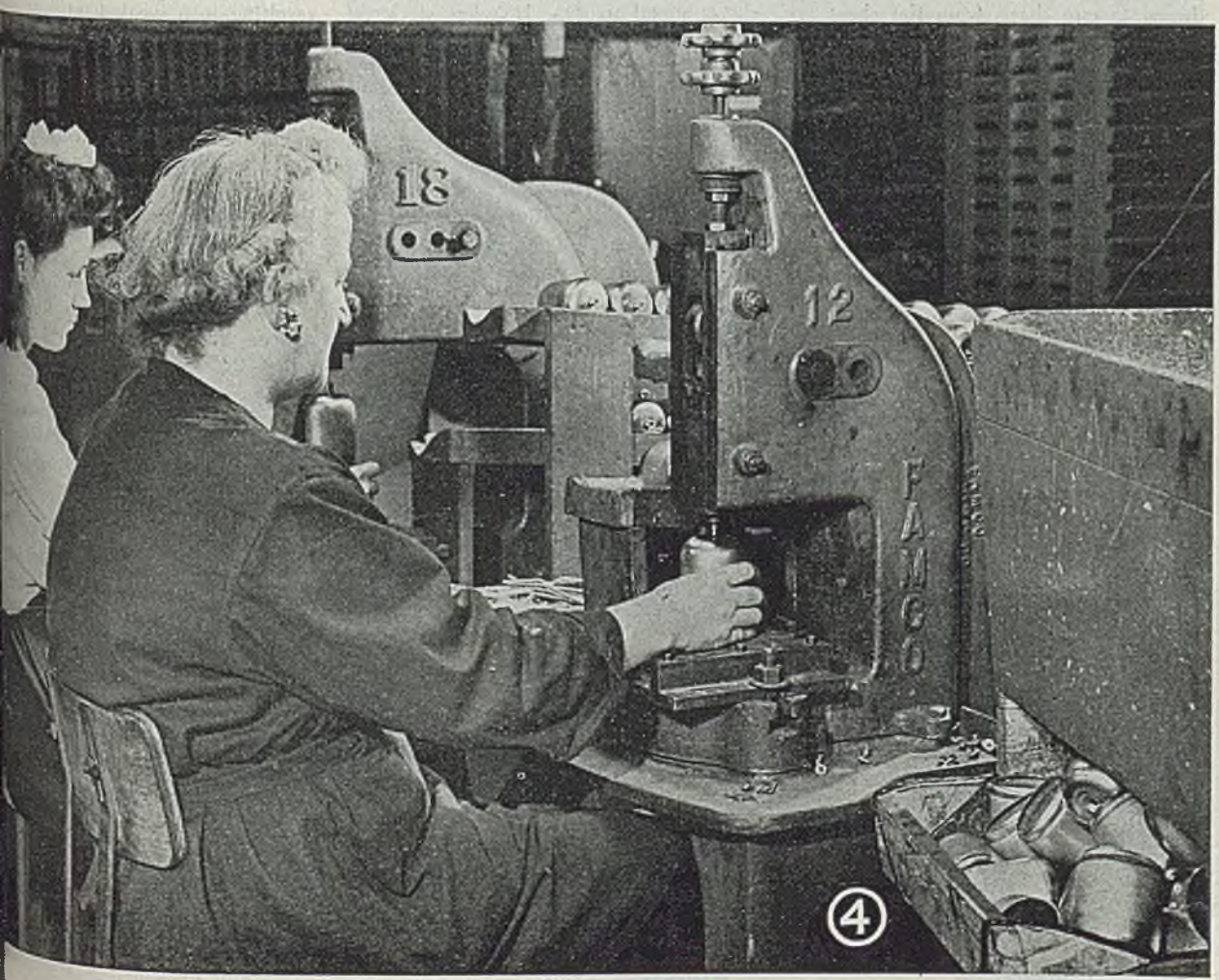
razing

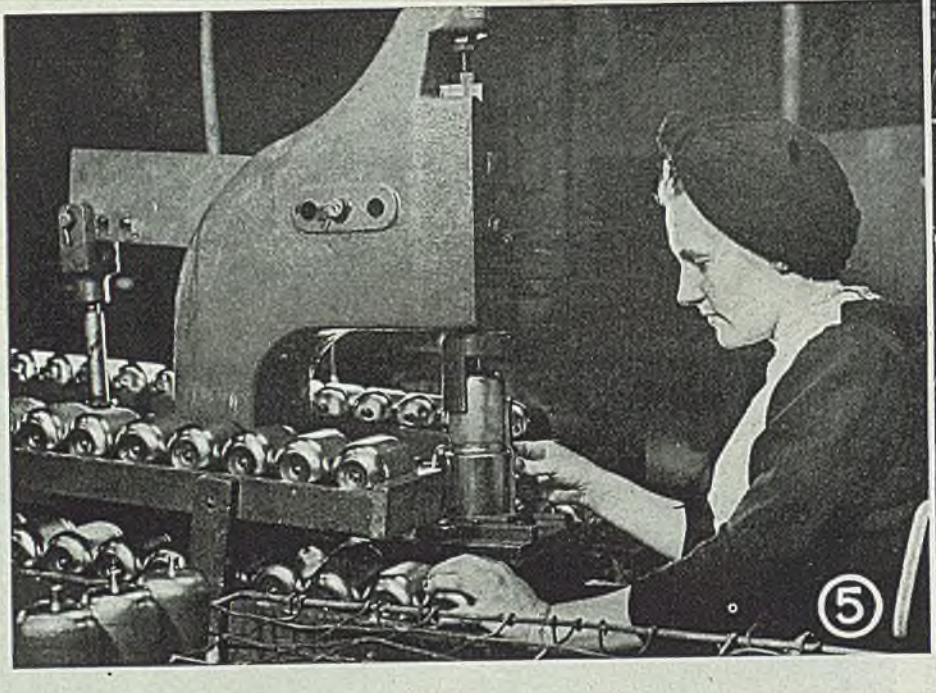


sers — one of their large volume now in production for some time. embly of the container which is le of withstanding internal pres- of 1500 psi and over involves the f three copper wire rings and a small piece of copper wire to braze er the two halves of the container, wo fittings, the feed tube and the seal — all pictured in Fig. 2. joints are made simultaneously as unit goes through the brazing ce.

at Strength: Figs. 9 and 10 are and after views of destructive n an insecticide container whose n is like that in Fig. 1. Fig. 9 shows al shape of the container; Fig. 10 pplication of pressure of 1600 psi. that despite grotesque distortion of







the thin sheet steel shell, the brazed joints did not fail.

Of particular interest is the middle seam where the two halves overlap approximately ⅛-in. for the main body joint. Although this joint expanded 15.5 per cent, it still remained intact. Containers are about 2¾-in. in diameter, 7 in. high; are made of 20-gage SAE 1010 steel, the two halves being deep drawn to cup shape from flat sheet involving approximately a 8½-in. deep draw.

Mr. Jacobsmeyer explains that this evidence of great joint strength is not unusual. "Most copper brazed joints in steel can be produced with strength closely approaching that of the base metal because with proper close press fit of mating parts, the copper melts and forms copper-iron alloys at the joint interface. Experience has shown that best results are obtained with press fits with interference around 0.001-in. per inch of diameter; that is, nominal dimension of the internal part should be 0.001-in. per inch larger than the mating part at contacting surfaces for relatively light sheet metal parts. Heavier stock of course requires less interference as too tight a fit would require excessively long periods in the brazing furnace to allow the copper to penetrate the joint completely.

"Generally," he adds, "it is almost impossible to get too tight a fit on light sheet metal parts. One precaution in brazing screw machine parts inside sheet metal parts is to watch that such a heavy press fit is not obtained as to tend to stretch the sheet metal parts beyond their elastic limit thus distorting the assembly. A loose joint is to be avoided because of the possibility that pure copper (of relatively low mechanical strength) will fill the space between the steel surfaces, resulting in a weak joint.

"Micrograph Fig. 11 shows why it is possible to develop almost the full strength of the steel in the joint itself. Note that here the line of the joint is almost entirely obscured by the fact that the grains have regrown across the joint line in many places. And the metal through the joint is not copper or steel but a copper-iron alloy formed by the molten copper alloying with the iron in the steel, which although not molten itself is able to absorb much of the copper at the brazing temperature of about 2050° F.

"These two factors account largely for the exceptionally high strength obtained in properly brazed assemblies. Translated into terms of service life, the

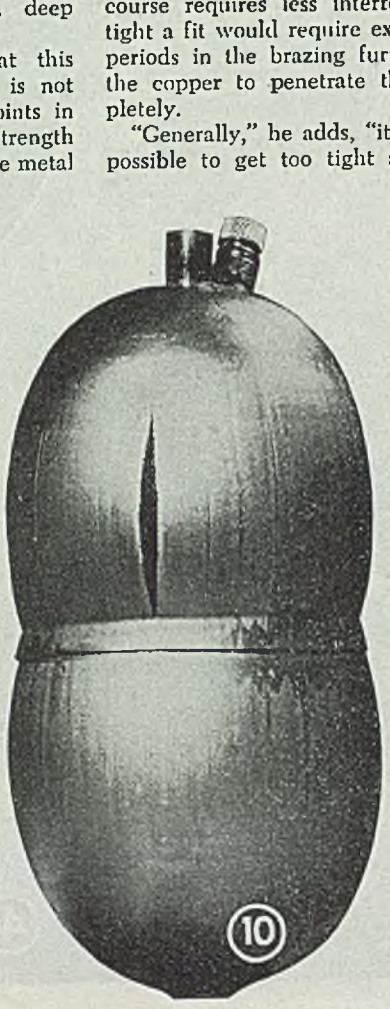
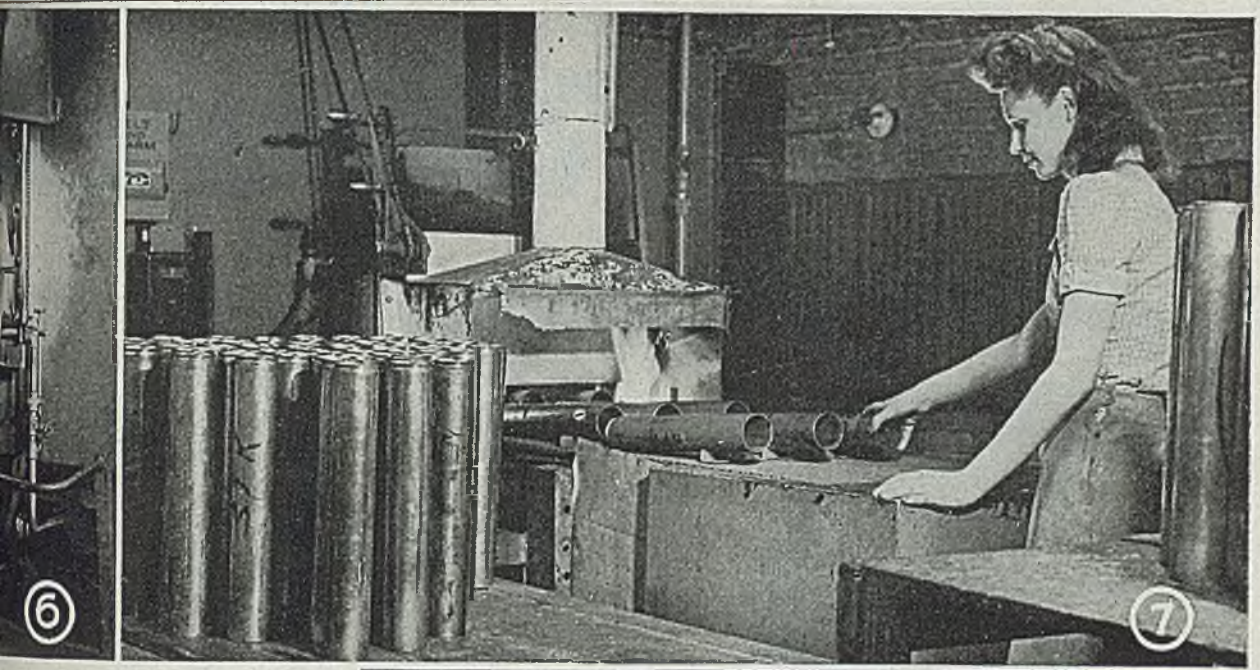


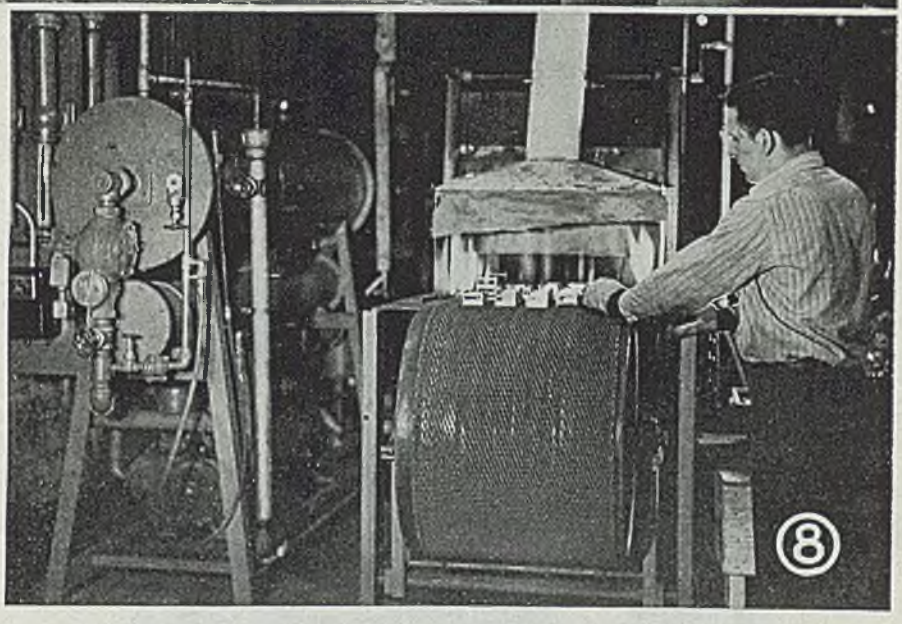
Fig. 5—At this station, operator places lower half of container in fixture, puts upper half on also, slides fixture in under head where it strikes against air valve in turn automatically operating the press. As a result, operation is extremely fast

Fig. 6—Batch type controlled-atmosphere brazing furnace has curtain of flame at door to prevent entrance of air when operator pushes heated rack of parts into cooling chamber back of main heating chamber

Fig. 9—Completed container before bursting test

Fig. 10—Container in Fig. 9 assumed this shape before failure at 1600 psi. Central joint did not fail, expanded 15.5 per cent





h of the bond is such that the ly functions as a single piece of with great resistance to vibration mpact and with no tendency to loose," concludes Mr. Jacobs-

reas the shear strength of copper s only 20,000 psi, the copper-iron formed in a good brazed joint roduce joint strengths closely ap- ing those of the steel itself. It is nusual for joints to show shear hs from 29,000 to 32,000 psi when el itself may only test 33,500 psi.

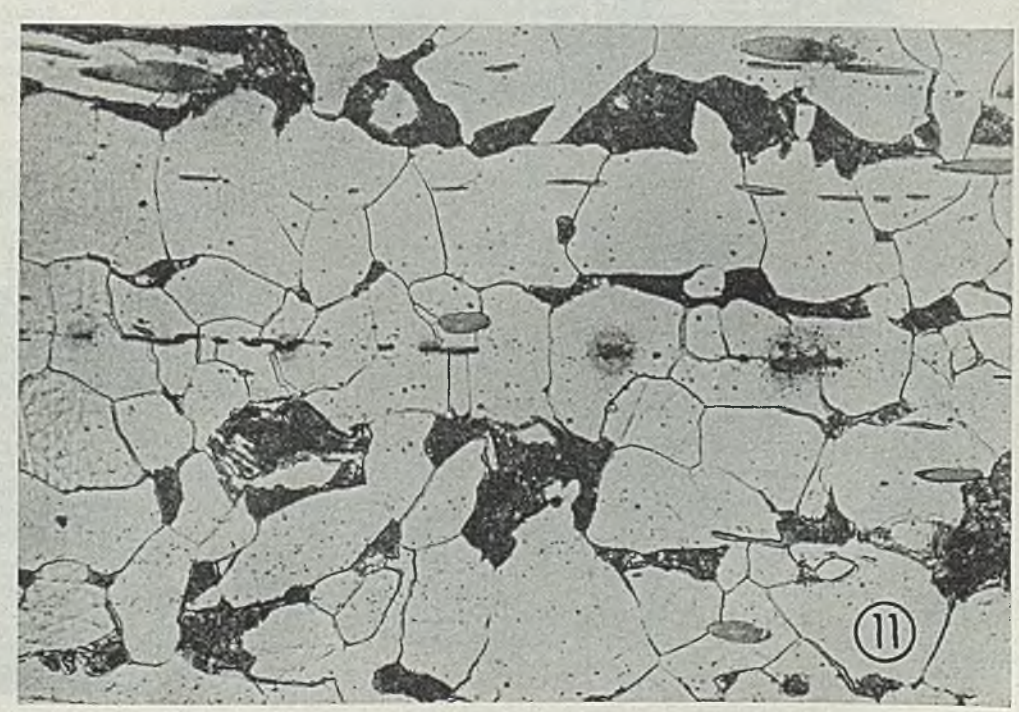
Fluxing Required: While there are methods of applying heat for , the use of an electric furnace an atmosphere that is controlled to be slightly reducing avoids rmation of any oxide film on the

(*Please turn to Page* 156)

— Loading end of con- brazing furnace. Unit trically heated, has con- trolled atmosphere

—Unloading end of con- furnace showing mesh nveyor. Atmosphere gen- or can be seen at left

11—Note line of joint is completely obscured by grown during brazing, zing for the great strength of brazed joints



GUNS "CANNED"

WAR MATERIEL amounting to mil-
lions of items constitutes a tremendou
disposal problem now partially solve
by newly developed methods to se
equipment in "cans". Army ordnanc
men have long dreamed of some storag
method that would eliminate the need
for extensive warehouses and the tedious
cleaning and reapplication of protective
oils and greases required every yea
when stored by conventional methods.

End of this war finds us with many
times the amount of materiel that was
left from World War I, with correspond-
ing increase in the disposal problem.
Now a method has been devised to sto
any amount of equipment desired in open
fields. And it will be ready for immedi-
ate use, instead of requiring time-con-
suming cleaning and assembling. Guns,
fire control instruments, and similar
current materiel that is not expected
to become obsolete quickly are to be

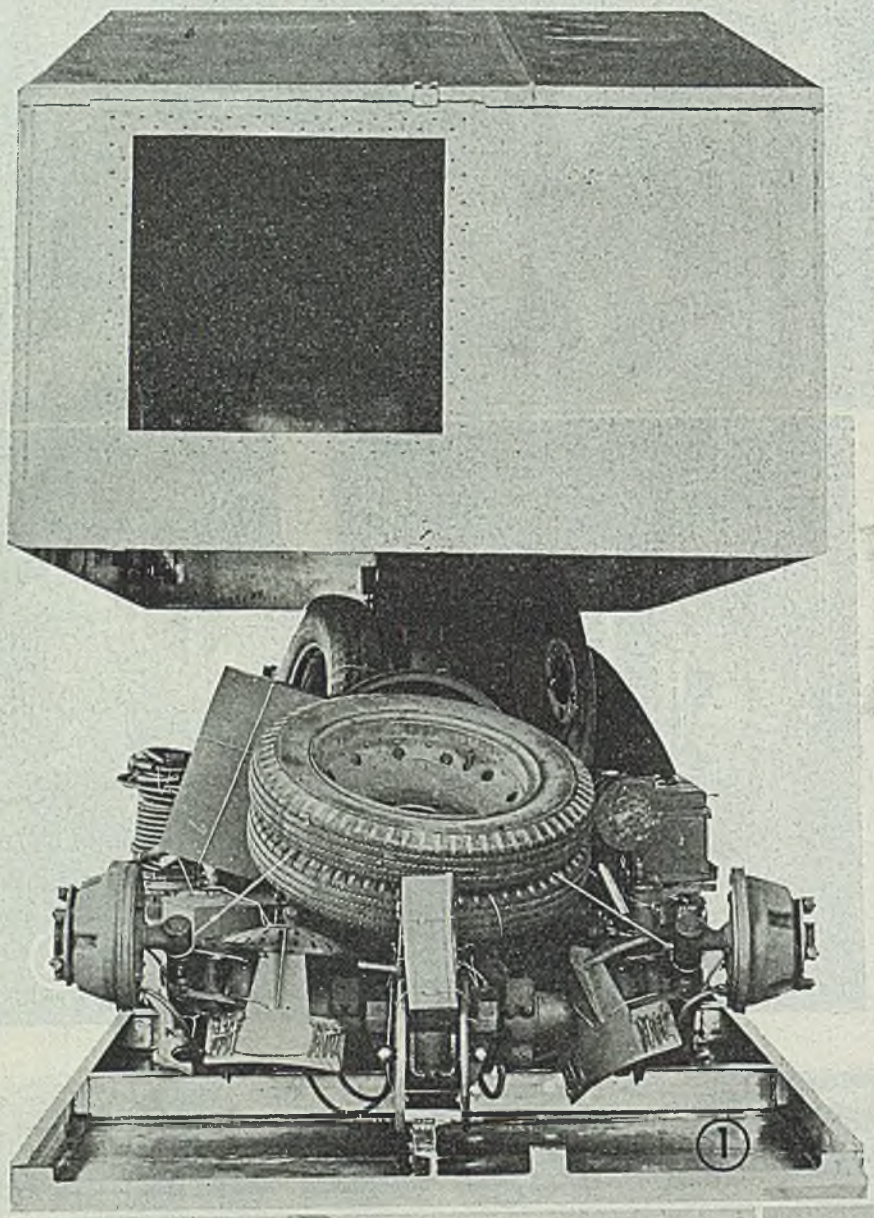
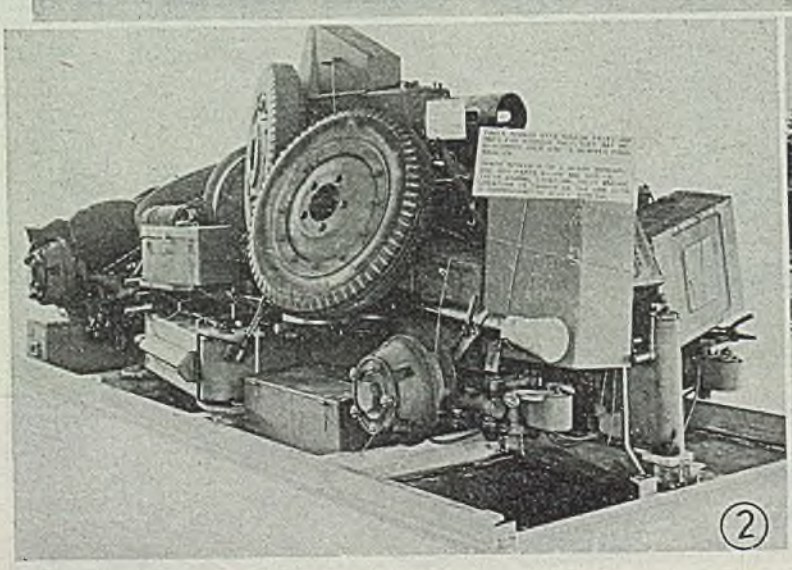
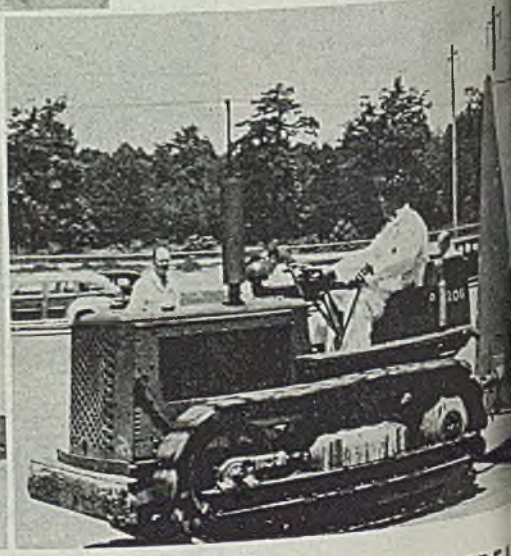


Fig. 1 — Cover of barrier being lowered in place on bed

Fig. 2—Another type of package designed to take the 40-mm gun and mount. Here are shown parts ready for enclosure

Fig. 3 — This 90-mm gun and mount is shown "canned" ready for open-field storage for any period up to 50 years. This improved storage method requires no warehouse and eliminates costly cleaning and regreasing required yearly by conventional methods of storage





. FOR NEXT WAR

in containers made of heavy steel

corrosion problem was solved by
g the air out of the hermetically
container and replacing it with
n, an inert gas. Silica gel to
moisture is also placed in the
er. But the weight of these units,
eir cost and the expense of the
n made development of a lighter
er desirable.

est units, known as the "balanced
e barrier," are made of aluminum,
t hermetically sealed but have
on for "breathing" and so need
ossess the rigid construction of
aled type of container. This is
ant feature, for the lightweight
ction enables the gun to be pack-
nywhere and then hauled or ship-
sily to point of storage. The new
were developed jointly by Alu-
Co. of America, Glenn L. Martin
Co. and Davison Chemical Co.

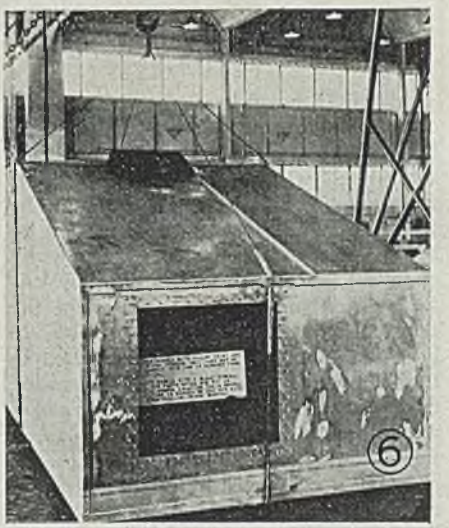
To assure good condition of the equipment, it is necessary to keep the moisture content of the air in the container below a relative humidity of 30 per cent. This is done by means of the Davison solar radiation silica gel breather seen in the accompanying illustration. It contains provision for absorbing moisture from any air drawn into the container due to temperature or barometric changes. In addition, any moisture is prevented from being absorbed by infiltration from surrounding air when there is no flow of air into the container. Additional silica gel units inside the container remove moisture of entrained air and from surfaces of the equipment.

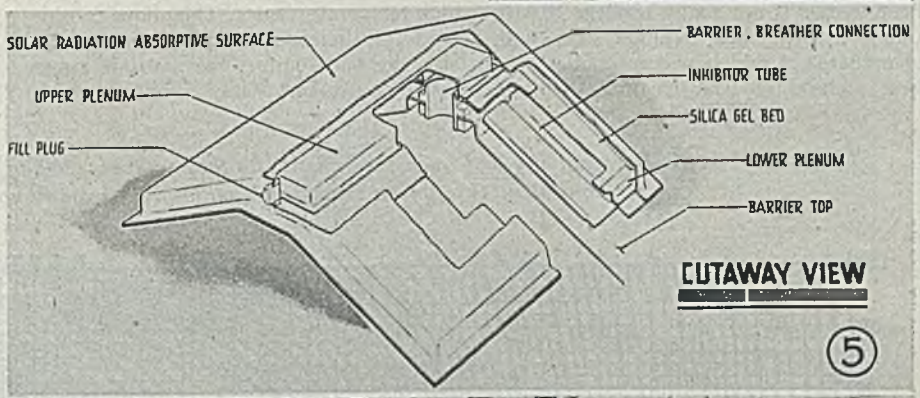
Aluminum was chosen because it assures minimum weight yet provides sufficient strength, ruggedness and long life. Being easy to fabricate, shape and weld, space required is a minimum since container can closely follow overall contour of the gun. It adds no appreciable weight to the gun, thus enabling it to be hauled about on its own standard gun carriage, simplifying the transportation problem. Tremendous expansion in aluminum producing facilities affords an ample supply of raw stock without dipping into supply of heavy metals needed for rebuilding operations in many countries of the world where these items will be packaged.

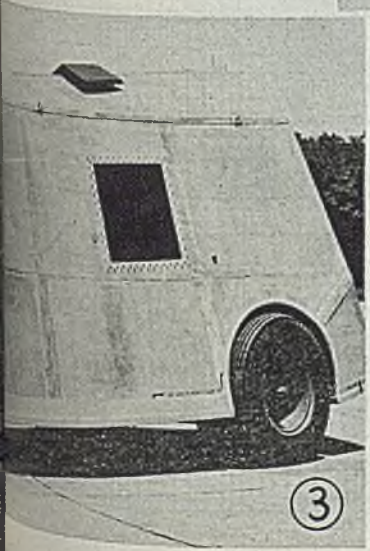
The containers will preserve a standing stock pile available in case of another national emergency. At the same time, this program will aid in maintaining proper balance of manpower and facilities in an industry vital in time of war.

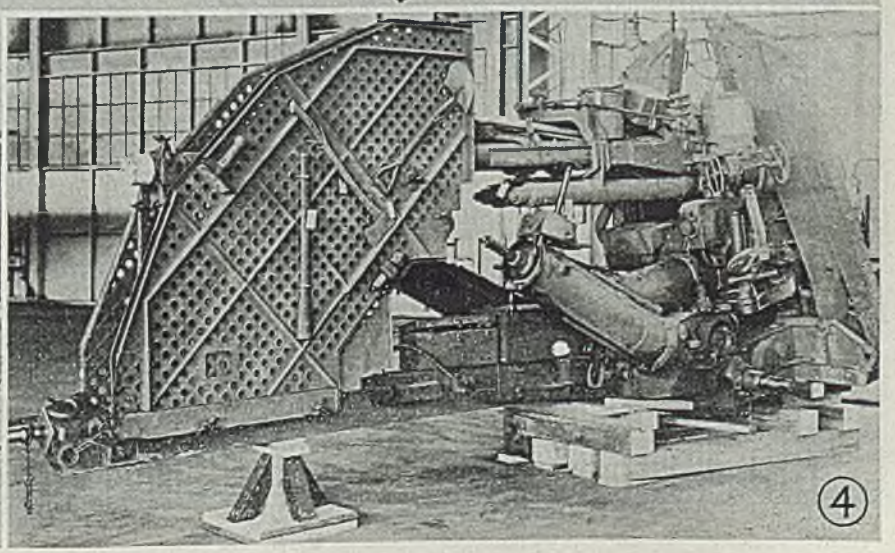
It is estimated that the total cost of container and work of packaging will not exceed that of taking the equipment out of the warehouse, cleaning and over-

(*Please turn to Page* 170)









g. 4—This is the way the 90-mm looks when ready for packaging process

g. 5—Key to success of barrier is Davison breather utilizing silica l to remove moisture from air ion into container by temperae or barometric changes. Other ica gel units inside container as- maintenance of less than 30 er cent humidity, the critical point for corrosion

g. 6—Finished package ready for ge in open. Note cover is aled to base with arc welds

Modern HEAT TREATING Practice

Testing for hardenability and other characteristics in steels has developed successfully into four principal techniques described in this, the second article of Mr. Seasholtz' series. McQuaid-Ehn and Jominy tests; method and choice of quenching media are discussed

By ARNOLD P. SEASHOLTZ
Metallurgical Engineer
E. F. Houghton & Co.
Philadelphia

ALMOST every heat treater has tested or supervised some method of testing the hardenability of steel. It is known that some steels will give the required results in production while others will not. The specific inherent properties possessed by many steels are controlled not only by chemical composition but also by the method of manufacture, especially the deoxidation practice. It is possible to have several heats of steel furnished to the same specification, each possessing different hardenability. This factor, over which he has no control, has often caused the heat treater endless trouble.

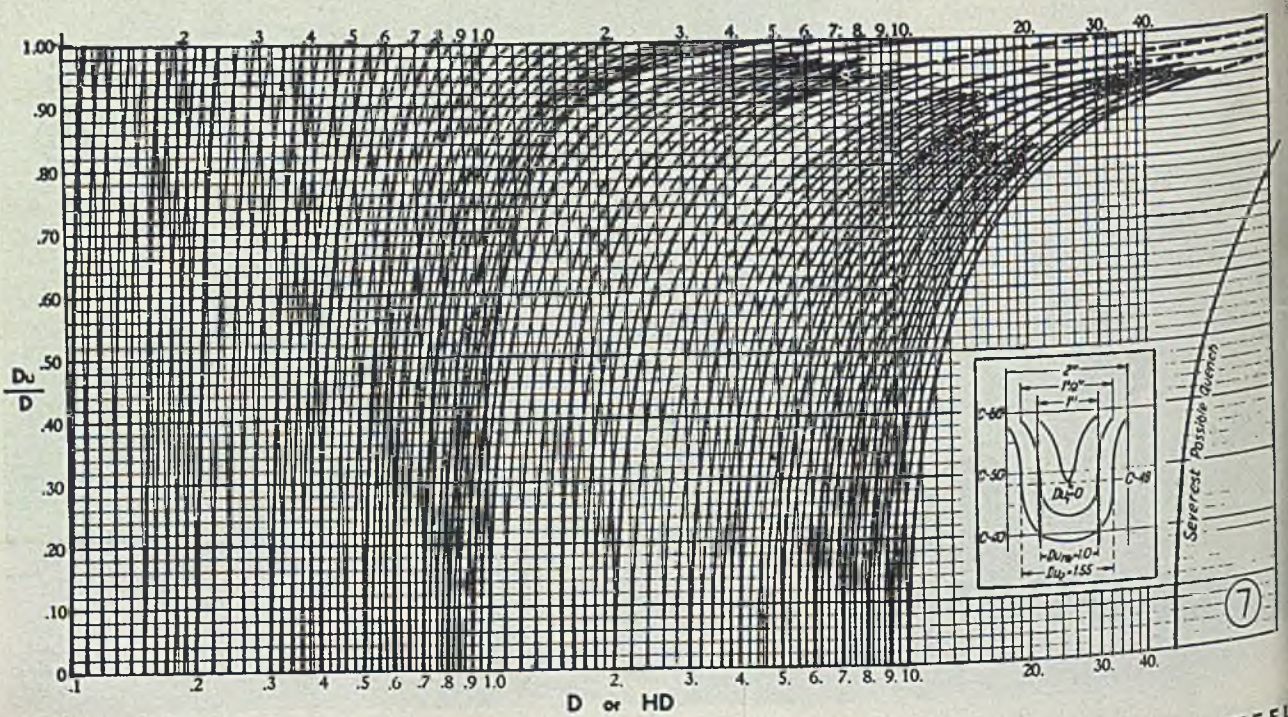
What the heat treater really needs is a steel with a definite hardenability. The heat treater is not really concerned with the chemistry, but requires steel with characteristics which will respond to the best method of heat treating that can be adapted to the parts he is treating.

Tension tests are made more frequently than other tests on metal. The statement has been made that alloy steels, regardless of composition, have very similar tension qualities when hardened.

Hardenability is an accepted test for the determination of tensile tests regardless of analysis, but special consideration must be made for high-impact values at low temperature, low-creep values at high temperatures, etc. The alloys considered for these special properties generally do not require the narrow range usually specified. Only a minimum is generally required. It is these facts that have caused the steel manufacturers and metallurgists to concentrate their efforts on specifying or furnishing steel for a particular purpose. Methods have been devised for the measurement of these characteristics so that the individual specification may be controlled, comparisons made between different types, and steels in general utilized more effectively. Many of the methods have been developed by individual plants, but the following tests for measuring hardenability are recognized and used nationally:

1. Test for austenitic grain size and abnormality, principally McQuaid-Ehn test and the oxidation method.
2. Jominy or end-quench test for hardenability.
3. Hardenability and quenching value by Grossmann.

Fig. 7—Hardenability and quenching charts. By these curves, severity of quench (heat transfer equivalent H) can be estimated. Courtesy Carnegie-Illinois Steel Corp.



Hardenability Calculated From Composition ⑧

By Marcus A. Grossmann

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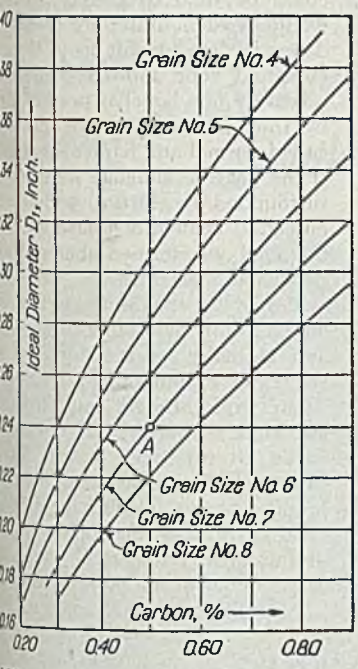
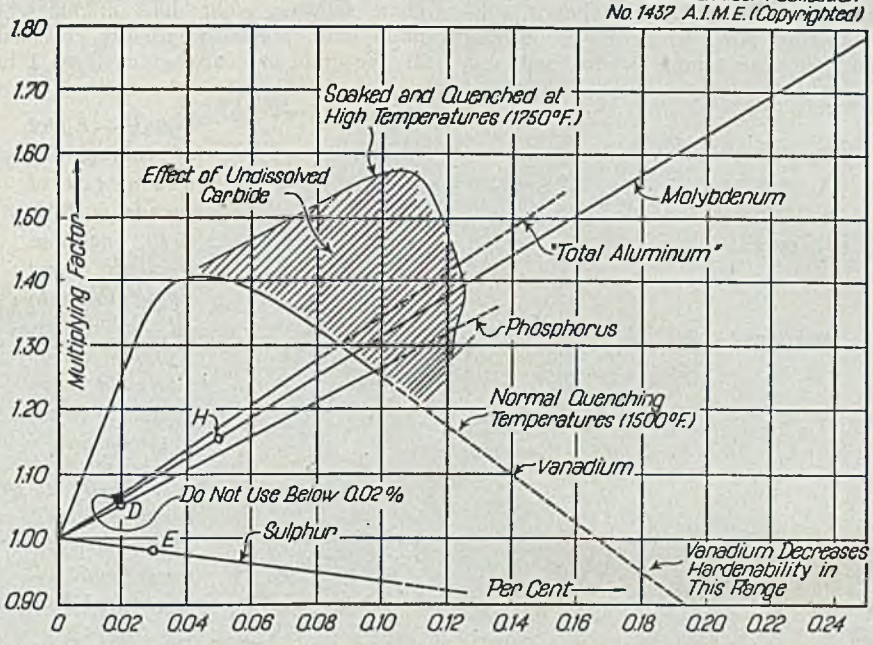
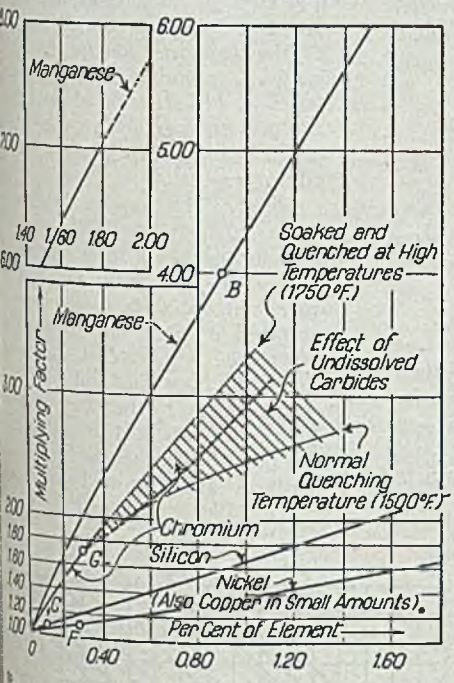
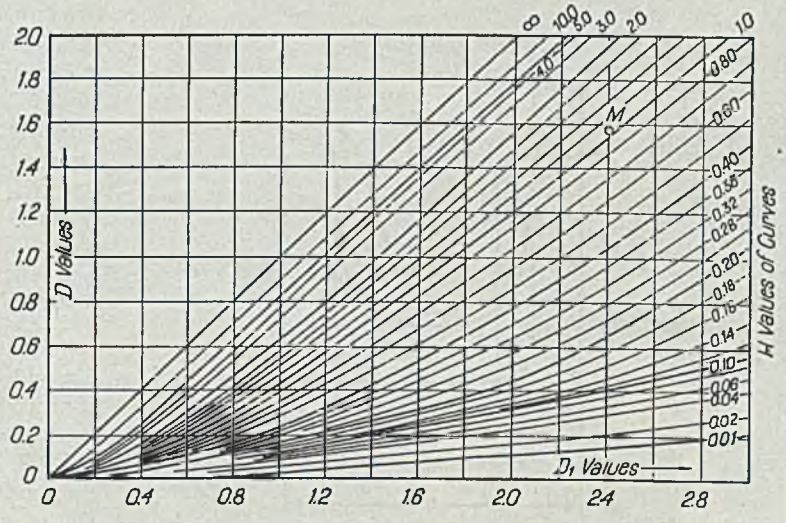
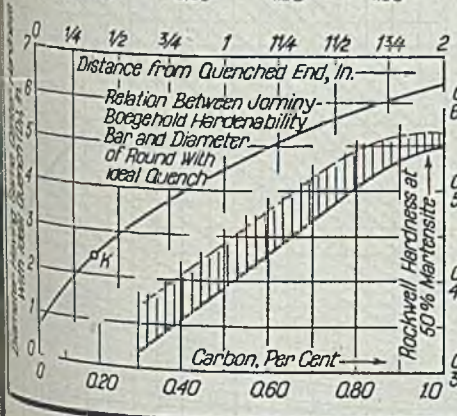










Example: To compute hardenability of a commercial steel of the analysis shown:

Item	Amount	Factor	Point
Grain size	7		
Carbon content	0.50	0.24	*A*
Manganese	0.90	4.00	*B*
Silicon	0.10	1.10	*C*
Phosphorus	0.020	1.05	*D*
Sulphur	0.029	0.98	*E*
Nickel	0.28	1.10	*F*
Chromium	0.30	1.70	*G*
Molybdenum	0.05	1.16	*H*
Copper	0.05	1.02	*

*Estimated on the line for nickel.

Ideal hardenability of given steel = D_1 = $0.24 \times 4 \times 1.1 \times 1.05 \times 0.98 \times 1.1 \times 1.7 \times 1.16 \times 1.02$ = 2.40. Such figures for D_1 will accurately compare one steel with another.

Jominy equivalent of the given steel at point *K*, that is, hardness of center of ideally quenched 2.40-in. bar, is the same as that found 3/8-in. from end of end-quenched specimen.

Actual hardness at center, taken from lowest curve, is about C-45 for 0.50 carbon, low alloy steel.

H—VALUES FOR DIFFERENT MEDIUMS

Example: Water quench, mildly agitated; H = 1.05; Steel D_1 = 2.40. Actual critical diameter D (from point *M* above D_1 = 2.40) is $1\frac{9}{16}$ in., size of bar of given steel that will harden in given quench to half martensitic structure at center; hardness C-45.

Circulation or Agitation	Value of H for		
	Oil	Water	Brine
None	0.25 to 0.30	0.9 to 1.0	2
Mild	0.30 to 0.35	1.0 to 1.1	2 to 2.2
Moderate	0.35 to 0.40	1.2 to 1.3	....
Good	0.4 to 0.5	1.4 to 1.5	....
Strong	0.5 to 0.8	1.6 to 2.0	....
Violent	0.8 to 1.1	4	5

4. Tests for P-F penetration fracture grain size by Shepherd.

McQuaid-Ehn Test

The McQuaid-Ehn test consists of heating a sample of steel in a carburizing mixture for 8 hours, at a temperature of 1700° F, and then slowly cooling it in the carburizing box. After this carburizing treatment, the sample is cut, polished, etched to bring out the grain boundaries and then carburized surface is examined under a microscope at 100 diameters magnification. The carburizing treatment develops definite grain boundaries which are readily visible. The magnified specimen then is compared with a standard chart showing eight different inherent grain sizes. Steels are usually classified as fine grain or coarse grain. Sizes 1 to 5 on the chart are classed as coarse grain while sizes 5 to 8 are classed as fine.

The terms "abnormal" and "normal" indicate a definite characteristic of a heat to develop a certain type of structure when carburized. In 1922 McQuaid-Ehn found that the structure after carburizing could be used to predict whether steel would harden uniformly or have a tendency to develop soft spots. If the hypereutectoid zone showed coarse grains or relatively fine lamellar pearlite enveloped by thin excess cementite, the steel was called normal and hardened satisfactorily. If the pearlite lamellae were very coarse surrounded by ferrite, with the hypereutectoid cementite coarse and irregular, the steel was termed abnormal and hardened unsatisfactorily.

Originally the McQuaid-Ehn test was adapted for determining the grain size and normality of the steel as a test for selecting carburizing grades of steel. Their work brought out the fact grain size and normality was definitely attributed to the open hearth deoxidation practices. Abnormal steel generally was found in heats which have a high oxide content due to incomplete deoxidation of the steel. Later, steel producers were able to control the normality of the steel, in both fine and coarse grain steels. Grain size was originally recognized by the tool steel manufacturers and was classified as a "tough structure" (fine grain) or a "dry fracture" (coarse grain). It was known that the tough or fine-grain structure was an indication of good tools. The dry or coarse-grain structure was recognized as being brittle and generally unsatisfactory.

About 1932, various heats were observed to heat treat satisfactorily in regard to quenching to maximum hardness and with less distortion. Other heats quenched out with spotty hardness and distorted a great deal more. A typical experience with one of the major steel companies was that out of seven heats of steel made to the same chemical analysis, four heats heat treated satisfactorily and three heats quenched out with spotty hardness and distorted more than the

(*Please turn to Page 172*)

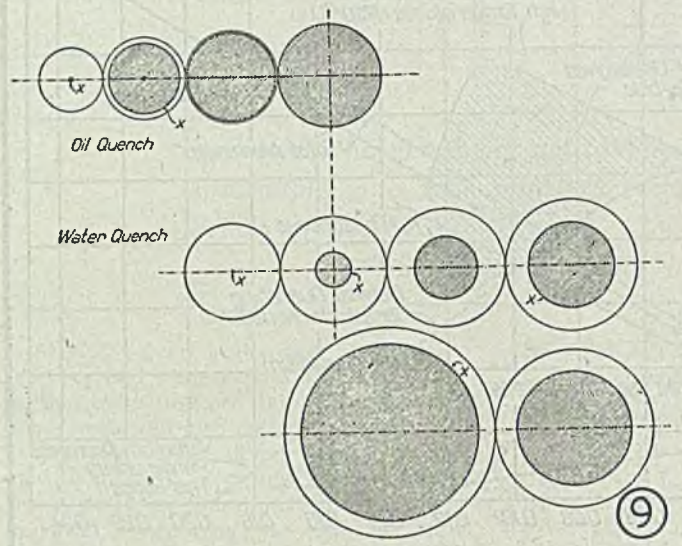


Fig. 9 — Effect of varying the diameter of rounds of SAE 3140, quenched from the same temperature into oil and water, represented by etched cross-sections (after Grossman)

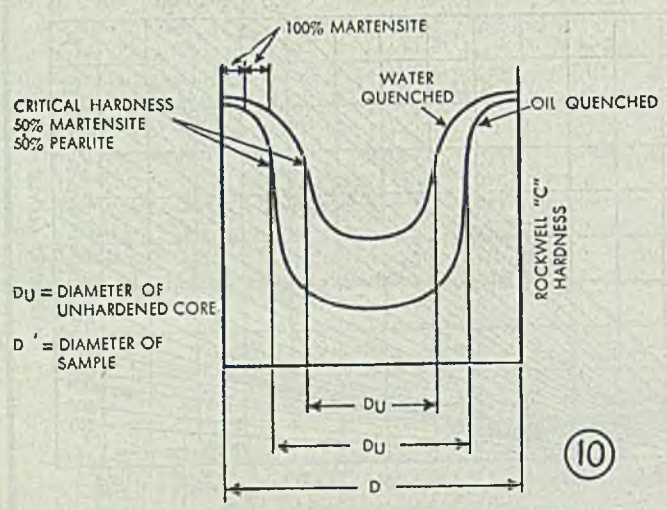
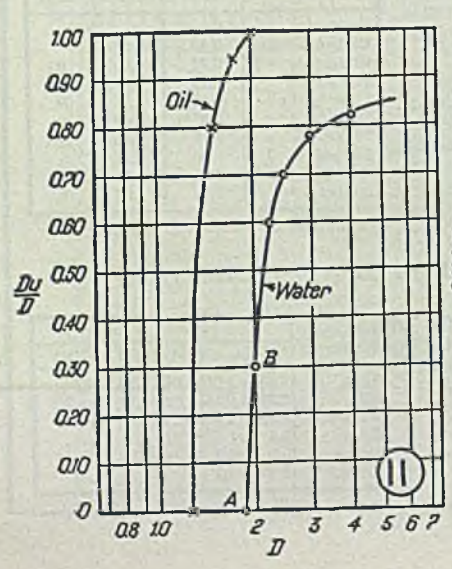
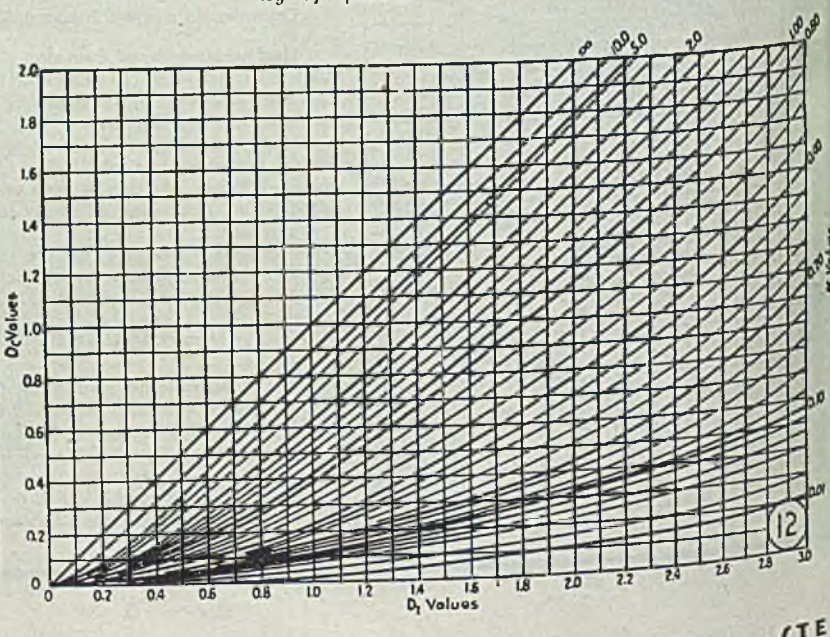


Fig. 10—Transverse hardness distribution for water and oil-quenched bar

Fig. 11—Original diameter (D) of rounds in Fig. 9 is here plotted as abscissae, and unhardened diameter (D_u) as ordinates, into curves showing how slope is controlled by quench

Fig. 12—Relationship between ideal critical size, critical size, and severity of quench





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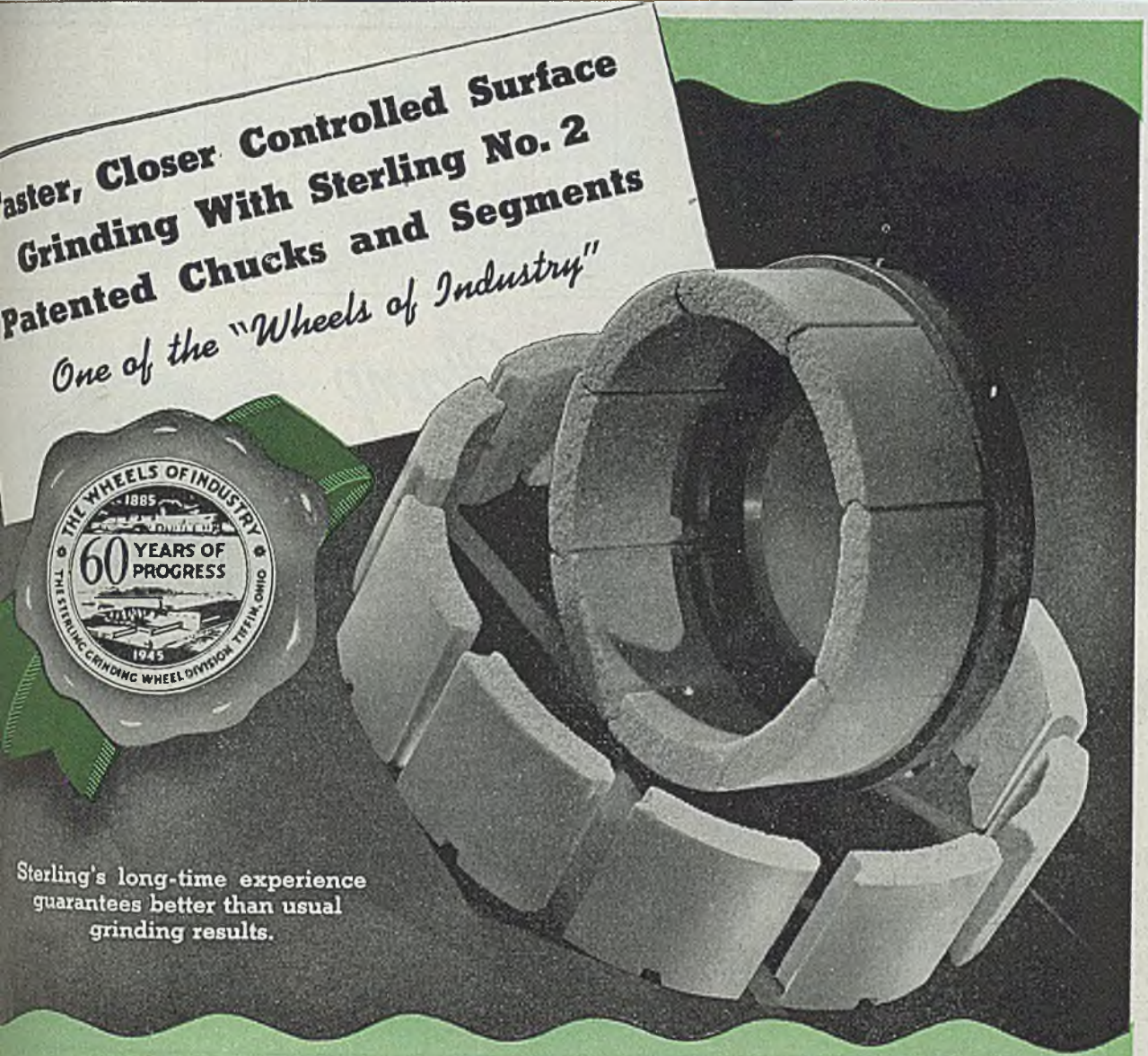

Sterling's long-time experience guarantees better than usual grinding results.

Sterling's segments are not gap-type. There is no large, open space between the segments to catch and send small pieces flying off the table. Their patented, interlocking design means added strength throughout the entire abrasive ring. The minute space between segments provides cooler grinding. Sterling segments remain firmly in place after being fastened in the chuck. One setting lasts until the segment wears down. It is a matter of moments to insert the socket wrench, remove the worn units and replace them with new ones.

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THE STERLING GRINDING WHEEL DIVISION
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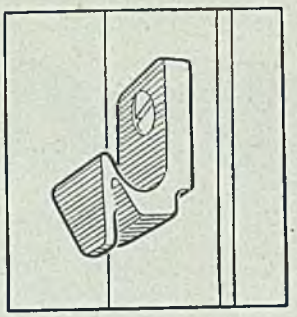
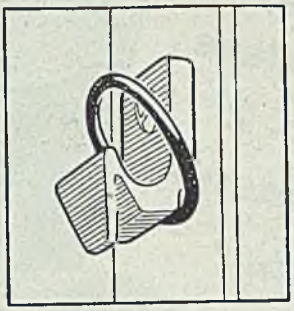
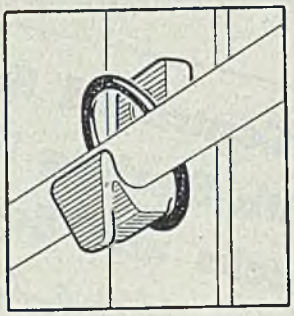
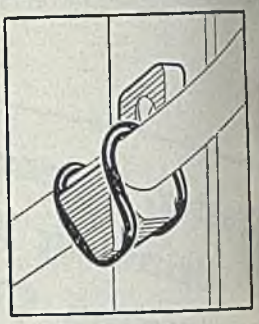
THE WHEELS OF INDUSTRY

Tube and Conduit Clamp

—requires no tools for installation, and has no loose parts to be lost or broken

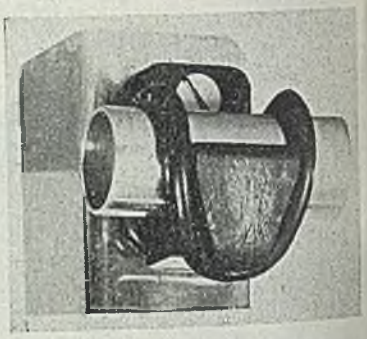
A NEW type clamp, particularly adaptable for tube and conduit type installations of all kinds, is shaped after an inverted lateral "S" and is fastened to the wall or frame with an ordinary screw. Tubing to be fastened is placed in the open side of the curve and the clamping ring passes around the back of the base, over the top of the tubing and down the front where it is hooked under the curve at the front of the "S" to form a simple locking device. This sequence is shown above.

The clamping ring can be made of a high grade synthetic rubber or other elastic material. At the present time, the Martin plants are using standard hydraulic seal "O" rings which have been rejected for use as hydraulic seals because of improper tolerances. The rubber ring also serves as a shock absorber in eliminating vibration. If it is damaged and requires replacement, this can be accomplished without removing the clamp body.

The clamp proper can be molded from a fabric base phenol fiber material or fabricated from formed sheet metal in any desired size. The combination results in a clamp which is extremely durable, yet light in weight and attractive. Units with various sizes of tubing locked in place are shown in the photo.

Now being used in plane installations for fastening hydraulic and pneumatic tubing, wire bundles and electrical conduits, the bodies are molded in color to follow individual hydraulic or electrical runs.

The clamp is an answer to the "mechanic's prayer" for, in addition to needing no tools for installation or removal of objects, the clamps afford other conveniences. There are no loose parts to be lost or broken, and, when the clamps are used in a series, any single tube or conduit can be removed without disturbing the others. The clamp also is adaptable for bonding and fastening purposes.



Though the Glenn L. Martin Co., Baltimore, which developed these clamps, has not started production of large quantities at the present time, this work will get under way soon, either through their own facilities or those of a licensee organization.

Heil Co. Uses Pallets for Handling Materials

Pallets are used for handling practically all types of miscellaneous materials in warehouse of Heil Co., Milwaukee, as shown in accompanying illustration. Goods are palletized when received and usually need no further manual handling until released. Fork trucks, manufactured by Clark Tructractor Division of Clark Equipment Co., Battle Creek, Mich., convey materials to proper bays and stack in less time than was required formerly.

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uality and Production UP!

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-Off Tools

For cutting off to hollow cores such as shell forgings, etc.

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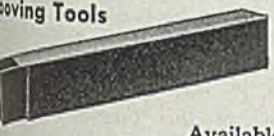
oving Tools



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For interrupted cuts on large forgings and castings.

Solid Carbide Guide Rings

For wear resistant uses on machines such as wire stranding machines. Increases life up to 50 times.

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Standard Turning, Boring, Facing Tools for Steel, Cast Iron, Etc.

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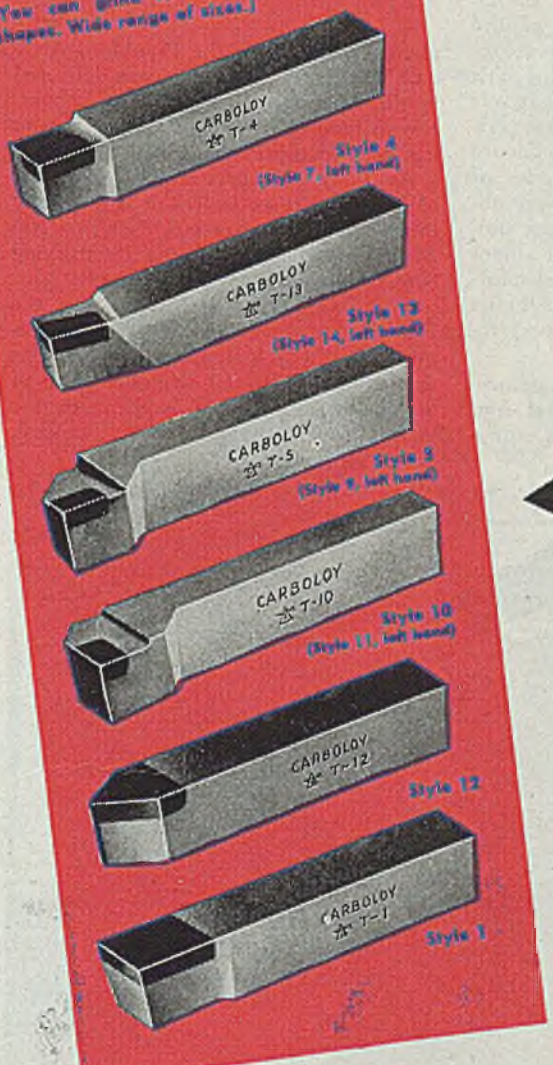

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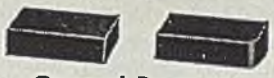
Drill concrete, brick, etc. 75% faster than old methods.

Diamond Impregnated Grinding Wheel Dressers

3 sizes. For all grinding wheels.



General-Purpose Standard Carboloy Blanks

Style 1000 Style 2000
Sizes 1/16" to 1/2" thick.

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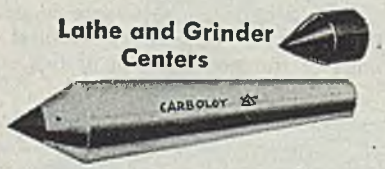
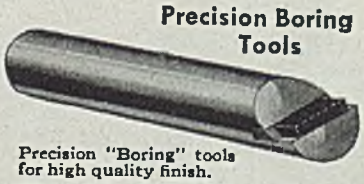


(Up to 50 times longer life than steel.)
Carbide tips only.
Finished tipped centers (with Morse, B & S, and Jarno Tapers).

Precision Boring Tools



Precision "Boring" tools for high quality finish.
(You grind point to suit).

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High-Speed X-Rays

Field emission X-ray technique used to study action of projectiles at Frankford Arsenal may provide means to radiograph valve components in operation and other industrial subjects. Preceding article discussed tube and circuit development

CHARLES M. SLACK* and C. T. ZAVALES†
Westinghouse Electric Corp.
and
EDWARD R. THILO‡
Frankford Arsenal
Philadelphia

PICTURES published in 1940, showing some of the phenomena that could be revealed by means of high-speed X-ray pictures (golf ball, shot gun shot), came to the attention of men at the Frankford Arsenal Laboratory. Colonel L. S. Fletcher, at that time director of the laboratory, and the men under him recognized the possibilities of applying this new tool to the field of ballistics. It was arranged at this time to have the experimental equipment used at Westinghouse brought to the Arsenal for a series of tests. High speed X-ray pictures were obtained of 30-caliber armor piercing bullets penetrating a 1¾-in. diameter aluminum rod. The pictures gave useful information about the behavior of the bullet and the manner in which the penetration took place.

Results of these tests were so promising that the Laboratory ordered four units of the present form of this equipment developed for the Frankford Arsenal. The first of these units was delivered to the Ballistics Section of the Laboratory in January, 1942, and the equipment has been in constant use ever since.

As X-ray exposures are on the order of 1/1,000,000-sec or less, it is necessary to use intensifying screens. Patterson No. 245 Industrial Combination Intensifying Screens have been used exclusively.

First problem investigated at the Frankford Arsenal was the field of terminal ballistics—a study of what happens to the bullet when it strikes a piece of armor, and also what happens to the armor during the penetration process. Ordinary photographic methods, including high speed photography, run into the difficulty of having the actual penetration obscured by luminous fragments thrown back at the time of impact. This difficulty is, of course, not present in the case of X-rays.

High speed X-ray pictures were taken of armor piercing bullets during actual penetration. Two mutually perpendicular pictures were taken of the bullet as it penetrated the armor. Pictures were taken simultaneously or in sequence. Fig 10 shows the experimental set-up used in taking these pictures. The horizontal tube is connected to the surge generator by ¼-in. diameter copper tubing. No trouble was encountered with "piping" the high voltage around by means of this tubing which provides greater flexibility in the positioning of the X-ray tube.

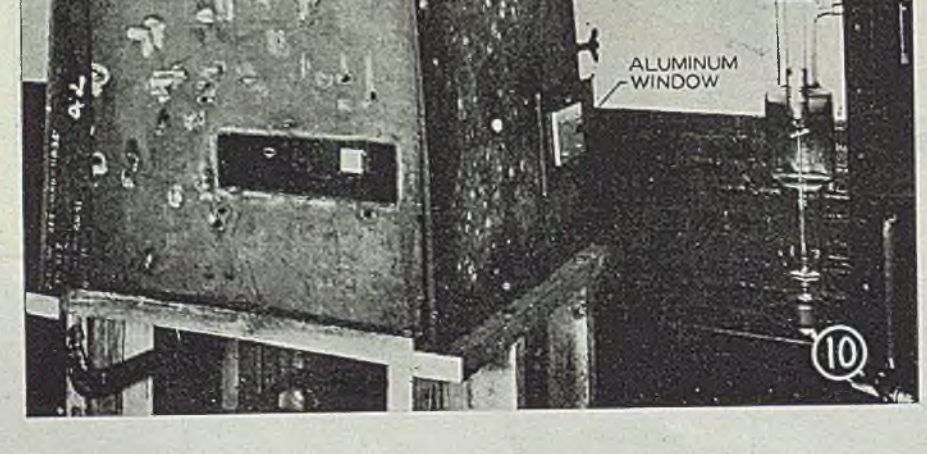

Fig. 12 includes two mutually perpendicular high speed X-ray pictures, taken in sequence, of a 30-caliber armor piercing bullet penetrating a small 2 x 2-in. piece of ½-in. thick armor. A stationary picture of the bullet is at left. In the center, the first of the high speed X-ray pictures shows the core of the bullet penetrating ⅜-in. into the armor, and one can see fragments of the bullet jacket and of armor splashing back. The jacket, which cannot penetrate the armor, has telescoped forward on itself and exposed the base to the core. Second high speed X-ray picture, at right, was taken of this same bullet approximately 20 microseconds after the first picture. The core of the bullet has penetrated the armor and its tip is projecting through the back. Part of the armor pushed out by the penetration can be seen. The jacket of the bullet has continued to telescope on itself and even more of the base of the core is in evidence. Other high speed X-ray pictures taken during this study showed the flow of the jacket material and the breaking up of the core as the bullets penetrated the armor.

High speed X-ray equipment is pre-eminently fitted to study bullet motion and behavior inside a gun barrel. No other means is available for taking a picture of a bullet as it passes down the bore of the gun. When a bullet is fired

*Assistant research director, Lamp Division, Bloomfield, N. J.
†Design engineer, X-ray Division, Pittsburgh
‡Associate physicist.

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in a gun barrel, the blast which accompanies each shot reaches the muzzle before the bullet does. The top part of Fig. 14 shows a spark shadowgraph of the blast which preceded the bullet exit. This spark shadowgraph was taken at the instant a silvered glass rod placed at the muzzle of the gun was broken. The location of the bullet, still several inches from the muzzle, was determined by means of a simultaneous high speed X-ray picture, as demonstrated in top and bottom views of Fig. 14.

It has been suggested that strain gages fastened to the outside of the gun barrel at various positions along its length might be used to indicate the passage of the bullet down the bore. Some preliminary work has been carried out at the Frankford Arsenal to determine the reliability of the gages to record the position of the bullet. Excellent pictures have been obtained.

Checks Shift of Components

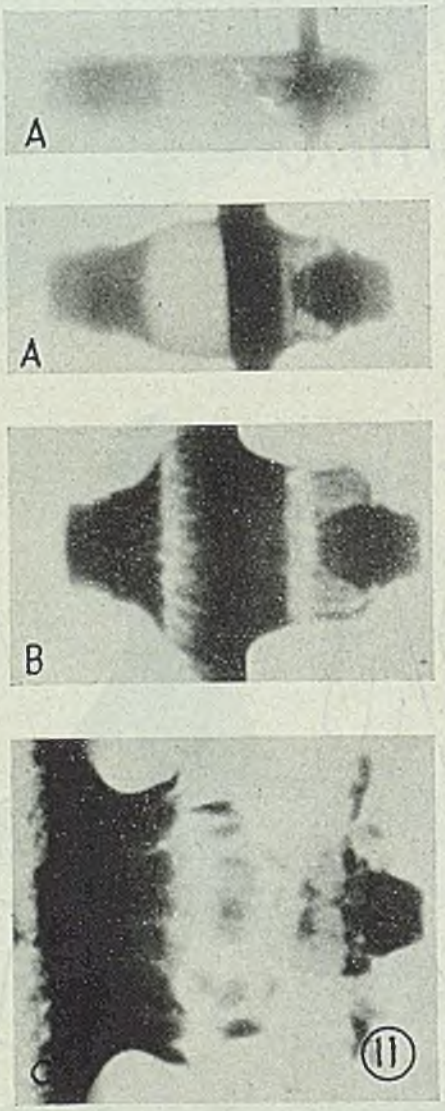
High speed X-ray equipment has been used to observe the realignment of component parts inside the bullet when it is fired. A stationary X-ray picture is taken of the bullet in question. The bullet then is fired and a high speed X-ray picture taken of this same bullet in flight. A comparison of the two X-ray pictures reveals any shift of the component parts which has taken place. This same procedure could be used, for example, to study the motion of the component parts of valves during their operation.

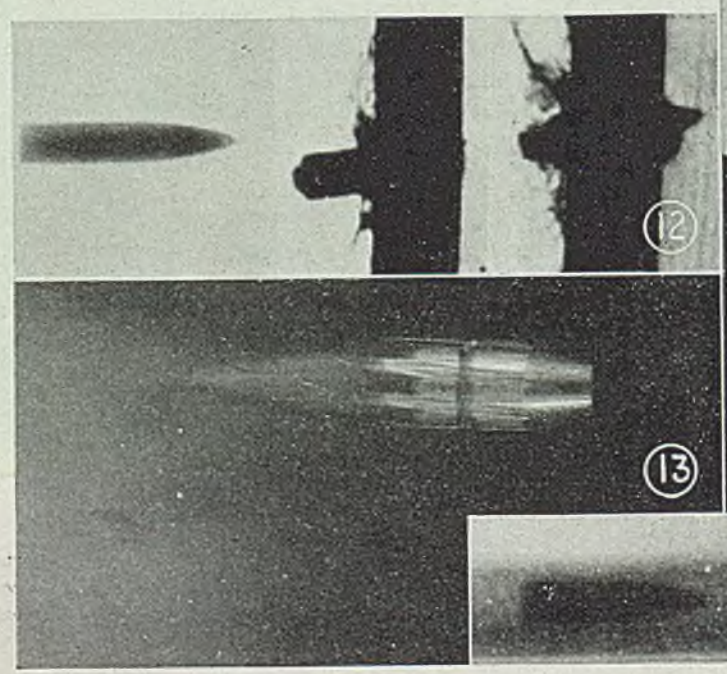
A series of high speed X-ray pictures have been taken of 20 millimeter high explosive shell passing through steel plate. It was necessary to place a steel plate ¼-in. thick over the X-ray film holder in order to protect it from the force of the explosion and the flying fragments. A new protection plate was required after every shot. Despite the fact that all the pictures were taken through ¼-in. steel, all details of the explosion are clear. One of the amazing things revealed by this study is the immense swelling of the shell to almost twice normal diameter before it finally bursts open.

Fig. 11 shows the manner in which the shell explodes. At A-1, the nose of the shell is through the plate. At A-2, almost half of the shell is through the plate. The shell has swelled to approximately twice its normal diameter. At B, the shell has just burst open. At C, the shell is torn wide open, and the petals on the back of the plate are curling back to make a large hole. The extreme usefulness of the high speed X-ray equipment certainly is well brought out by these pictures.

A use for which the high speed X-ray equipment was not designed but for which it can be adapted readily is the taking of high speed "flash" photographs. A wire spark gap is substituted for the X-ray tube on the surge generator. The short duration, high intensity spark that results from the discharge of the surge generator can be used to take a 1/1,000,000-sec photograph of any moving object. Fig. 13 shows a 50-caliber bullet in free flight, taken in 1/1,000,000-sec on Eastman Triple X film with a lens opening of F-11. Light from the spark discharge of the surge generator was used as illumination.

Frankford Arsenal is not the only army installation using high speed X-ray equipment. The ballistics laboratory at Aberdeen has two units; several units are located on the West Coast and in Great Britain. Many other applications have been made both at Frankford and at the other locations but due to the nature of the investigations they cannot be discussed at this time. It is anticipated that this equipment will be highly useful in many other fields, including medicine, in period of peacetime just beginning.





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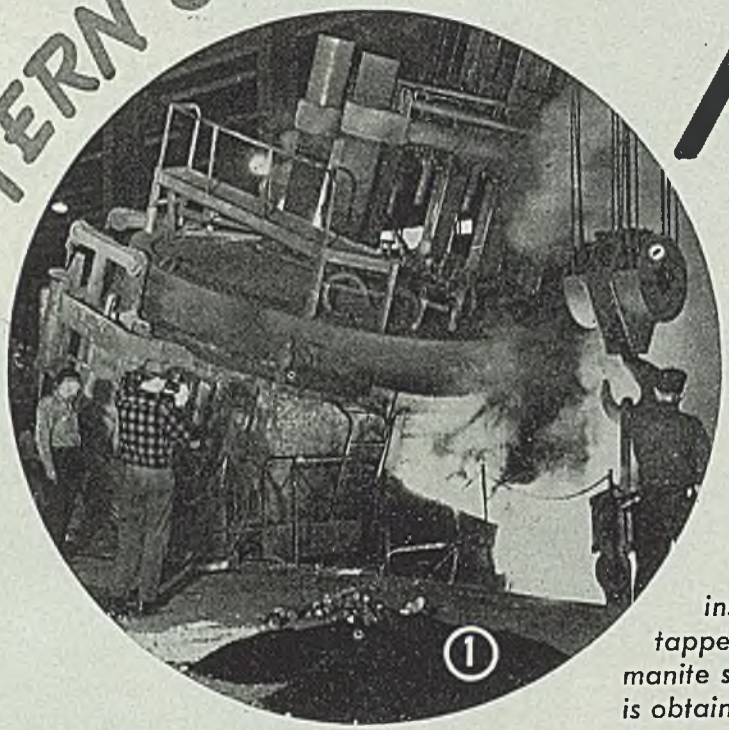
WESTERN STEEL PLANT OBTAINS 178 HEATS from Electric furnace roof



Ample expansion joints are provided in laying up roof lining on 40-ton electric furnaces at Pacific Coast plant. New roofs are preheated for 60 hours before installing on hot furnace. After first heat is tapped roof is cleaned and thin mixture of silica manite swept into joints. Long life of refractories is obtained

By E. G. JONES
General Superintendent
Isaacson Iron Works
Seattle, Wash.

COST of furnace refractories is an item of major importance in the maintenance of an electric steel plant and much has been said and written on this subject during the war years, all with the purpose of increasing the knowledge of how to better the life of these refractories. This is especially true in the case of larger furnace roofs which normally tend to give a shorter life than the small furnaces.

The Isaacson Iron Works, Seattle, Wash., have two 40-ton Lectromelt furnaces, basic lined using silica brick in the roofs. The furnace shell and roof ring are 15 ft diameter. Forging quality ingots of both carbon and alloy steel are produced in this plant using a two-slag process, pouring ingots weighing from 450 to 90,000 lb.

This plant was placed in operation during August of 1943 and the life of the first few roofs averaged between 25 and 30 heats. These roofs were laid up dry with 12 and 13½-in. standard shapes and considerable cutting of these brick was necessary in order to properly fit the bricks around electrode openings and in roof center. The service secured from a roof of this type depended a great deal on the skill of the brick mason and, as skill varied considerably according to the brick mason available to build the roof, it was felt that uniform results could not be obtained without the use of bricks of uniform shape. It was therefore decided to adopt, as standard, the design of roof shown in Fig. 2. The heavy dark lines shown in this sketch indicate the location of expansion joints and while allowance for expansion is perhaps slightly more than recommended by brick manufacturers, this amount has proven satisfactory and little if any spalling occurs.

An electrode opening of 19 in. is used for a 17-in. electrode. Larger openings were tried out and a slight increase in roof life resulted no doubt due to a decrease in the pressure of gasses escaping around the electrodes. However the pressure in the furnace was also reduced to a point where silica content could not be held and it was necessary to go back to the original size electrode openings.

On a continuous three shift operation new roofs are always placed on a hot furnace and bricks are subjected

Fig. 1—Tapping a heat from one of the 40-ton furnaces at Isaacson's plant

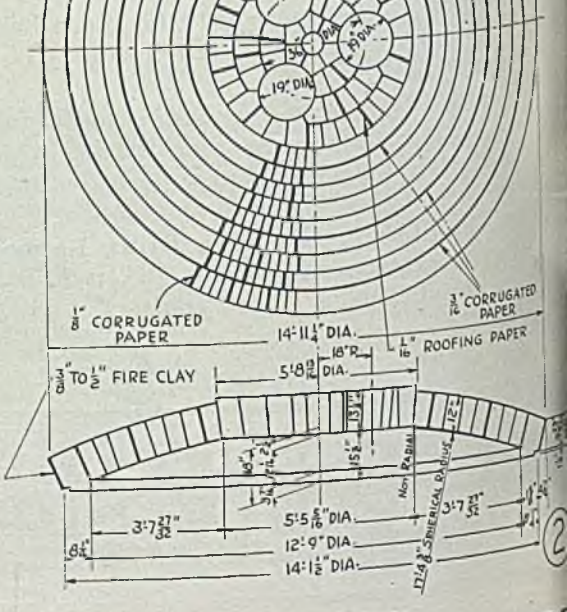
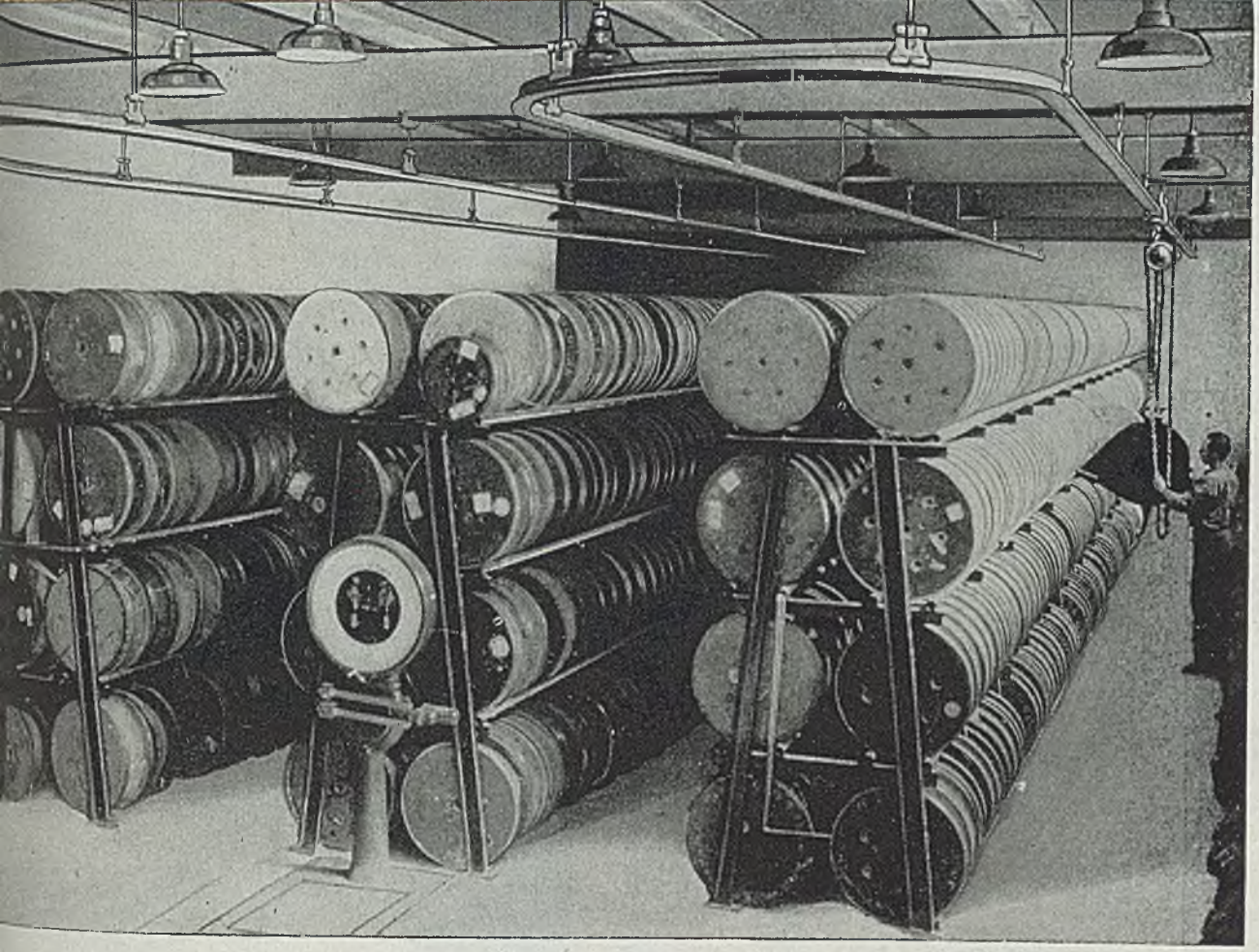


Fig. 2 — General arrangement of roof. Heavy dark lines indicate location of expansion joints



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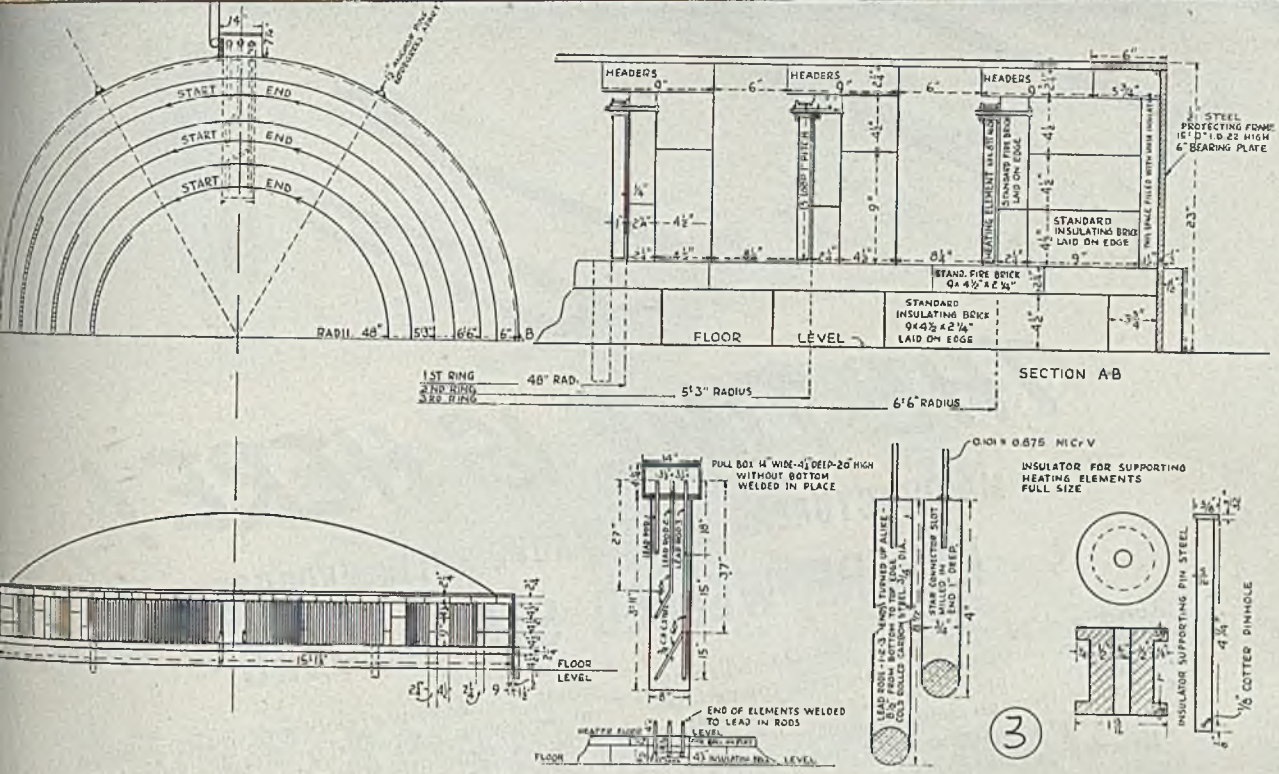


Fig. 3 — Details of automatically controlled roof preheater

thermal stresses and considerable ling often results during the first with a new roof. In order to try correct this condition an electric er was installed and roofs are pre- ed for approximately 60 hr before put into service.

his heater is automatically controlled the temperature is gradually brought o 1000° F. By this time the major sion of silica brick has taken place the danger of spalling due to ther- shock greatly reduced. The roof er is constructed as shown in Fig. 3. additional floor space is required roof heater.

ure roofs are fully equipped with trode cooling glands and the average for a complete roof change is 50 Roof changes are made between the furnace charged before the old is removed and power is put on electrodes have bored well down scrap. This has two advantages:

The hot electrodes are lowered far ugh down so that the operator can onto the roof and attach the gun to the electrodes without be- exposed to too much heat and trodes are removed rapidly.

Having bored fairly deep into the the new roof will not be exposed e are to any great extent until is absorbed considerable temperature thus be able to resist further ex- on stresses.

e old roof is removed with one e and the new roof is set in place nother. Thus, the preheated roof not exposed to the air long enough to sufficiently as to promote spalling. shdown during the first heat on new roof is carried out rather slowly a high voltage is avoided. As soon first heat is tapped all of the ac- cumulated dust is blown off the roof and a thin mixture of silimanite cement is poured over the brick and swept into the joints. This cement fills all of the wide joints between brick and prevents hot gasses from escaping through joints and burning away the brick. The dust is blown off the roof at the end of each shift. This allows the heat to radiate through the brick in a normal manner and eliminates the buildup of temperature on the innerface of the roof.

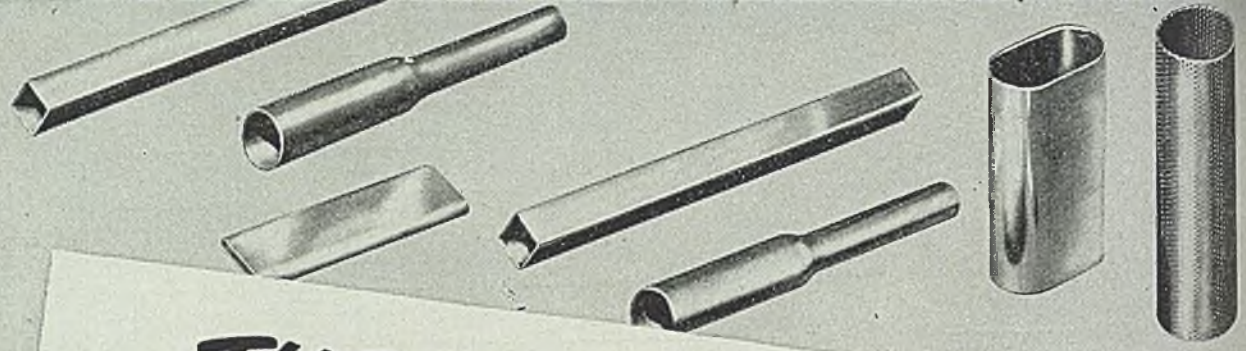
If the furnace operators are not instructed otherwise, they will usually after tapping, raise the roof 6 or 8 in. in order to allow smoke and gas to escape so that they can see to patch bottoms or banks. This may save a minute or two in patching but by so doing, a cold draft of air is pulled up off the floor and the face of the bricks are rapidly chilled and severe spalling may result.

It is preferable that the roof remain in place until ready for charging and if more than one charge is necessary the roof should be swung back into position on the furnace while the second part of the charge is being picked up. Using the highest available voltage does not always result in the fastest melting but the use of the highest voltage invariably results in the lowest refractory life. There are many factors which affect the efficiency of a meltdown and when these factors are known it is often possible to maintain high efficiency on the meltdown without the use of the highest voltage.

The furnaces at Isaacson Iron Works are equipped with 7500 kva transformers and the high voltage tap is 267 v. However, the voltage on this tap has been

BILL OF MATERIAL FOR ROOF PREHEATER

Standard firebrick, 9 x 4½ x 2¼-in., number	2400
Standard insulating brick, 9 x 4½ x 2¼-in., lbs	1300
Cold set cement, lbs.	170
Steel insulator pins, 5/16 x 4-7/32-in., number	170
Bobbin insulators, number	170
Cotter pins, number	170
Cut washers, 5/16-in., number	170
Nichrome furnace ribbon, 0.101 x 0.875-in., lbs	300
Lead rods, 3/4-in. co'd rolled carbon steel, feet	20
Steel frame: 15 ft. diam x 6-in. top x ½-in. thick, 22-in. cap, lbs	2260
Terminal box, open bottom, 14 x 7 x 20-in. high	
A. A. conduit and cover, 2-in.	
Close nipple, 2-in.	
Locknuts, 2-in.	
Bushings, 2-in.	
Iron pipe tubes, 3/4 x 6-in.	
A. B. contactor and push button, size 4, No. 705	
Conduit, 2-in.	
Standard copper wire, 3/0	
Thermocouple, chromel alumel, 0 to 1500° F.	
Lindberg input controller type AA	
Foxboro indicating potentiometer controller	
Two-conductor lead wire	
Breaker and starter switch, 200 amp, 440 v, 3-pole	
Anchor pins, 1½-in. hot rolled carbon steel	



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Revere hopes that, in the conflict just ended, what we won was the gigantic opening battle for better living. To fight *this* war our nation needs materials and the products of industry on a scale even greater than that which won military victory.

One inevitable result of Revere's war effort is that not only our ability to produce, but our ability to give service, have been expanded many times. Revere research has probed further and further. Revere Technical Advisors are armed with greater knowledge and experience. New methods and new machines may save precious time or cut all-important cost.

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Fig. 4 — Exterior of furnace roof after it completed its initial campaign of 178 heats

reduced to 235 v and with the type of scrap used and the manner and method of charging, the meltdown time has been reduced by about 12 per cent by the use of the lower voltage as compared with the time taken to melt when using 267 v. The scrap does not weld together in front of the doors or on the banks as it did with the high voltage, and time is saved in pushing in.

As soon as charging has been completed the furnace is started on the low voltage tap of 140 v and held on this tap for 7 min. By this time the electrodes are sufficiently buried as to prevent the arc from splashing onto the roof face and reducing the fusion point of the silica brick by penetration of iron oxide which the arc splash carries. After 7 min on the low tap, the melting is continued on the high tap (235 v) until only a small amount of scrap is left on the banks after which the voltage is dropped to 220 v and held till the meltdown is completed.

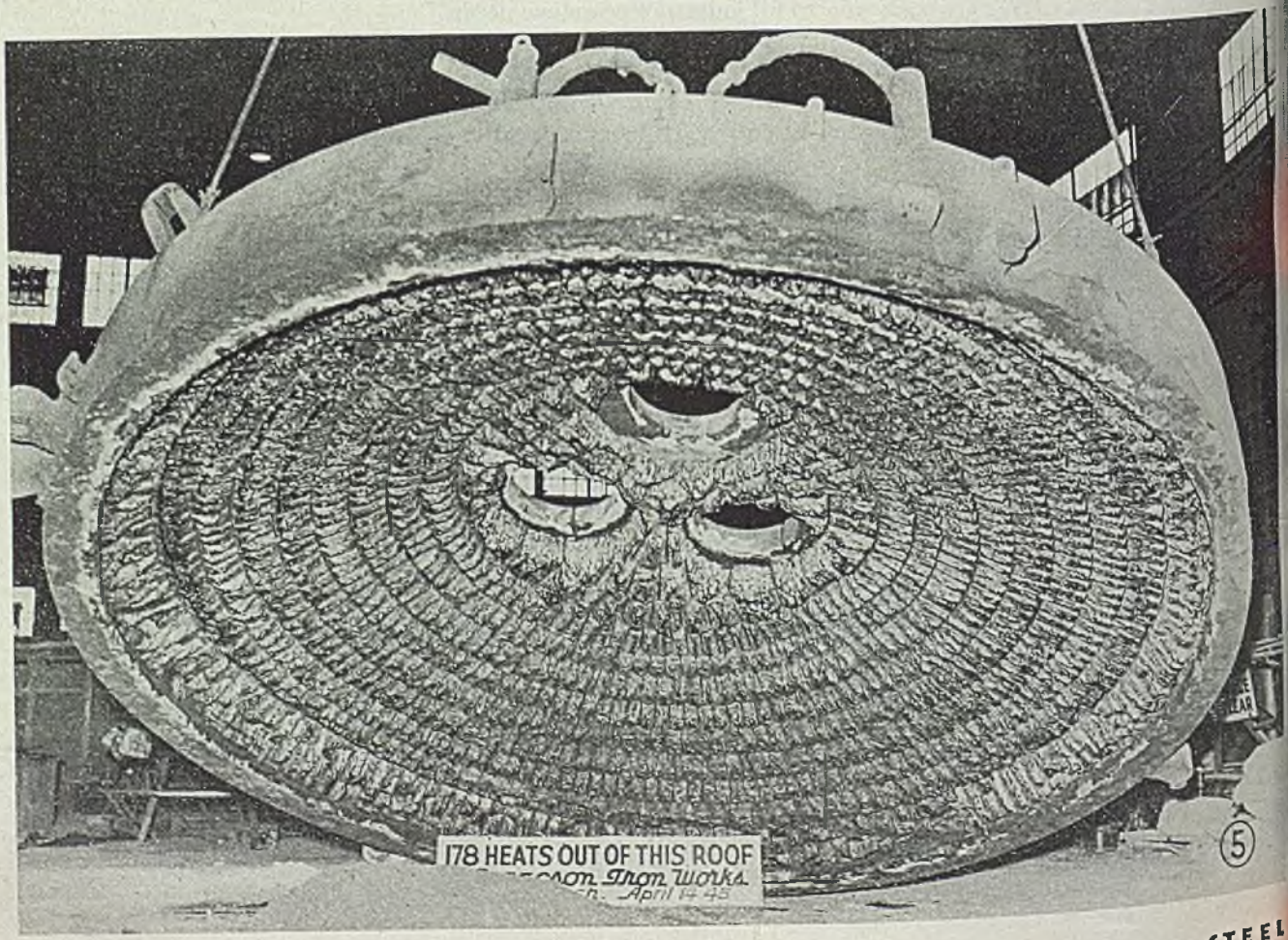
The preheater (Fig. 3) is Isaacson's own design. It has a capacity of 90 kw, is 3 phase, 60 cycle, 480 v and 109 amp per phase. A type AA Lindberg input controller and a Foxboro indicating potentiometer controller are used.

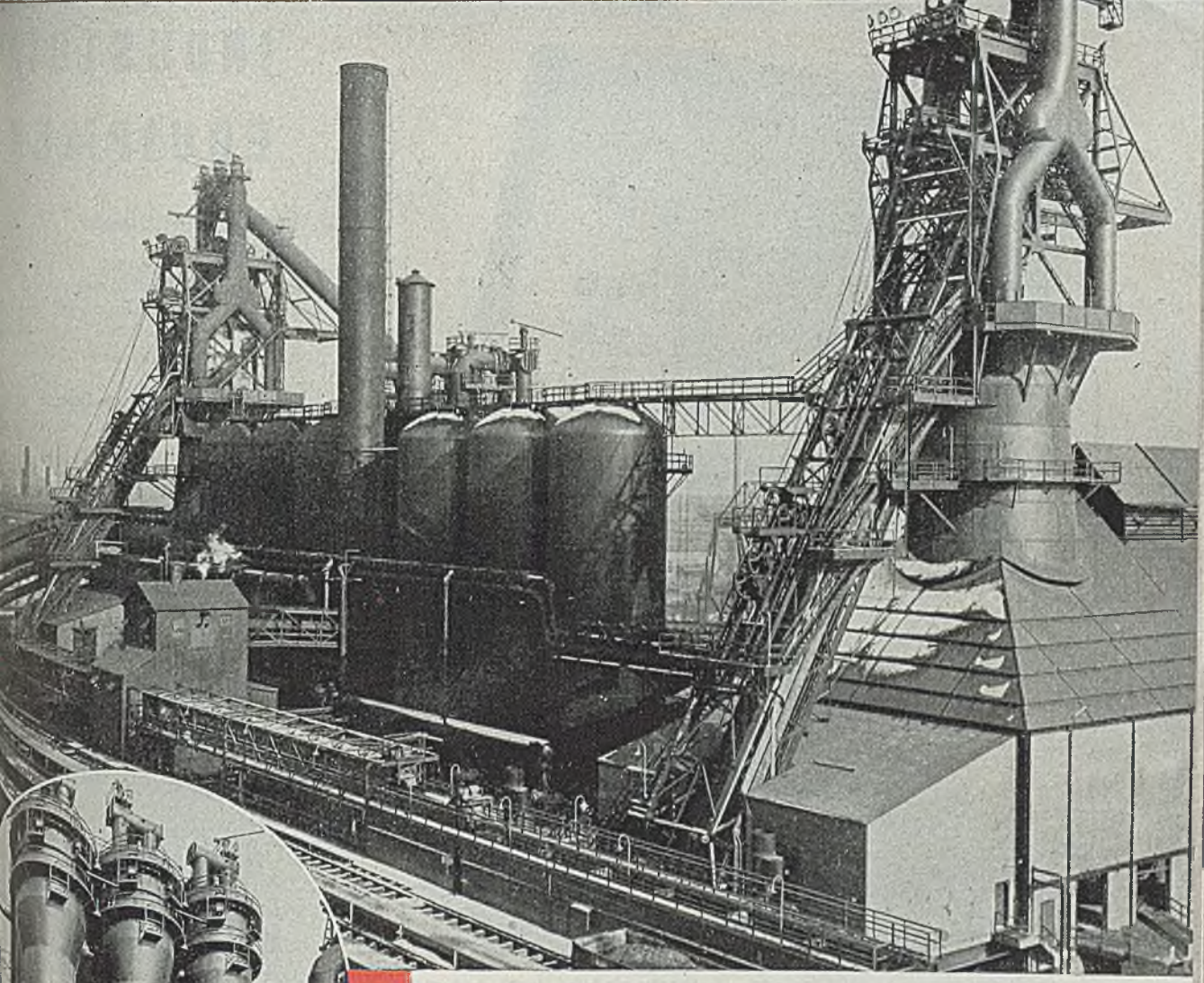
Under the foregoing conditions and methods of operation a 12-month average roof life of 110 heats was secured. However, it was evident that better life could be secured if the roof center could be made to stand up longer as most roofs failed due to the center falling in while considerable thickness of brick remained on the outer course. Therefore an attempt to strengthen the center section of the roof was made as follows: The roof was completely laid up with the exception of the centered key brick "A" and three bricks "G". See Fig. 2. These four bricks were set in place on top of a 4-in. high block. This was done so that these particular bricks could be lifted out easily after all other bricks were in place.

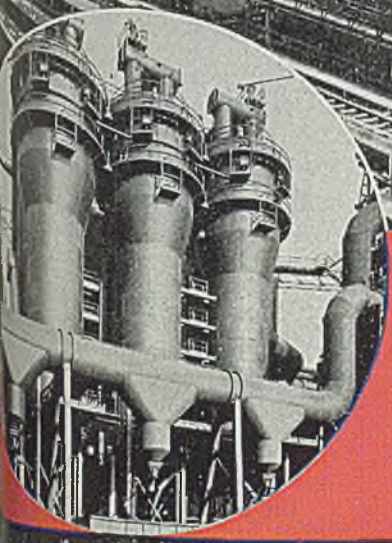
After all bricks were in place the four bricks left protruding were withdrawn and the 4-in. block removed and a mixture of high-temperature cement and fine silica sand mixed to the consistency of a light grout was poured into the opening left by the withdrawal of bricks "A" and "G". These openings were filled to a height of about 9 in. and the bricks were replaced and driven home. The grout was thus forced into all the voids left between bricks due to unevenness of brick surface and this retarded to a great extent the erosive action of furnace gases on the brick joints. The first roof laid up in this manner lasted for 178 heats and no patching of the roof center was required.

Photographs of this roof taken after it was removed from the furnace indicate that there was practically no tendency for the bricks to fail from expansion pressure and that wear was fairly uniform all the way across the roof.

Fig. 5 — Interior of furnace roof showing condition of lining after 178 heats







View of complete plant showing efficient arrangement and use of space. In Circle: Close-up of three washers with superimposed precipitators.

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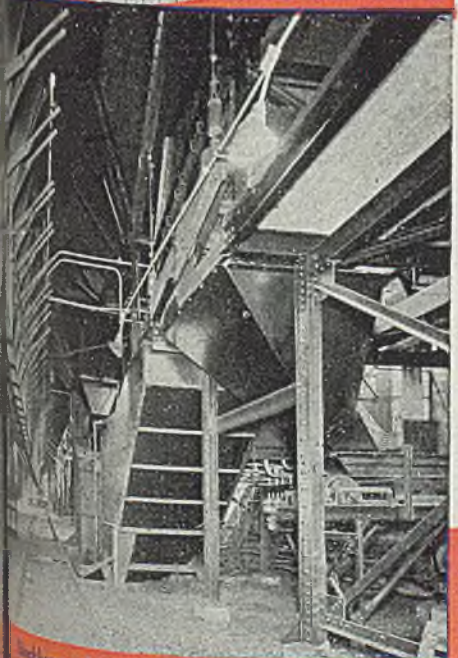

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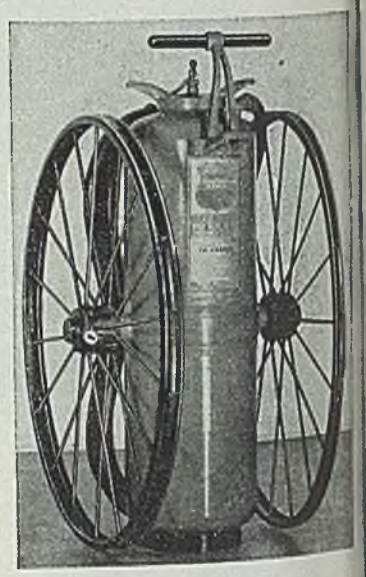
Fire Extinguisher

A new Challenger 40 gal. engine is introduced by American-La France-Foamite Corp., Elmira, N. Y. The metering feature of the unit makes foam tougher, more tenacious and more lasting.

Another important feature of the engine is its brass collar, to eliminate the



danger of corroded steel threads, brazed to the shell dome inside and outside. This machine is also equipped with a Foamite shut-off nozzle similar in principle to the fire department type. The nozzle is easy to operate, works smoothly and will not stick. It contains no rubber ball to deteriorate with age.

The engine delivers 450 gal, over ten times its liquid capacity, of Firefoam in less than 3 min.

Milling Machine

A heavy duty, knee-type vertical milling machine, designed for toolroom and die sinking work, is announced by Reed-Prentice Corp., Worcester 4, Mass.

The spindle head of this miller has a tilting arrangement which allows milling at all angles within 45° front and back and within 30° left and right of the vertical. Head and transmission are mounted on a sliding ram to increase operating range. Variable spindle speeds are obtainable between approximately 90 and 2200 rpm by means of a Reeves drive. An auxiliary high speed drilling head is available with spindle speeds from 410 to 6450 rpm. The high speed head may be installed with removable standard head by swiveling it from right hand to left hand side of ram.

Table has a working surface of 33 x

STEEL

ITH ALCOA IMPACT EXTRUSIONS

. . . so little gives you so much

You start with that aluminum slug. One wallop of the press and there's the shell. Expand its top to a circle, cut the threads, and the part is ready for its cap. An Alumilite finish (process patented) adds to its good looks.

With Alcoa Aluminum impact extrusions, you have high speed production at its best. Very little machining is required. Metal is sound and uniform, giving great dependability. Ribs, bosses and other projections may be included.

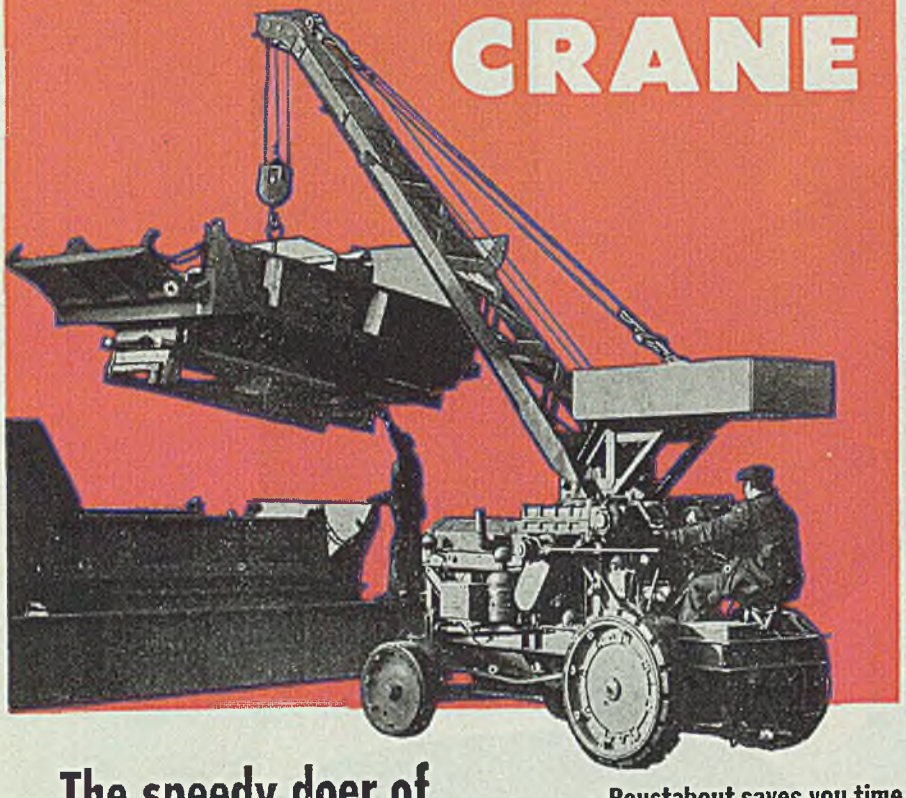
A slight change in design may permit a part to be made as an impact extrusion. Production is speeded up. Costs are cut. Our engineers will gladly help you determine what products are adaptable to the process. ALUMINUM COMPANY OF AMERICA, 2112 Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA FIRST IN ALUMINUM

ALCOA ALUMINUM

Cut Your Load-Handling Costs with this versatile always-on-the-spot

ROUSTABOUT CRANE



The speedy doer of a hundred jobs around your plant

"Our Roustabout Crane is the last piece of equipment we'd want to give up. It's busy all the time." That's what one owner says of his Roustabout, and hundreds more say the same thing. For outside the range of your other material handlers this powerful crane, always where you want it when you want it, moves, loads, stacks heavy stuff to 7½ tons quickly, at low cost, meeting emergencies, saving manpower. Designed and built for smooth easy operation and years of overwork, Roustabout's boom swings on a heavy ball-bearing turntable, its gears run in oil. . . . It pays you to write now for the whole story of this crane.

Roustabout saves you time and money on these and many other jobs

- Big stuff off and on trucks, freight cars
- Moving large machines
- Handling bales, boxes, drums
- Moving big castings, motors, railroad and marine gear
- Loading air transport planes
- Handling tanks, pipe, structural steel
- Installing heavy valves and fittings

ARMY E NAVY

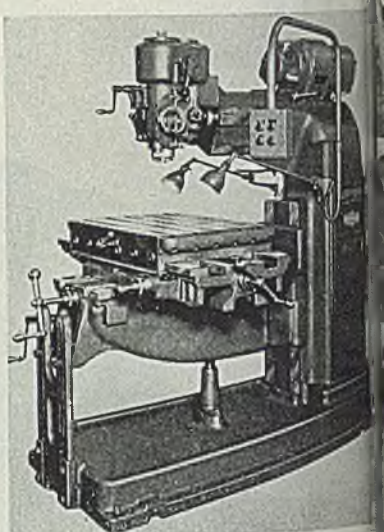
THE HUGHES-KEENAN COMPANY
585 Newman Street, Mansfield, Ohio

ROUSTABOUT CRANE

Roustabout Cranes
By Hughes-Keenan
Load-Handling Specialists Since 1904

in. and is 4 in. thick. Vertical feed of knee is hand operated and has 16 in. travel. Longitudinal and cross feeds have a range of 27 in. and 20 in. respectively and are power driven by an variable speed electronic unit. The electronic speed drive provides a feed range from less than ½-in. to over 4 ipm.

A centralized push-button control station is mounted on pendant rigid-arm

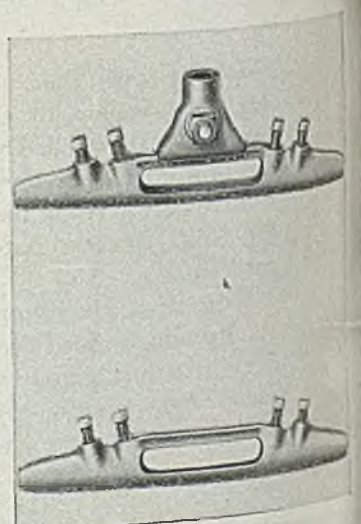


having a 90° swing, which brings the control station in easy reach of operator in any working position. The magnetic control panel and the electric unit are mounted inside the column in dust-tight compartments.

Trolley Splicer

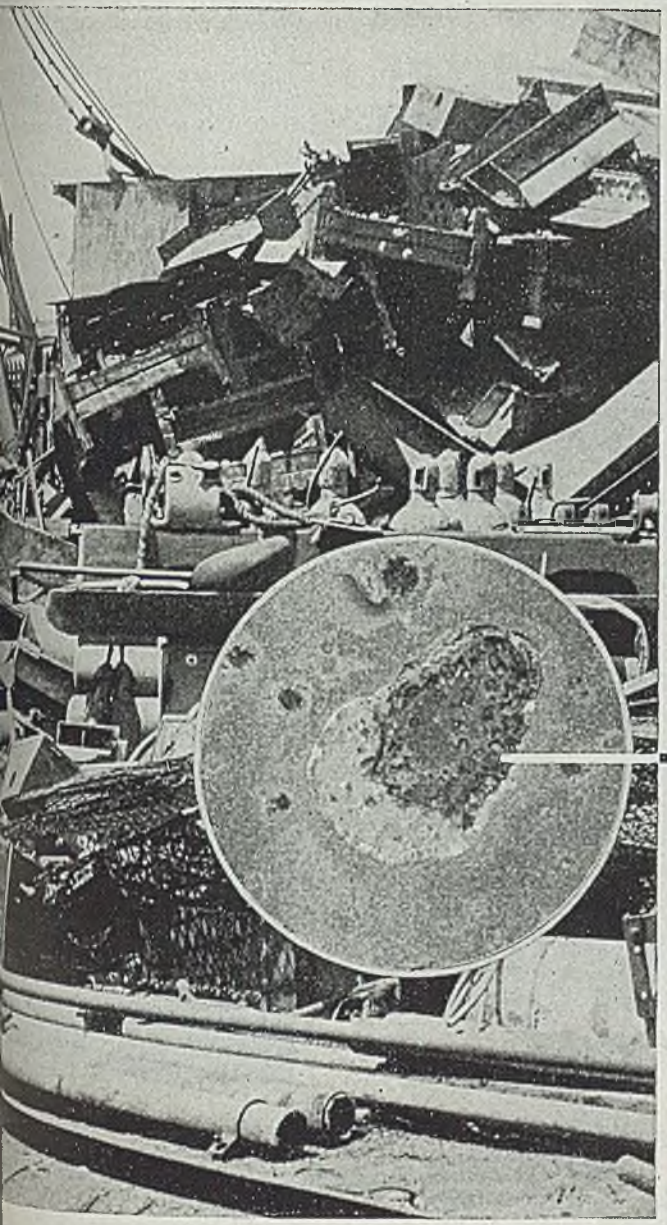
A new by-pass type of trolley splicer is announced by Mosebach Electric & Supply Co., 1170 Arlington avenue, Pittsburgh 3.

The trolley splicer can be supported



by a trolley clamp, which is attached to insulator supports, as illustrated. The clamp grips a specially designed bar which is similarly shaped to groove section of 4/0 or 6/0 trolley wire.

The splicer is equipped with knife-edge approaches so as to give a smooth



You don't need to put up with —RUST

RUST COSTS AMERICAN INDUSTRY WELL OVER $100,000,000 A YEAR!

How much of that sum could you save if rust were eliminated in your plant?

Cities Service Anti-Corrode and Cities Service Rust Remover quickly and safely effect substantial savings...help insure your production.

Cities Service Rust Remover wipes metals clear of rust or tarnish formations. Easy to apply—acts quickly and effectively.

Cities Service Anti-Corrodes *prevent* rust ...provide safe and durable protection against rust or corrosion. There is a specific Anti-Corrode for every industrial need.

Talk over your rust problems with a Cities Service lubrication engineer and let him suggest methods for their solution. You will benefit immeasurably from his expert knowledge of the subject. Write now or mail the coupon below.

Rust can be *eliminated*... and Cities Service can *help* you.

Mail this Coupon Today...

CITIES SERVICE OIL COMPANY, Room 412
70 Pine Street, New York 5, New York

Gentlemen: Please send full information on Cities Service Rust Prevention Program.

Name .....

Title .....

Company .....

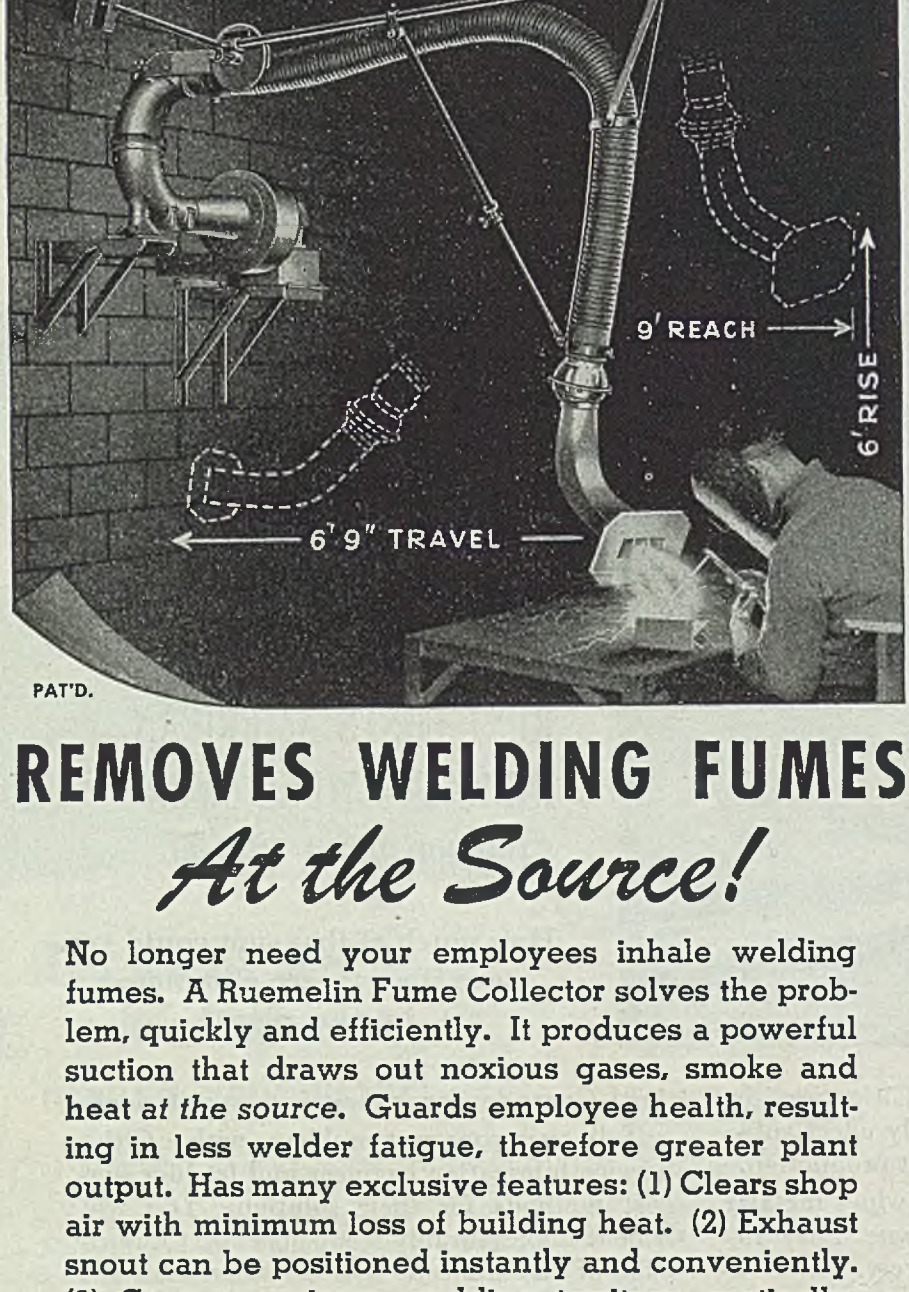
Address .....

City ..... State .....

CITIES SERVICE OILS
ONCE-ALWAYS

BIBLIOTEKA POLITECHNIKI ŚLĄSKIEJ

RUEMELIN Fume Collector



PAT'D.

REMOVES WELDING FUMES

At the Source!

No longer need your employees inhale welding fumes. A Ruemelin Fume Collector solves the problem, quickly and efficiently. It produces a powerful suction that draws out noxious gases, smoke and heat *at the source*. Guards employee health, resulting in less welder fatigue, therefore greater plant output. Has many exclusive features: (1) Clears shop air with minimum loss of building heat. (2) Exhaust snout can be positioned instantly and conveniently. (3) Covers maximum welding territory, vertically, horizontally and by circle swing. (4) Shipped completely assembled, easy to install. Thousands of Ruemelin Fume Collectors now serving war industries. 9 ft. and 15 ft. sizes (radius of swing).

We gladly offer engineering service for your fume collector installation. Write for Bulletin 37-C.

RUEMELIN MFG. CO.

3882 NORTH PALMER STREET • MILWAUKEE 12, WISCONSIN, U. S. A.

MANUFACTURERS AND ENGINEERS

SAND BLAST AND DUST COLLECTING EQUIPMENT, WELDING FUME COLLECTORS

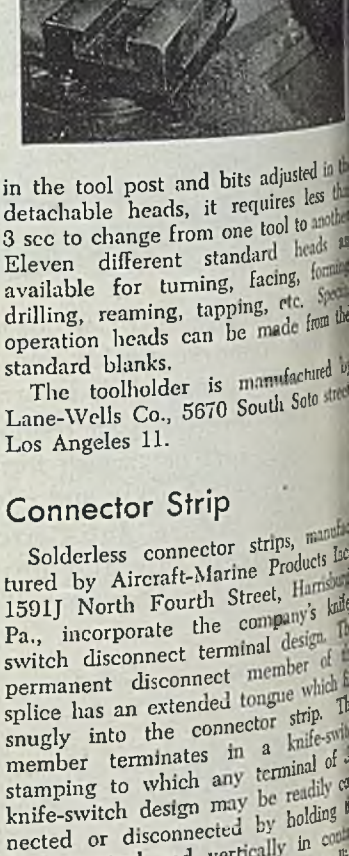
A 4709-⅔-R

under run for fast moving trolley wh
This new by-pass trolley splicer is ma
of Mesco bronze and is easily instal
It is available in sizes to accommod
2/0, 4/0, 6/0 and No. 9 section tro
wires.

Lathe Toolholder

When a series of identical cuts
to be made engine lathe production
erations can be speeded up with
Lane-Wells type L universal toolhol
It consists of a body which fits into
lathe tool post in the conventional m
ner, and detachable heads which ac
standard high speed or carbide tip
tool bits.

These attachments are made in
sizes to fit any engine lathe from
36 in. swing. Once the body is fast



in the tool post and bits adjusted in th
detachable heads, it requires less tha
3 sec to change from one tool to another
Eleven different standard heads ar
available for turning, facing, formin
drilling, reaming, tapping, etc. Specia
operation heads can be made from the
standard blanks.

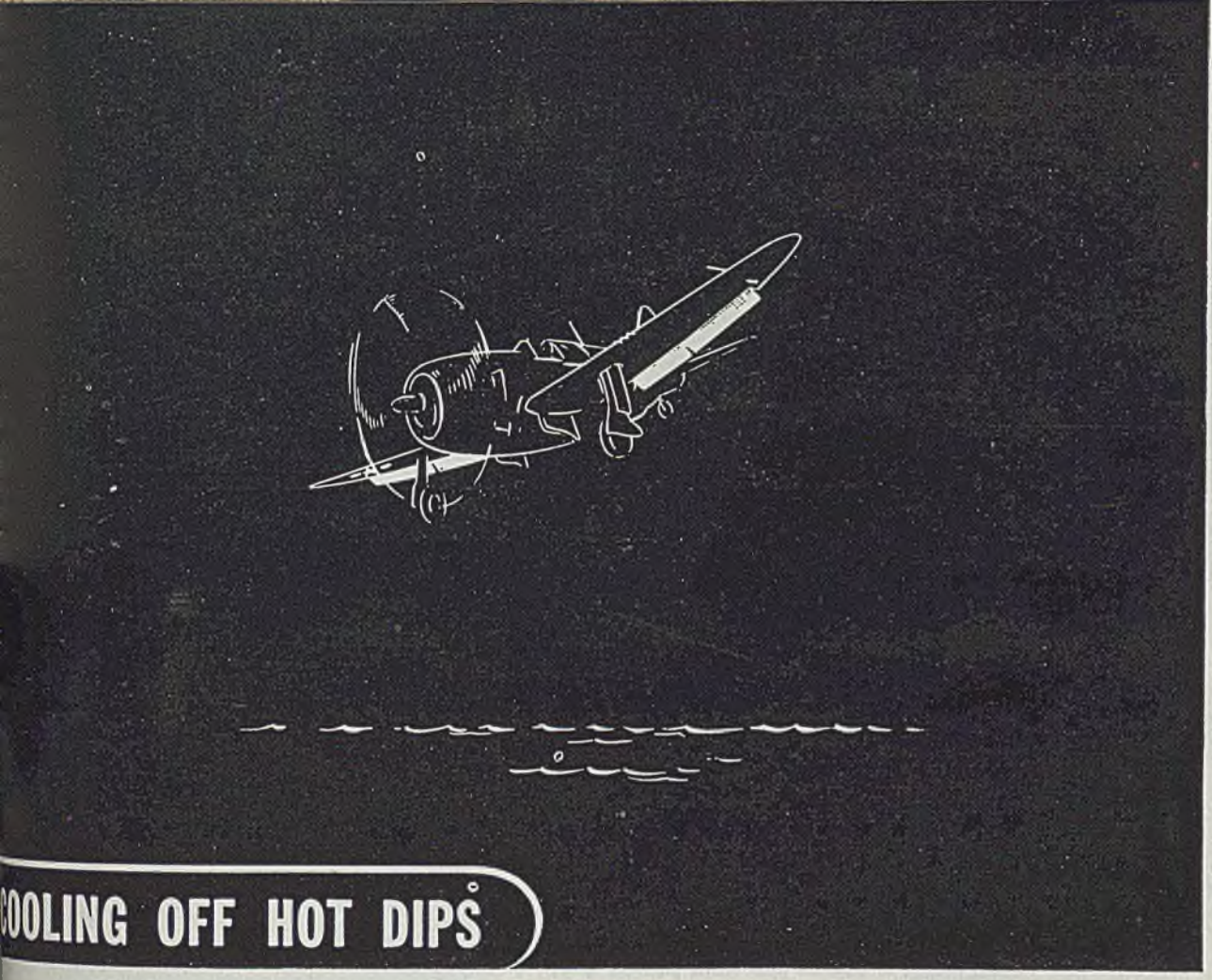
The toolholder is manufactured by
Lane-Wells Co., 5670 South Soto street
Los Angeles 11.

Connector Strip

Solderless connector strips, manufac
tured by Aircraft-Marine Products Inc
1591J North Fourth Street, Harrisburg
Pa., incorporate the company's knife
switch disconnect terminal design. T
permanent disconnect member of a
splice has an extended tongue which fi
snugly into the connector strip. Th
member terminates in a knife-switch
stamping to which any terminal of a
knife-switch design may be readily co
nected or disconnected by holding th
free terminal end vertically in contac
with the strip member and then pulli
back. The resulting connection is
four-point contact giving maximum
electrical and mechanical service pe
formance.

Two types of connectors are availab
The single-width strip is for use w

STEE



COOLING OFF HOT DIPS

other result of industrial refrigeration

HEN a fighter pilot dips in for the deck, he's coming in hot . . . fast . . . he either cools off speed wing flaps *down* . . . or, he's headt trouble . . .

the electrolyte in which aluminfor wing flaps or window sash pped must be cooled off, too . . . e's trouble ahead.

anodizing aluminum or aluminalloys, the uniformity of the thin 000th inch oxide film . . . its tough. . . corrosion- and abrasion-re. . . strength of primer paint . . . are all dependent, in large measure, on *controlling* bath temperature.

So, here's another important job for G-E Condensing Units! Preventing the electrolyte in anodizing tanks from reaching excessively high temperatures.

And *cooling off hot dips* . . . in many a chemical or metallurgical process . . . means smoother, more economical, more efficient production . . . with fewer bugs popping up to plague operating engineers and management executives.

G-E Condensing Units can be counted on to do a *quality* job . . . to respond to close, automatic temperature control for any liquid. So, if the problem of cooling a fluid is facing you now . . . or is listed among your postwar projects . . . *turn to G-E!*

Our specialized engineering techniques . . . industrial refrigeration and air conditioning experience, skills and research are at your service. You can tap this source—without obligation—by simply writing:

General Electric Company, Air Conditioning Department, Section 5459, Bloomfield, New Jersey.

☆ ☆ ☆

BUY . . . and hold . . . WAR BONDS

GENERAL ELECTRIC

Industrial Refrigeration

. . . "G-E HOUSE PARTY," every afternoon, Monday through Friday, 4 p. m., E W T, C B S . . . The "G-E ALL-GIRL ORCHESTRA," Sundays, 10 p. m., E W T, N B C . . . "THE WORLD TODAY" News, Monday through Friday, 6:45 p. m., E W T, C B S

IRCO PRODUCTS
CONQUER RUST THE WORLD OVER

Rustarest Aluminum Paint

designed for your specific requirement

TWO-FOLD PROTECTION

RUSTAREST ALUMINUM PAINT is designed to embody the most effective protection against rust or corrosion. In addition to the metal armor protection the aluminum pigment forms, the RUSTAREST vehicle contains special rust inhibiting and neutralizing qualities. The combination of the finest aluminum pigment plus RUSTAREST insures the maximum protection for both heated and cold metal surfaces.

DURABILITY AND MOISTURE RESISTANCE

Aluminum paint is durable because the metal flakes are opaque to light and impervious to moisture. All drying oils are adversely effected by sunlight, continuous exposure to sunlight injures a film unless it is protected by suitable pigments. The flaking and laminated structure of aluminum paint assures protection to the binder. RUSTAREST ALUMINUM PAINT films, because of its flaking structure, also protect surfaces against moisture penetration. The arrangement of the flakes in the film forces moisture to follow a much longer path around and between the innumerable flakes. This is equivalent to multiplying the film thickness several times. When it is remembered that the RUSTAREST vehicle is in itself highly resistant to moisture passage it becomes evident why RUSTAREST ALUMINUM PAINT is superior to most other types of coating.

REFLECTIVITY AND HIDING POWER

RUSTAREST ALUMINUM PAINT reflects between 60-75% of light and radiant heat falling upon the surface.

It helps insulate structures and keeps the interior at lower temperature. It increases visibility of bridges, towers and water tanks. It improves lighting efficiency on dark interiors and by reflecting instead of absorbing radiant energy it protects the vehicle and gives it longer life.

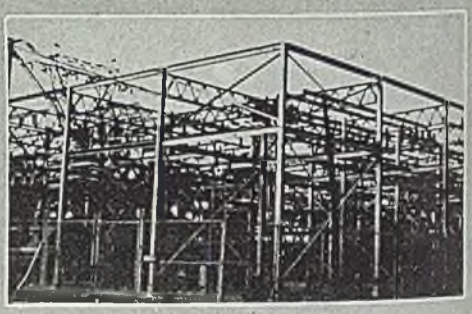
RUSTAREST ALUMINUM PAINT film if only .0005 of an inch thick, uniformly applied will hide and cover any colored surface; since the average thickness is twice this value the paint develops its maximum reflectivity in a single coat.

WEIGHT

A gallon of aluminum paint weighs a little over 8 pounds. This is less than half the weight of common paints thus making it easy to apply. The dried film is approximately 5.5 pounds per gallon. This factor is of some importance where saving in the weight is desired.

WHERE RUSTAREST ALUMINUM PAINT CAN BE USED

Steel Bridges
Sheet Metal
Gas Tanks
Production Spraying
Steel Frames
Wire Fences
Flashings
Air Ducts
Ventilators
Structural Trusses
Frames
Ship Interiors
Boiler Fire Doors
Water Tanks
Galvanized Iron
Trucks
Corrugated Metal
Ships
Roofs
Piping
Transmission Towers
Steel Stacks
Crane Run-Ways
Railings
Mine Equipment
Dust Collectors



FOR ALL T... OF STRUC... STEEL

Also for ... posts, fen... ports and ... Metal roofs ... buildings ...

CHAIN LINK FENCES

It penetrates between the wires and is not effected by constant flexing.

MARKS SHOW PORTIONS WHERE DAMAG... OCCURS

The ideal treatment for towers is a complete ... coat of RUSTAREST NO. 10A and aluminum.

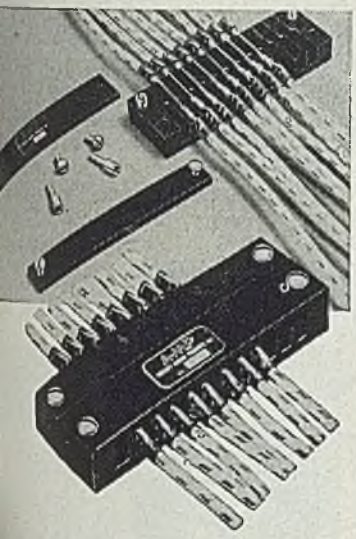
The next best is to spot joints and rusted portions ... RUSTAREST NO. 10 and then apply complete coat ... RUSTAREST NO. 10A and aluminum.

For further information write for literatu...

INTERNATIONAL RUSTPROOF CORPORATION

2507-15 PLOVER AVENUE CLEVELAND, OHIO

...ther pre-insulated splicing terminal ...h requires no insulation sleeving. ...knife-switch part of the permanent ...ber extends outside the strip and ...ection and disconnection is made ...out removing the cover of the as...bly. The double-width strip has ...disconnect ends enclosed, locked and ...ated by the cover one-half of which

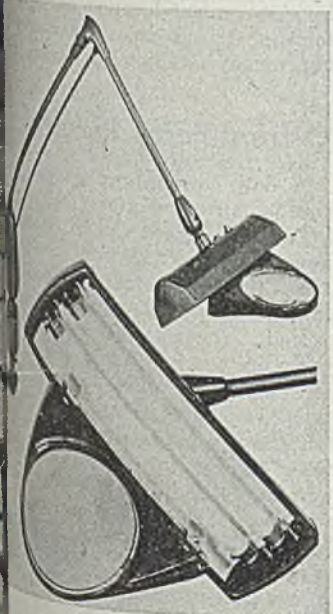


...ndependent of the other half Dis...ection is made by unscrewing only ...half of the cover to expose the ...ections.

...cking screws with threaded heads ...e it possible to permanently stack a ...s of AMP strips with the cover ...ed on top. The strips may be ...ed to accommodate any desired ...er of connections.

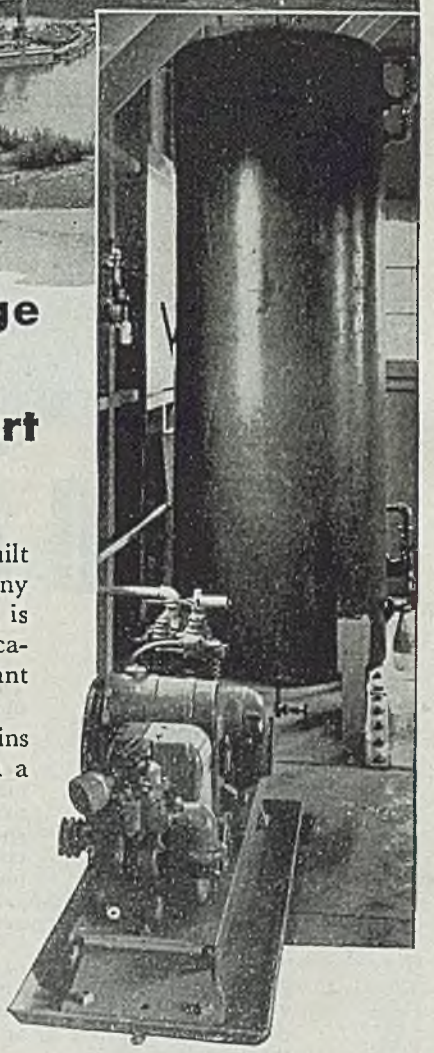
...hting Device

...a adaption of Super Sight magni...ion to fluorescent lighting is an...ced by Safety Division of Boyer-



...dwell Co., 6540 St. Antoine street, ...it 2. Where magnification is used ...ntinuously, the cool fluorescent light...s add to comfort of operator. Super

CURTIS Dependability Scores Again



Giant Army Dredge Relies on Curtis Compressor to Start 320 H.P. Diesel

This new ASD Hydraulic Dredge, built by American Steel Dredge Company for the U. S. A. Engineer Corps, is designed to operate in isolated locations for long periods. Its power plant cannot fail.

A Curtis Air Compressor maintains a minimum of 200 lbs. pressure in a large air storage tank, used to start the main Diesel Engine which is directly connected to the dredging pump.

Here's but another example of the recognition accorded Curtis equipment. For years Curtis has set the highest standards and performance records for economical dependability throughout a long, trouble-free life. Here are some reasons why:

✓ TAPERED ROLLER BEARINGS
✓ CARBON-FREE DISC VALVES
✓ CENTRO-RING LUBRICATION
✓ AUTOMATIC PRESSURE UNLOADER
✓ PRECISION CONSTRUCTION THROUGHOUT

Write for our bulletin, Form C-4-C.

CURTIS
ST. LOUIS
NEW YORK
CHICAGO
SAN FRANCISCO
PORTLAND

CURTIS PNEUMATIC MACHINERY DIVISION
of Curtis Manufacturing Company
1996 Kienlen Avenue, St. Louis 20, Missouri

F-442

Please send me bulletin, Form C-4-C.

Firm .....
Name .....
Street .....
City ..... Zone.. .....State .....

UNEXCELLED!!!

IN MAN-HOUR SAVINGS

EUCLID *Cranes*

WE CAN DELIVER
a limited number of 5 to 10 ton cranes in 60 to 90 days

This type of Euclid Crane is ideal for many industries.

Convenient floor controls permit it to be operated skillfully by any of the several men working on the floor. They get the necessary "lift" instantly whether it be a speedy movement of material, or the precision of control required in modern foundry work, the placing of parts in machine tools, or the final assembly of finished parts. This saves valuable time and increases the output of each man-hour.

Euclid Cranes and Hoists don't have to be pampered. They embody safeguards against all contingencies and are as nearly "fool-proof" as it is possible to build. Above all they are products of quality that prove to be the cheapest to operate and maintain in the long run.

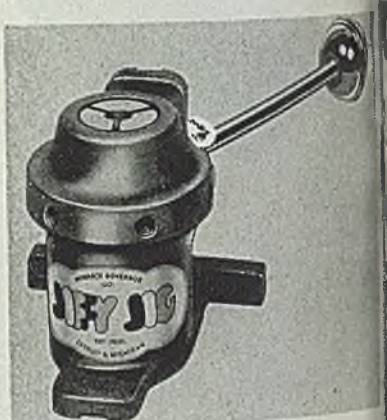
THE EUCLID CRANE & HOIST CO.
1365 CHARDON RD. • EUCLID, OHIO

lighting: Standard bayonet type of bulbs; lamps that are sealed to relieve explosive hazard; fluorescent lamp.

It is supplied with three types of brackets and two sizes of lenses.

Chucks

Monarch Governor Co., 1832 West Bethune avenue, Detroit 6, announces Model J-10A Jiffy Jig chuck for use in vertical setup position. Except for the bracket that allows for horizontal set-ups, this new model includes all features of Model J-10 and is adaptable to various machine tools for drilling, milling, grinding, boring, etc. The chucks are designed to provide ample chip clearance and when the chuck is either open or closed, collet has absolute zero



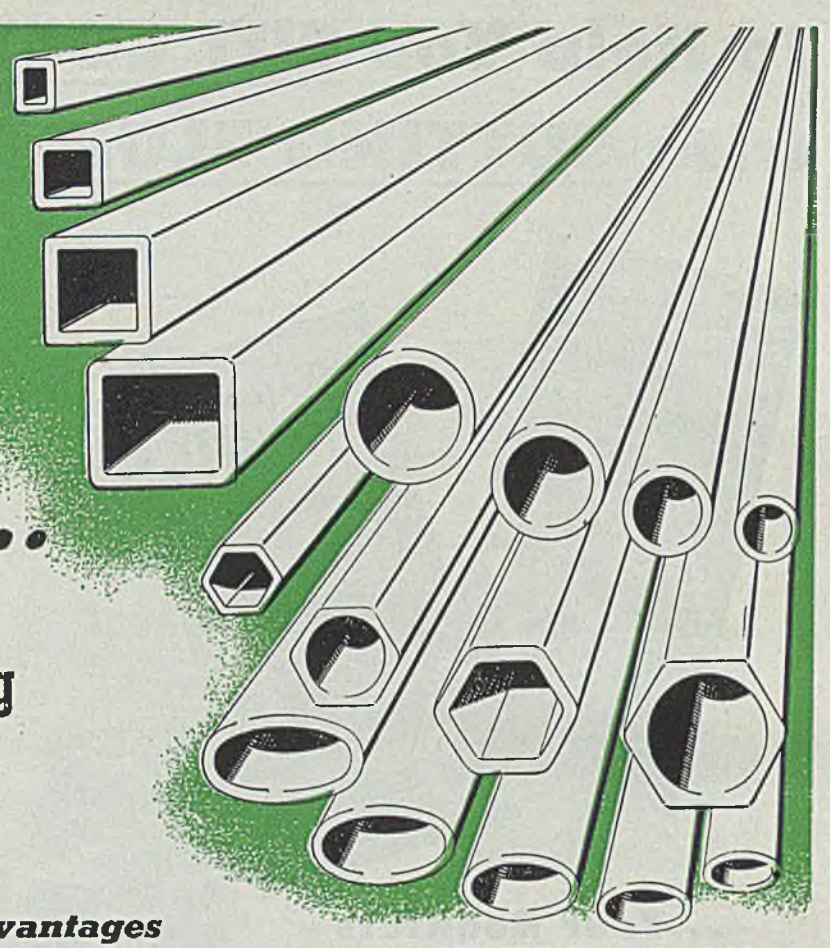
axial and rotary movement, positive axial and rotary dimensional control. The device consists of a cap, base and an operating lever, the taper on cap conforming to that of collet. With proper sized collet in place, cap is screwed down on base until collet opens and closes as desired; operating lever is then screwed into convenient location and it is ready for use. It has capacity for stock ranging from $\frac{1}{16}$ to 1 in. cross section.

Current-Force Recorder

A new current-force recorder for recording current and force resistance welding machine electrodes is announced by Special Products Division, General Electric Co., Schenectady, N. Y. Desirable for use in welding research and for periodic checking of welding machine performance, the device is designed to be helpful to users of energy-storage type welding machines for determining when forge pressure is applied to work with respect to discharge of welding current. In addition, it permits resistance welding machine users to comply with Navy Specifications, Navaer PW-6A, Bureau of Aeronautics, specifications for spot welding of aluminum alloy, for class A spot welding.

Compact and portable, recorder consists of an amplifier-oscillograph unit and a special electrode holder. Amplifier-oscillograph unit, which operates from

How UP-TO-DATE Are You On ALUMINUM?



Coming...

ecision-Processed Tubing
Reduce Postwar
oduction Costs! . . .

. . many other important advantages

WHAT A LOT OF HEADACHES go out the window the moment you specify ynolds Aluminum Tubing!

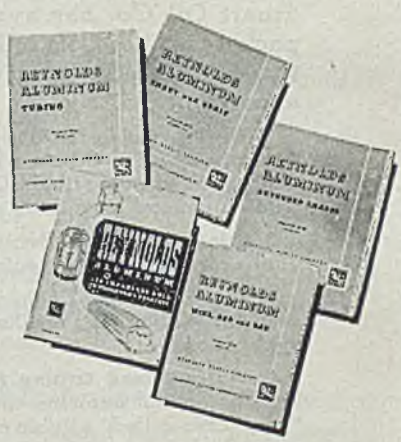
xtruded—and therefore seamless—it lives up to every performance test. In dition, since it is precision-processed to close tolerances, it comes to you exact very dimension—length, weight, inside and outside diameters.

And finally, each shipment is carefully labeled, wrapped, packed in boxes . . . dy to go into production without further checking.

Whatever you make (actually, there seems almost no limit), you'll be able to et Reynolds Aluminum Tubing in the proper length size, temper, and alloy lp you save time, manpower, floor space, tools—reduce your metal in- tory . . . increase production, decrease costs!

NSIDER ALUMINUM . . . Consider the added efficiency and economy of new high-strength Reynolds Aluminum alloys. Consider light weight, corro- n-resistance . . . resistance to shock . . . thermal and electrical conductivity non-sparking qualities . . . chemical stability, non-toxicity, color and taste traction. Consider also ease of fabrication and assembly, lower price trends. d, finally, consider Reynolds nation-wide production and service facilities. ynolds Metals Company, Aluminum Division, 2520 South Third Street, uisville 1, Kentucky. Consider Aluminum . . . **CONSULT REYNOLDS**

LIKE TO MAKE a good product better? Reynolds technicians will gladly work with your engineers. Offices in principal cities. Phone nearest office or write Reynolds Metals Company, Aluminum Division, 2500 South Third Street, Louisville 1, Kentucky.



UPON REQUEST! Bulletin 17-B, Tubing . . . Bulletin 22-B, Sheet and Strip. For Wire, Rod and Bar, see Bulletin 31-B . . . Extruded Aluminum Shapes, Bulletin 35-B. And don't forget Catalog 100-A. "Reynolds Aluminum. Its Important Role in Tomorrow's Products."

7806-A1-7

REYNOLDS METALS

REYNOLDS ALUMINUM

The Great New Source of

INGOT • SHEET • SHAPES • WIRE • ROD • BAR • TUBING • PARTS • FORGINGS • CASTINGS • FOIL • POWDER

To Help You CUT COSTS with CUTTING FLUIDS...

...Four Booklets

Machining costs come down and machining quality improves when cutting fluids are selected and used scientifically. To help you use cutting fluids to better advantage, D. A. Stuart Oil Co has available four pocket-size booklets full of information gathered from over eighty years experience.

1. Cutting Fluids for Better Machining. A comprehensive 60-page hand-book on cutting and grinding fluids. Contains much data on general machining as well as oils.

2. Grinding with Oil. Deals with the use of oils for production, precision grinding.

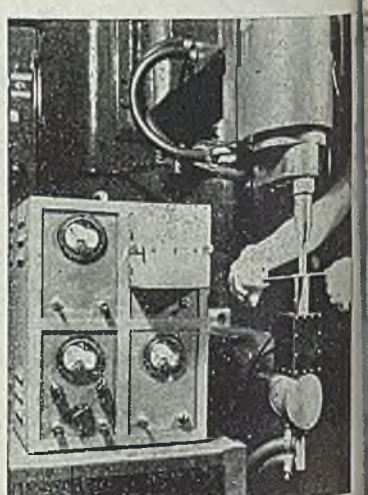
3. The 577th Oil. Contains twenty-two case studies showing results of proper oil application.

4. Water-Mixed Cutting Fluids. A new booklet which explains the "how" and "why" of so-called "soluble oils" and gives many tips on how to handle them.

These booklets are yours for the asking. Indicate by number which you are interested in. *D. A. Stuart Oil Co. Limited, 2735½ S. Troy St., Chicago 23, Illinois.*

D. A. Stuart Oil Co.
LIMITED
ESTABLISHED 1865
Stocks in Principal Metal-Working Centers

115-v, single phase, 60-cycle power source, is composed of a single channel amplifier, an oscillator, a power unit, and a small magnetic oscillograph, all housed in a metal case. This unit simultaneously records a timing wave, rapidly changing electrode force and electrode current of welding machine while a weld is being made. Record produced by recorder also indicates squeeze time, duration and magnitude of welding current, rate of rise of forge pressure and hold time. The electrode holder is equipped with strain gages for measuring compressive strain, which is a measure of force in the electrode and a built-in shunt for diverting



from electrode a proportional amount of current, which is used to operate an oscillograph galvanometer.

In operation, a 5000-cycle voltage from the oscillator is applied to two points on strain gage bridge circuit and output from two opposite points is a measure of force on electrodes. The output of the bridge is fed into amplifier which amplifies the modulated carrier and rectifies and filters the amplified output. Output is then fed to oscillograph where record is made. Welding current and a 60-cycle timing wave are recorded simultaneously on the 3½-in. paper record.

Vacuum Tube Voltmeter

The televiso series 200A VT voltmeter for voltage measurements within the range of 7 cps to 500 megacycles are available.

Five voltage ranges are provided—0.5, 2, 15, 50, 150—spread full scale on a 4½ in. meter dial. Lowest readable voltage is 0.05 v on a maximum scale range of 0.5 v. Accuracy of readings are 2 per cent full scale; middle scale accuracy is 5 per cent or more.

Aluminum panel and dural cabinet are ¼-in. thick, sub-chassis is ⅛-in. thick and is spaced off panel by studs to simplify servicing. Size of the unit is 14 x 9½ x 7½ in.

Series 200A utilizes no diode input tube. Plate circuit rectifier type makes available higher input impedance at all frequencies. No shorting of input probe is required for zero adjustments. Adjust-

You Use Wire Rope You Need This New Bulletin on

DERN MONEY-SAVING SHEAVE WHEELS

s why thousands of old "bicycle-type" sheave ls now in operation have outlived their useful- —why their defective alignment and worn-out es are chewing up expensive rope needlessly y their excessive weight increases mass inertia, friction and power costs.

ere's a brighter side to the picture. It also tells Vulcan Allcasteel Sheaves are light in weight xtremely strong and tough—why their original ct balance and accurate alignment never change—why their smooth hard groove-surface resists wear; thereby prolonging the useful life of wire rope—reducing lubrication and power costs—promoting safe operation.

This sheave-wheel bulletin is different from any that you ever saw before—packed full of engineering data and other useful information relating to the selection and operation of sheaves and wire rope, yet interesting and easy to read throughout. Write for Bulletin No. A-396 today. No charge or obligation.

VULCAN IRON WORKS

Established 1849

Main Office and Works **WILKES-BARRE, PA.,** New York Office 50 Church

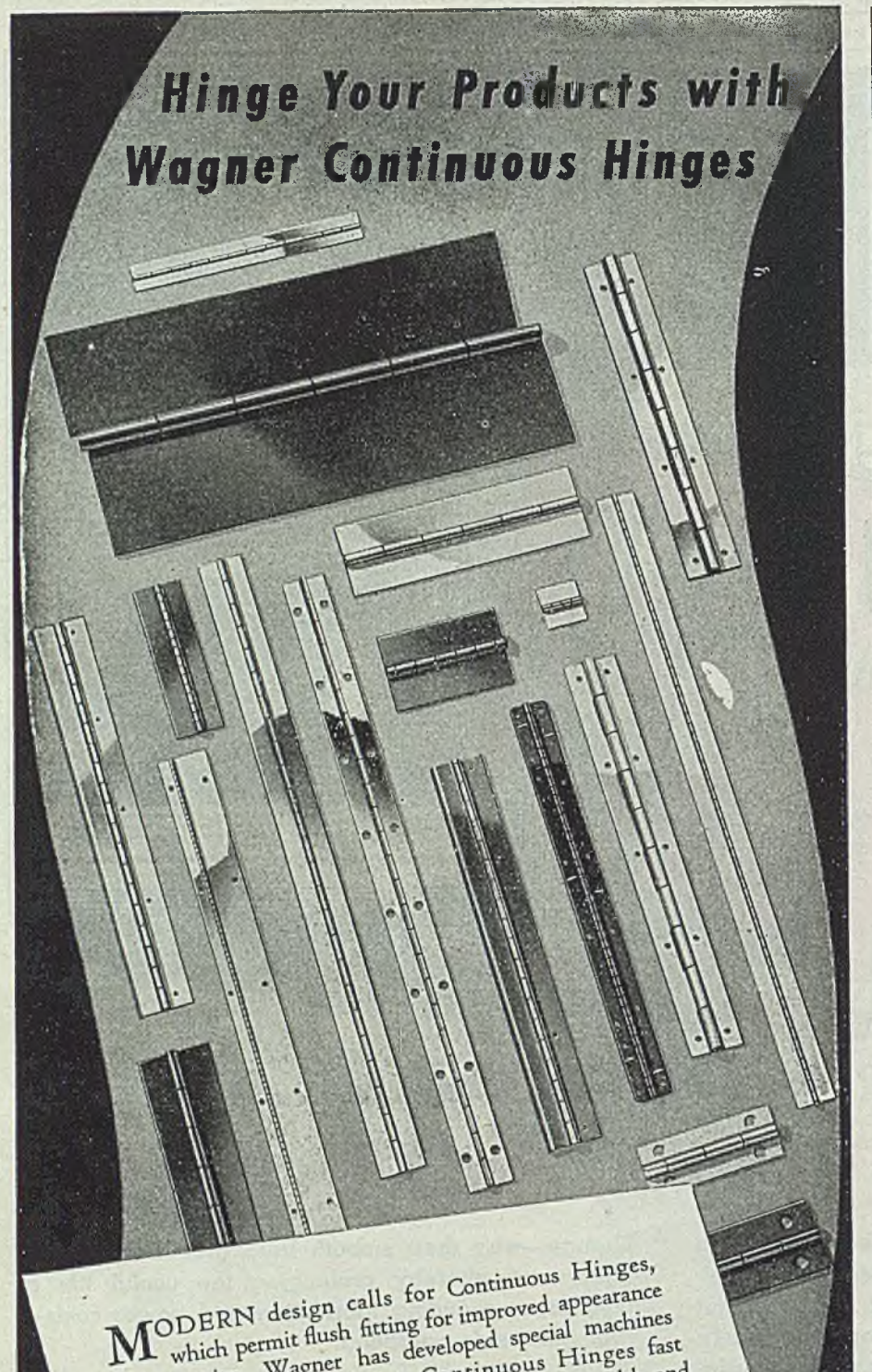
y-Duty Electric Hoists
ained Hoists
e Hoists
pping Hoists
Hoists

Shaking-Chute Conveyors
Chain Conveyors
Cast-Steel Sheaves and Gears
Cages, Skips and Gunboats
Coal-Preparation Equipment

Steam Locomotives
Diesel Locomotives
geared and electric drive
Gasoline Locomotives
geared and electric drive

Load-Carrying Larries
Rotary Kilns, Coolers and Dryers
Crushing Rolls and Pulverizers
Briquetting Machines
Ball, Rod and Tube Mills

Hinge Your Products with Wagner Continuous Hinges



MODERN design calls for Continuous Hinges, which permit flush fitting for improved appearance and security. Wagner has developed special machines and methods for producing Continuous Hinges fast and economically in any metal — any length, width and finish. Engineered to your specific requirements, they can be perforated, counter sunk, formed or spring loaded. You'll find Wagner a *dependable source* for Continuous Hinges of any kind. For your present or future products, we'll work with you confidentially. Write today.

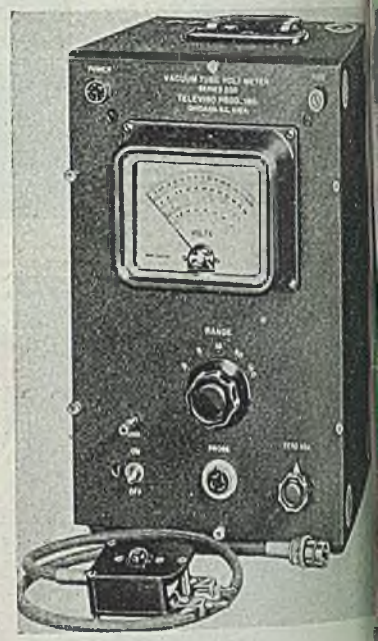
E. R. WAGNER MFG. COMPANY

4615 North 32nd Street • Milwaukee 9, Wisconsin

Since 1899 producers of Metal Stampings and Specialties, Hinges and Hardware, Machine-Applied Hinges, Rolled Butt-Joint Spacers and Bushings.

ments for zero are made once and remain constant. Filament and plate voltages are transformer and tube regulated. Built-in calibration voltage is provided.

The series 200A will operate satisfactorily from any source of voltage from



95 to 130 v ac. Line voltage surges are not observable during use: This unit is manufactured by Televiso Products Inc., 7466 Irving Park road, Chicago 34.

Light Duty Clamp

Designated as Model KV-210, a light duty, toggle-action clamp is introduced by Knu-Vise Inc., Detroit 16 for holding parts for inspecting, grinding and other mechanical processes. The clamp has a long handle for extra leverage and the toggle bar can be reduced in length for mounting close to work to achieve increased holding power.

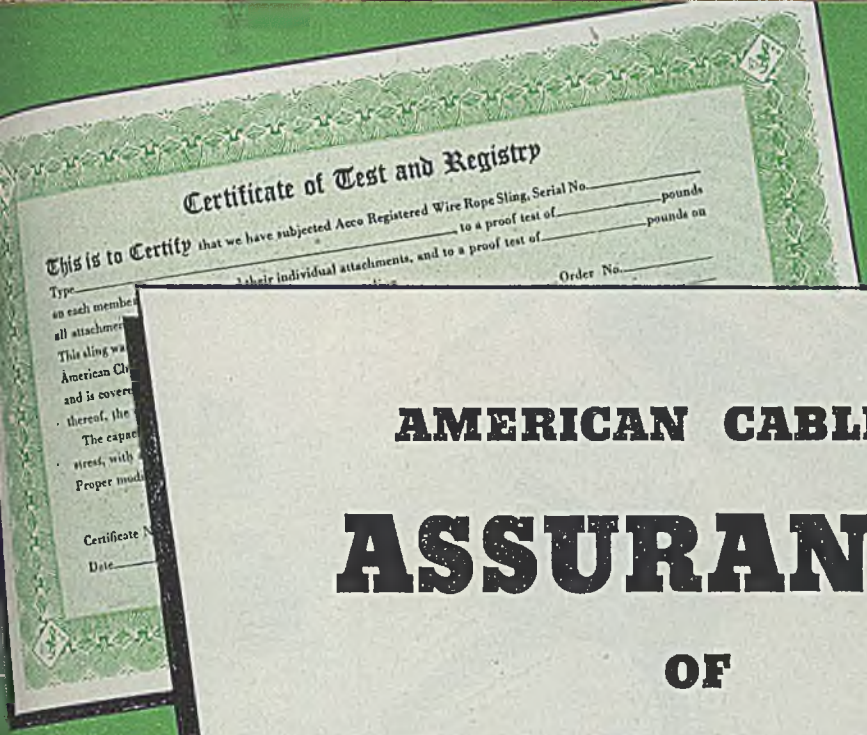
Bar can be used for making direct clamping to work or it can be equipped with a spindle held by a standard bolt retainer welded to the end of the bar.

All parts, except toggle bar, are heat treated, and the entire clamp is cadmium plated. It measures 7⅛-in. in height and 6⅜-in. in length, and weighs 24 oz. The recommended load at end of the toggle bar is 240 lb.

Tablet Compressing Machine

An improved Eureka tablet compressing machine is offered by F. J. Stokes Machine Co., Philadelphia 20, Pa. Improvements include a more efficient feeding device for handling materials difficult to feed; frame has been strengthened; ejection cam is now milled to give smoother action; and an improved adjustment of lower plunger enables press to make very small tablets.

Applying pressure of 1½ tons, with maximum die-fill of 7/16-in. and producing tablets up to ½-in. diameter at rates up to 100 per minute, this press has many applications in experiment



AMERICAN CABLE'S

ASSURANCE

OF

Wire Rope Sling

STRENGTH & SAFETY

• Now you may have registered assurance—a Certificate of Test and Registry—with your wire rope sling.

American Cable proof-tests every Registered Sling to twice its rated capacity. Then, as proof of known strength and safety, you may have your sling **ACCO-Registered** and receive a Certificate showing the actual proof-test load, maximum safe load and date of testing. Only the highest grade wire rope (TRU•LAY Preformed of Improved Plow Steel) is used to make American Cable's **ACCO-Registered Slings.**

ACCO-Registered Service helps you select the right sling for your particular job; then registers and identifies its pre-determined strength. Send today for your free copy of the book on **ACCO-Registered Sling** Service.

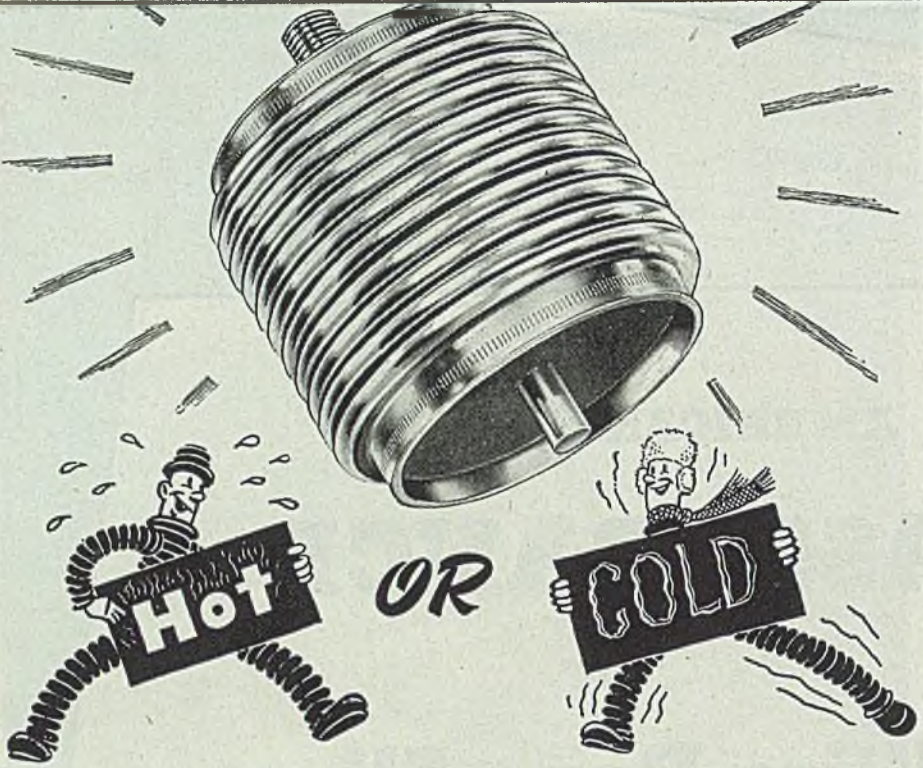
ARMY E NAVY

ACCO

Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, Portland, San Francisco, Tacoma, Bridgeport, Conn.

AMERICAN CABLE DIVISION
AMERICAN CHAIN & CABLE

In Business for Your Safety



It doesn't matter to C. M. H. Stainless Steel Bellows!

You can't choose the temperatures of each bellows application, but you *can* use a product engineered to perform with equal efficiency . . . at both ends of the thermometer! We mean C.M.H. Bellows, made of 18-8 Austenitic *Stainless Steel,* with a working range of sub-zero to a scaling point of 1800° F.—wide enough to meet practically any heat or cold requirement.

Notice below the other advantages stainless steel and C.M.H. design bring you. Check and compare . . . and we think you'll want the full story of C.M.H. Stainless Steel Bellows!

Ask for Chicago Metal Hose Form SS B 2 on which to submit your bellows requirements. It will save you time . . . assure more accurate transmittal of essential data.

★ Corrosion resistant qualities of stainless steel enable wider application of C.M.H. BELLOWS.

★ Multiple ply construction gives even greater strength factors when needed.

★ Ferrous fittings, attached by Circular Seam Welding, assure permanent, leakproof joints.

★ Uni-metal assemblies avoid the costly troubles encountered where bi-metal types or solder joints are used.

★ Long lengths are standard production permitting economical use of C.M.H. Stainless Steel BELLOWS for many unusual types of applications.

★ Better delivery schedules are possible because C.M.H. BELLOWS are standard production products.

Flexible Metal Hose for Every Industrial Use

ARMY E NAVY

CMH

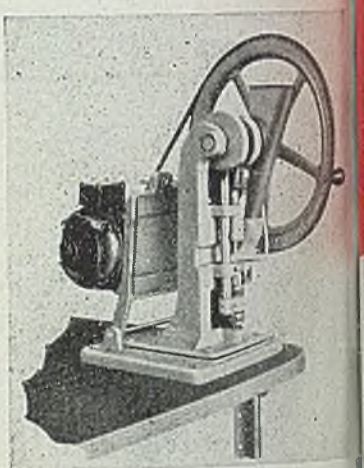
CHICAGO METAL HOSE CORPORATION

MAYWOOD, ILLINOIS

Plants: Maywood and Elgin, Ill.

industrial specialties such as chemical products, catalysts, etc., pharmaceuticals, ceramic mixtures, carbon and powder metallurgy tests and other purposes.

It produces tablets equal in physical properties to those made on larger machines. A core-rod attachment can be



provided to make cored pieces. Bench space is 12 x 18 in.; height, 24 in. motor, ¼-hp. Available without motor for hand operation; also with variable speed drive to handle various size tablets in runs of considerable length.

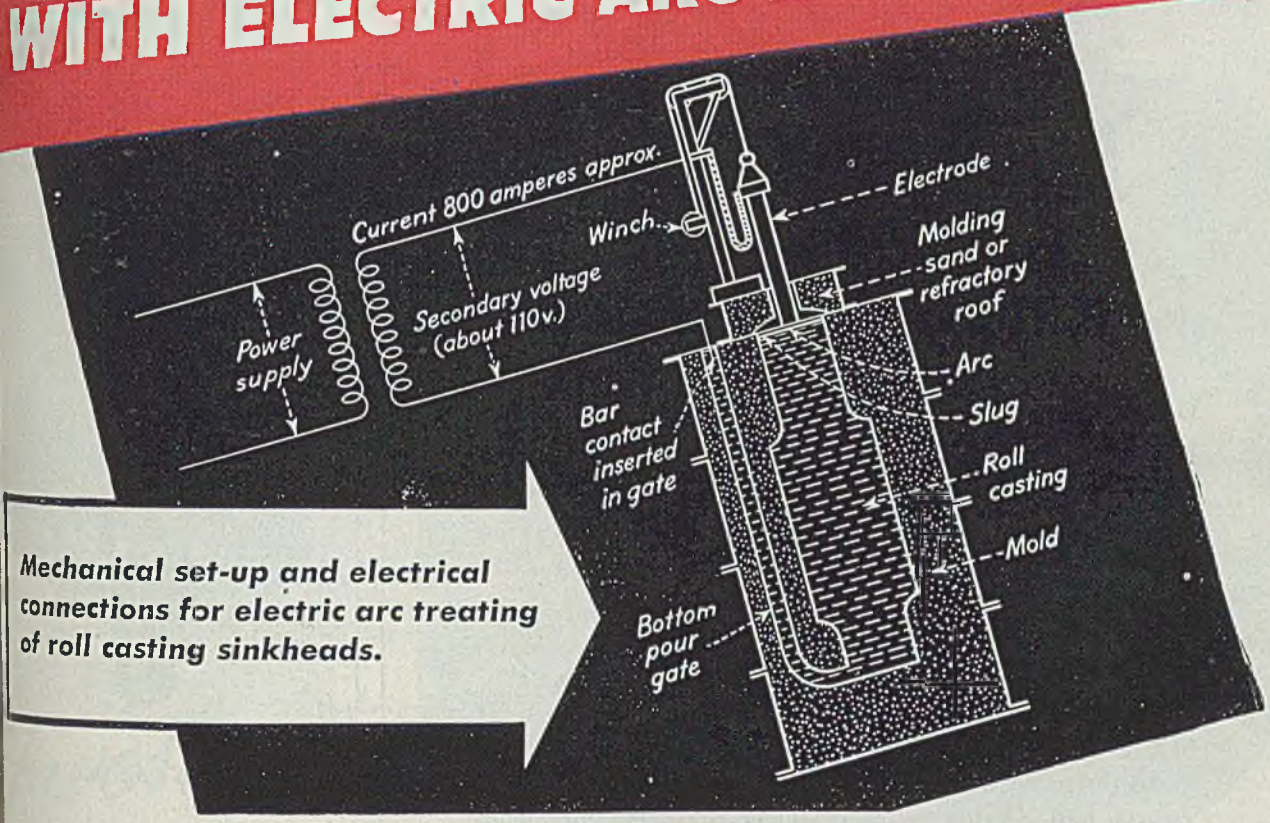
Marking Machine

A machine for marking code specifications on formed, welded and extruded shapes either continuously or at desired intervals is offered by Superior Type Co., 1800 West Larchmont avenue, Chicago 13. The equipment is attached to the vertical surface of the machine preceding in line, which furnishes the drive, automatically feeding the strip material into the marking unit. Any part of the upper surface of the strip can be marked as the machine swings into any position in an 180° arc. Stock up to a width of 5 in. can be accommodated. The unit has an enclosed reservoir and ink distributing rollers. It can be provided with a marking roller having interchangeable type and logos, or with smooth cylinder for dies.

Electron Tubes

Featuring sturdy mechanical construction to withstand vibration, shock and rough service in aircraft, automotive and industrial applications of radio and electronic control, new lock-in tubes for high and ultra high frequency applications are offered by Sylvania Electric Products Inc., Emporium, Pa. Tube bases of all-metal design provide shockproof positioning of the tube in its socket. Self-socket pins which provide mechanical and electrical contacts with socket parts are welded directly to tube elements. Utilizing glass "header" construction permitting use of heavier element supports direct bonding of pins to glass and metal

TOP CROP CUT TO 5% WITH ELECTRIC ARC HOT TOPPING



Mechanical set-up and electrical connections for electric arc treating of roll casting sinkheads.

EVERAL years ago National Carbon Company began a series of experiments with electric arc heating of ingot hot tops and the sinkheads of large steel ings. The results of these experiments have been con- in commercial practice by several steel plants, ich report the process offers economy and an increase oduction without upping producing capacity.

One stainless steel plant, where operating practice was ptionally good, normally obtained a top crop of %. Electric arc hot topping reduced the crop to 5% at a saving of several dollars per ton over the cost of hot topping operations.

At another plant producing large roll castings, 694 tons of metal were treated. Castings averaged 27.8 tons. Total saving was 111.4 tons, an average of 4.5 tons per casting. The cost: less than $1 per ton of metal treated.

Hot topping apparatus is inexpensive. Electrode consumption is only one-half pound per ton of metal treated.

Our experimental work with hot topping is part of what we call "customer service"—one of the five essential things you never see in "National" carbon and "Acheson" graphite electrodes. The others: selection of raw materials, manufacturing experience, manufacturing control, and continuing research. We invite you to write our nearest office about these reasons for the superior performance of "National" and "Acheson" electrodes.

NATIONAL CARBON

ACHESON GRAPHITE

The words "National" and "Acheson" and the "Network" and "Acheson" Seals are registered trademarks of National Carbon Company, Inc.

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Unit of Union Carbide and Carbon Corporation
UCC
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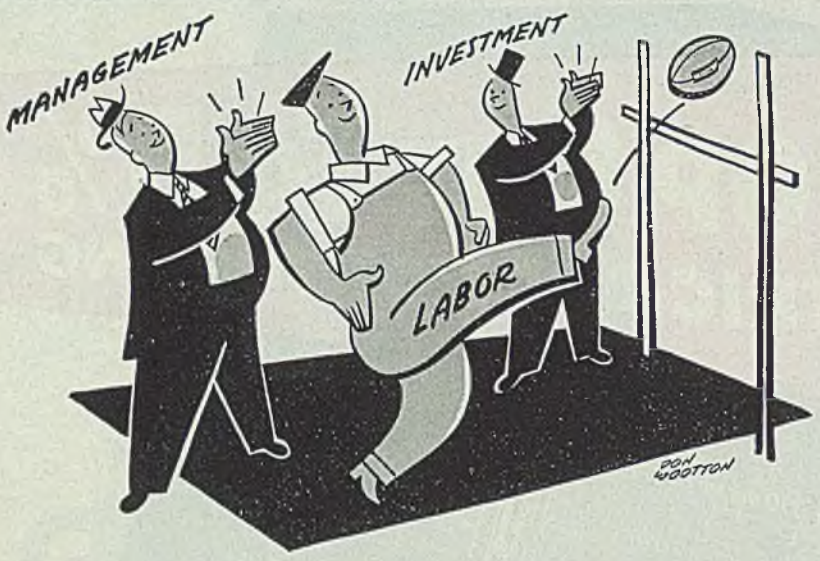
DIVISION SALES OFFICES: Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco
In Canada: Canadian National Carbon Company Limited, Toronto 4, Canada



TEAMWORK PAYS

One of the peculiar things about money is that it can never be paid—to anybody—until it is *earned.*

Management earns money by doing a good managing job—by operating plants that make things people are willing to buy for a little more than those things cost to produce.

Invested capital earns money by furnishing the finances for industry's operations.

Labor earns money by doing productive work—by selling skill and time and energy to industry.

All three can increase earnings only by producing more—to give better value to the customer who pays out money for the products of industry.

The interests of labor, management and finance are best served when all three work as a team, for a common goal.

That kind of teamwork will do more for America than all the laws that can be enacted, or all regulations that government can devise.

Geo. D. Trundle Jr.
President

THE TRUNDLE ENGINEERING COMPANY

Brings to Industry and Business

26 Years **OF CONSULTING MANAGEMENT ENGINEERING EXPERIENCE**

GENERAL OFFICES • CLEVELAND • BULKLEY BUILDING

CHICAGO
City National Bank Bldg., 208 S. La Salle St.

NEW YORK
Graybar Bldg., 420 Lexington Ave.

design also reduces lead inductance and interelement capacity.

Tube is particularly adaptable for higher frequencies allocated for tele-

vision, aircraft radio and railway train communication.

Welding Electrode

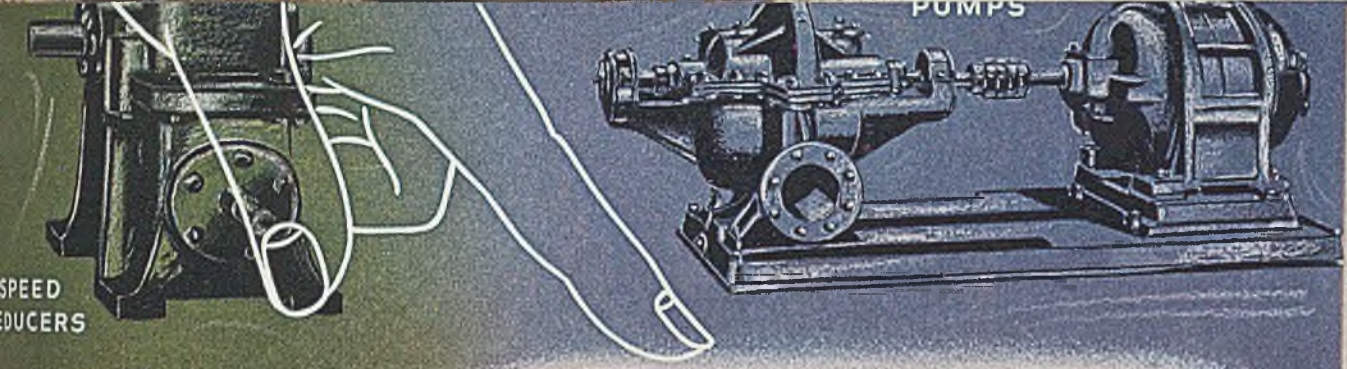
Alloy Rods Co., York, Pa., announces the addition of Nickel-Arc, a machinable cast iron welding rod, to its line of stainless and tool steel electrodes. It may be used freely on either ac or dc current in all positions. No preheat is required to obtain porosity-free deposits completely machinable in the weld deposit fusion zone. The weld deposit is free from cracks or cross checking in multiple pass welds and after machining or grinding the weld deposit closely matches the color of the parent cast iron and withstands hydrostatic pressure.

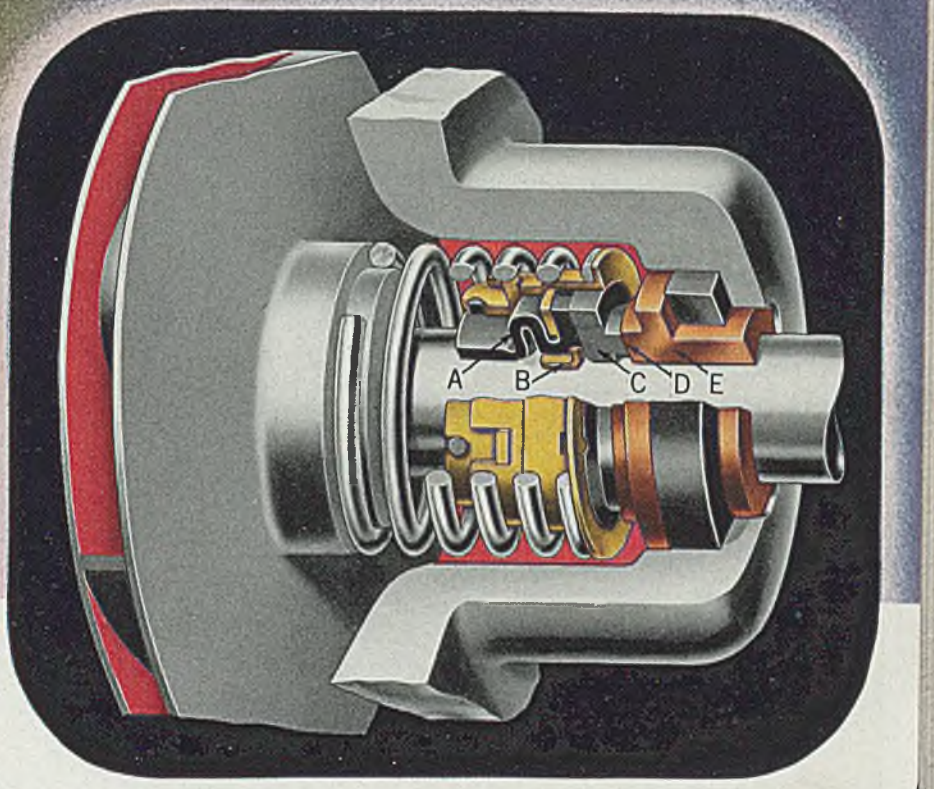
Rotary Sleeve Seal

A development recently introduced is the elastic sleeve seal for centrifugal, rotary, reciprocating, and other pumps using rotating shafts that must be sealed.

The seal is at present being manufactured for use with new compressors as a replacement seal for old. It has been proven that they work equally well on bent, pitted, or slotter shafts and eliminate all springs, shims, and

STEEL





Investigate THIS *New* SHAFT SEAL!

The JOHN CRANE Bellows Shaft Seal is giving excellent and trouble-free service on all types of shaft sealing applications, such as found on the following:

Turbine Pumps • Speed Reducers • Refrigeration Compressors • Rotary Pumps • Agitator Shafts • Centrifugal Pumps

This precision-built Shaft Seal automatically adjusts for washer wear and shaft end play. Eliminates stuffing box leakage, gland adjustment and shaft wear. Excellent for high speeds and high pressures.

The JOHN CRANE Bellows Shaft Seal can be furnished in various metals and synthetic rubber stocks in order to best suit different operating conditions. Made in two basic types: Type I (for limited diameter) and Type II (illustrated above) for limited length.

A Synthetic Rubber Bellows—tail seals on shaft. Head is flexible; adjusts automatically for washer wear or shaft end play.

B Protecting Ferrule—prevents flexible bellows from adhering to shaft; assures free movement.

C Sealing Washer—rotates with shaft; driven through metal parts; no torque on bellows.

D Sealing Faces—both carefully lapped at our factory to insure a perfect seal.

E Floating Seat—cushioned in synthetic rubber sealing ring, eliminating stress distortion of sealing faces.

Manufacturers and Design Engineers
Write for Bulletin!

Crane Packing Company

1879 CUYLER AVENUE
CHICAGO 13, ILLINOIS

Baltimore - Boston - Buffalo - Cleveland - Dallas - Detroit - Houston - Los Angeles - New Orleans - New York - Philadelphia - Pittsburgh - San Francisco - St. Louis - Tulsa

DIAMOND G MULTI-CLAMP

The Clamp of a thousand uses...

Here's a new clamp that meets the needs of many industries . . . a clamp that solves scores of problems quickly and economically!

The new Diamond G MULTI-CLAMP instantly FITS and HOLDS rubber hosing, metal pipe, tubing, cables and other equipment in a vise-like grip. No wrench, no screw-driver, no disassembling necessary. The patented worm-type self-locking screw assures uniform instant adjustment. Each standard MULTI-CLAMP covers a wide range of sizes and adjustments. Continuous "gear-action" solid band prevents leakage or unequal pressure at any point!

The Diamond G MULTI-CLAMP is corrosive-resistant and meets current Army-Navy specifications. It can be used repeatedly and is practically indestructible. Mechanically held and securely welded . . . a double safety feature! For special purposes, various types of inserts, extra wide bands of metal, plastic or rubber are available.

See the MULTI-CLAMP in action . . . for automotive, aviation, railroad, marine, electrical, hydraulic, pneumatic, electronic, household use and general plant applications. Sample on request.

Easy to Install—no disassembling

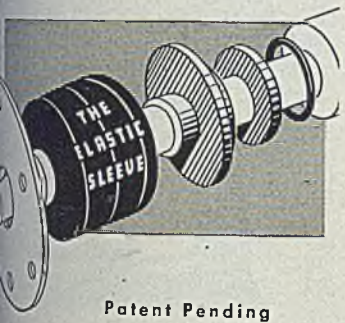
Double Safety Feature—mechanically held and welded

GEORGE K. GARRETT CO., INC.
1421 CHESTNUT STREET, PHILADELPHIA 2, PA.

DIAMOND G PRODUCTS

t glands due to the perfected devel-ent of a new oil resistant elastic rial which is being used as the body e elastic sleeve.

o assure longer life with proper ication, the seal bearing of the de- is located at the source of the oil ly. The design, which has been

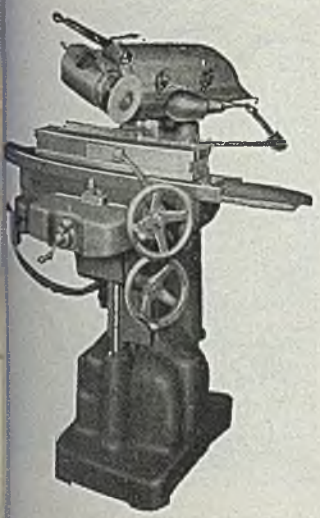


Patent Pending

ed out for all modern installations, es faster placement due to fewer mbly parts with no fragile parts to during assembly. This rotary seal product of Temperature Control ers, New Haven 15, Conn.

t Broach Sharpener

eat Lakes Broach & Gage Co., 1008 klin street, Detroit 8, is offering a lat broach sharpener and back-off ine designed to meet the require- of fast servicing of flat broaches. s machine will handle practically l broaches, insets, keyways, and

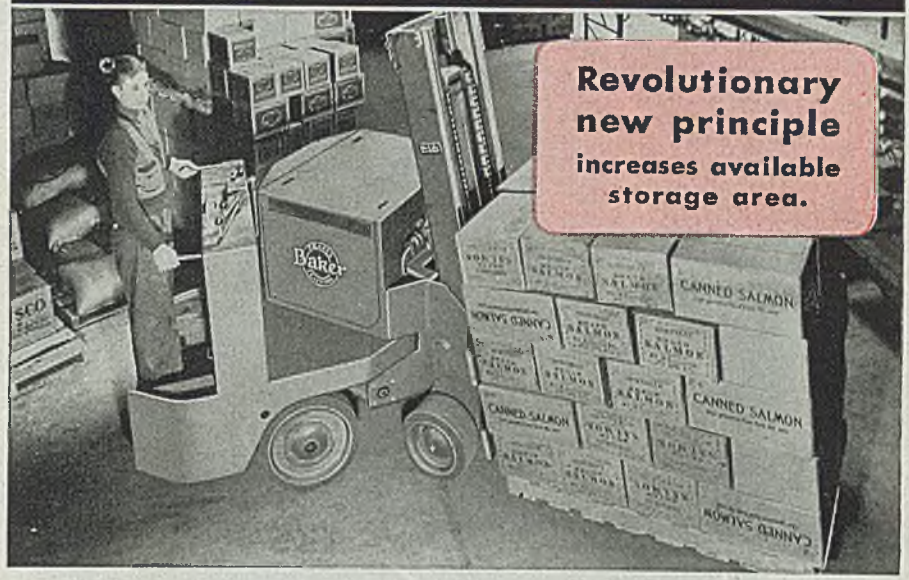


h bar assemblies. A particular re is the handle for the table feed, sted to 0.0005, thus enabling the tor to re-step and back-off key- and other similar broaches with- employing a surface grinder.

rque Tester

cking torque wrenches, measur- torque necessary to screw and un- threaded parts, determining start- rque of motors, and other measure- are performed by an instrument gives the results directly on dial. ese torque testers are made in a e of capacities from 50 in.-oz.,

New Baker ARTICULATED Fork Truck cuts aisle requirements



DESIGNED PRIMARILY FOR EFFICIENT WAREHOUSE OPERATION

A basically new design* involving a new method of steering by "articulating" the frame, permits swinging the load to line it up in position without lining up the truck itself. Thus this truck requires about two feet less space for placing loads at right angles to aisles. It needs less clearance on turns, and speeds carloading or any other handling operation where loads must be lined up or positioned in congested areas.

Specific advantages of this truck are:

1. **Works in narrower aisles.**
2. **Turns in a smaller radius.**
3. **Spots loads quicker and easier.**
4. **Control units are more accessible.**
5. **Simpler Steering design cuts maintenance.**
6. **Permits mechanization of handling where hand trucks were necessary because of space limitations.**

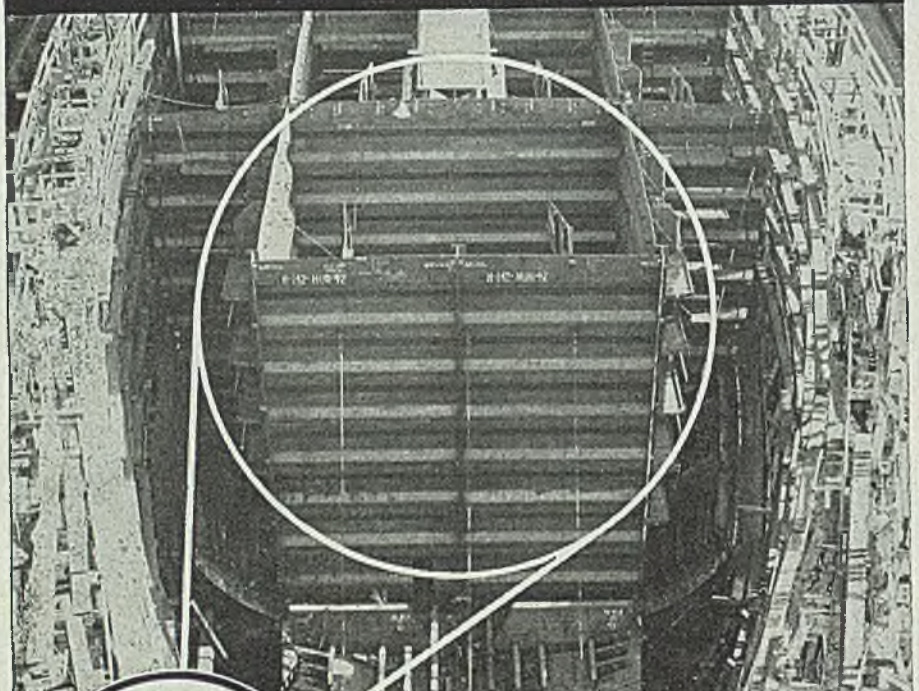
Field tests in both warehouse and production operation have proved the many advantages of this new truck. For complete specifications request Bulletin 1330.

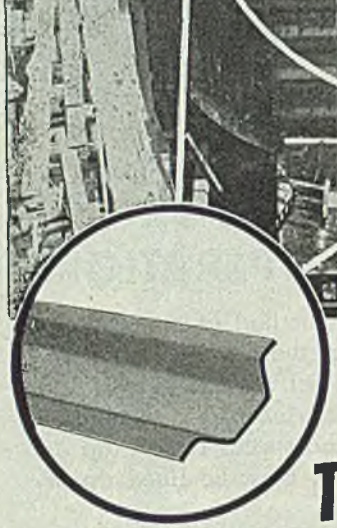
*Licensed under Stevenson Patent No. 2,284,237.

BAKER INDUSTRIAL TRUCK DIVISION *of The Baker-Raulang Company*
2167 West 25th Street • Cleveland, Ohio
In Canada: Railway and Power Engineering Corporation, Ltd.

Fort Pitt Bridge

PRESSED PLATE SECTIONS





SPEED AMERICA'S Tankers off to War!

This illustration shows one application, by an important western ship builder—of the two ton bulkhead plates prefabricated on Fort Pitt Bridge's 36-foot Hydraulic Press—IN ONE OPERATION. Just as this war-developed facility aids the Maritime Industry, it too, is highly important for peacetime needs—varied heavy shapes can be pressed in a single operation, providing lower costs, constant product uniformity, eliminating many useless operations.

Descriptive Bulletin on request.

"Steel Permits Streamlining Construction With Safety, Endurance and Economy"

FORT PITT BRIDGE WORKS

General Offices: Pittsburgh, Pa. Plant at: Canonsburg, Pa.

BRANCH OFFICES

NEW YORK, N. Y. . . . 441 Lexington Avenue
CLEVELAND, OHIO . . . Bulkley Building
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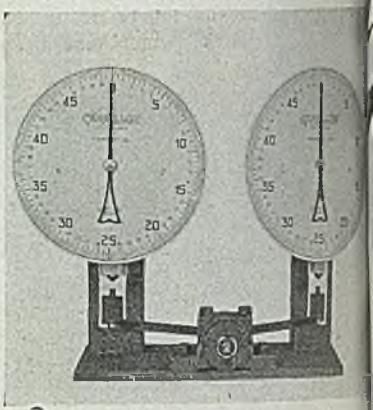
DETROIT, MICHIGAN . . . New Center Building
PHILADELPHIA, PA. . . . Commercial Trust Bldg.

up to 1000 ft-lb, graduated in 5 ft-lb. In using the instrument it is necessary to supply torque to the shaft and resulting force is indicated on the dial. The shaft can be provided with pin, vise, adapters,



or other fittings to suit the application. This instrument is made by John Chatillon & Sons, 85 Cliff street, New York 7.

Welder's Truck

Designed to accommodate one gas and one air cylinder, a new welder's truck is offered by Palmer-Shile Co., 796 South Harrington avenue, Detroit 17. Truck handles are equipped with cross bar on which Gasaver or torch hanger may be mounted. Hooks welded on handles provide a place for hanging gas hose

when not in use. Tool box is mounted on swivels so that tools are always in level position.

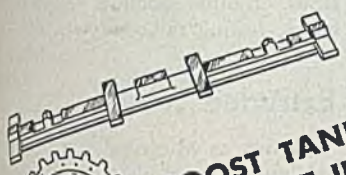
Unit is of all metal, all welded construction. Frame work is of angle iron and sheet metal. Handles are of heavy tubular steel. Overall height is 48 in., width 29 in.; wheels are 24 x 2 in.

Soldering Irons

Electric soldering irons for battery use are offered by Hexacon Electric Co., 139 West Clay avenue, Roselle Park, N. J., in 100 or 200 w sizes wound for either 12 or 24 v. All irons are available with either 6 or 12 ft cords and with plug cap or battery clips.

Heating element is housed in dam

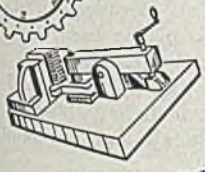
The Kind of Job Colonial Broaches Helped to do.....



CUT COSTS OF AUTOMATIC RIFLES 57%

BOOST TANK SPROCKET PRODUCTION 300% WITHOUT INCREASE IN MAN POWER OR MACHINES

2



MACHINE 7 DIFFERENT PARTS IN 60 SIZES ON ONE MACHINE

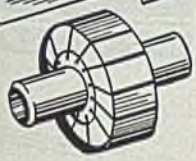
3

PRODUCE SPLINE FITS WITH "ZERO" BACKLASH

4

MAKE ONE BROACHING MACHINE DO THE WORK OF 3, 6 OR MORE MILLING MACHINES

5



TURN OUT PARTS IN PRODUCTION TO TOOL ROOM PRECISION

6

Those are just a few typical examples. Colonial field engineers can help you cut costs, boost output, or increase precision. A call, a letter or a wire to Colonial will pay dividends.

Are you on the mailing list to receive "Broaching News"?

colonial BROACH COMPANY

DETROIT 13, U.S.A.

Broaches Broaching Machines - Broaching Equipment


SEAMING ROLL


TIPS FOR SAW TEETH


FORM TOOLS


MASTER GAGE BLOCKS

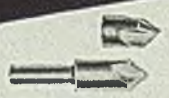

FLASH TOOL FOR WELDED TUBING

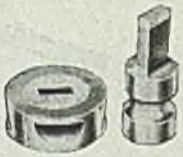

ROUTER BIT

Improve PRODUCTION PROCESSES and cut costs with KENNAMETAL SPECIAL TOOLS


TIPS FOR MEAT CUTTERS


TRIANGULAR SAW FILES


COUNTER SINKS


PRESSING DIE AND RAM


DIE FILE


BALLS FOR SIZING


WIRE ROPE DIE


FLARING TOOLS


CHUCK JAWS

The properties that make Kennametal outstanding for fast, economical machining of steel, cast iron, non-ferrous metals, and non-metallics, are equally useful when applied to a variety of other production processes. Shown on this page are a few examples that suggest scores of economic applications of Kennametal on special tools, dies, and rolls.

Kennametal is the tough, strong, cemented carbide that contains an extremely hard intermetallic compound, $WTiC_2$. Its superior wear-resistance comes from a combination of precisely maintained properties— high modulus of elasticity (2 to 3 times that of steel); low coefficient of friction; and exceptional hardness (up to 92.3 on Rockwell A scale).

Kennametal can be accurately molded into almost any shape, limited only by reasonable proportions. Its cost is moderate—almost insignificant when compared with the tool and production economies effected through its use. The best way to prove this is to let us cooperate with you in designing a Kennametal tool for test purposes on your specific job.

Remember, Kennametal can be used in your production machines without entering into any complicated, continuing agreements.

KENNAMETAL

SUPERIOR CEMENTED CARBIDES

KENNAMETAL Inc., LATROBE, PA.

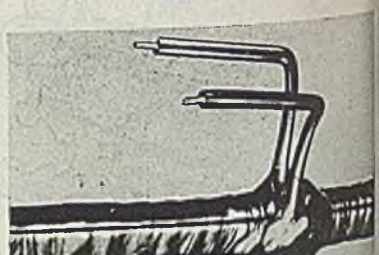
proof hexagon shaped barrel which protects it from all danger of mechanical injury. Due to hexagon shape, irons can be held in vise when replacing tip without danger of denting housing or elements. High heat alloy core resists scale and prolongs the life of element.

Circuit Tester

An all-purpose electric tester is available from Amerline, 1753 North Honore street, Chicago 22. The tester is of the vest pocket type and indicates voltages from 90 dc, and 60 ac, to 500 v ac or dc. A General Electric neon lamp on the top glows in varying intensities indicating circuit conditions. No glow indicates a dead line. The lamp lights on currents as low as 1 microampere. The new tester can be used for locating blown fuses, trouble-shooting electric appliances, testing radio circuits, etc.

Extruded Tubing

Known as Miccrotube, a new product for insulation of plating racks is offered by Michigan Chrome & Chemical Co., 6340 East Jefferson avenue, Detroit 7. It is an extruded tubing made from an elastic plastic base material that has resistance to plating baths and cleaning solutions. It will withstand hot plating solutions, including 180-190° copper and practically all types of boiling cleaning



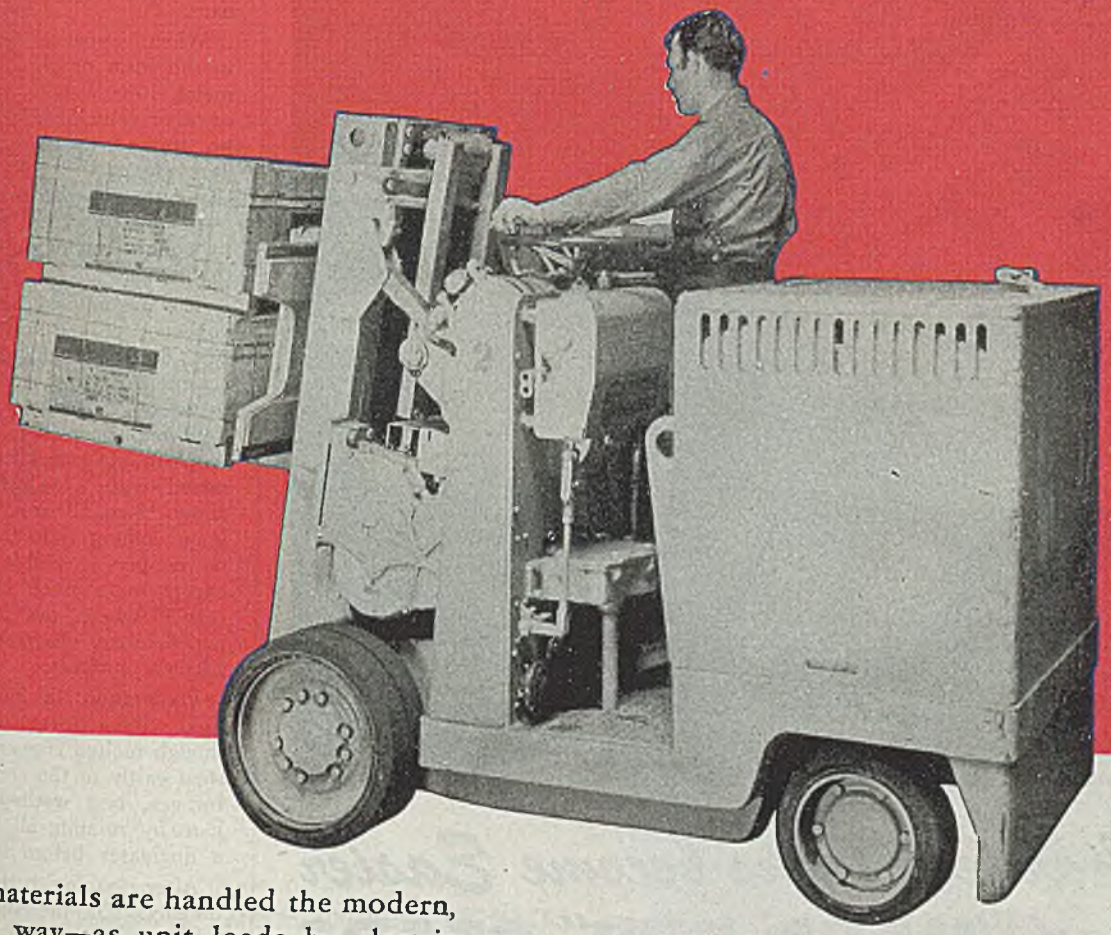
solutions indefinitely without damage or deterioration. It is not recommended for use in trichlorethylene. Its surface is smooth and glassy which permits solutions to drain from racks more quickly. It is available with inside diameters ranging from $\frac{1}{8}$ to 1 in.

Electrode Holder

Exposed metal surfaces of the new screw type electrode holder offered by Allis-Chalmers Mfg. Co., Milwaukee, are constructed of spatter-resistant Mallory metal. Simplified design facilitates easy replacement of parts and heavy insulation and handle ventilation provide cool operation.

It is available in light and heavy duty sizes to accommodate electrodes up to $\frac{3}{8}$-in. diameter.

WHEN THE POWER IS EXIDE *SUSTAINED* SPEEDS ARE ASSURED



WHERE materials are handled the modern, economical way—as unit loads by electric industrial trucks—tonnage figures climb and handling costs go down. And when the motive power is Exide, sustained speeds, all day long, are assured.

Thousands of Exide Batteries are in service at the factory and warehouse fronts . . . helping to keep war supplies moving smoothly . . . and getting them off to a running start. Exides are specially designed for this important service. They have the extra power and rugged construction the job demands. For dependability, long-life and ease of maintenance, you can always count on Exide Batteries.

Write us for a FREE copy of the bulletin "UnitLoads," prepared by The Electric Industrial Truck Association. It tells how to cut handling costs up to 50% . . . covers latest developments in materials handling . . . and includes actual case histories.

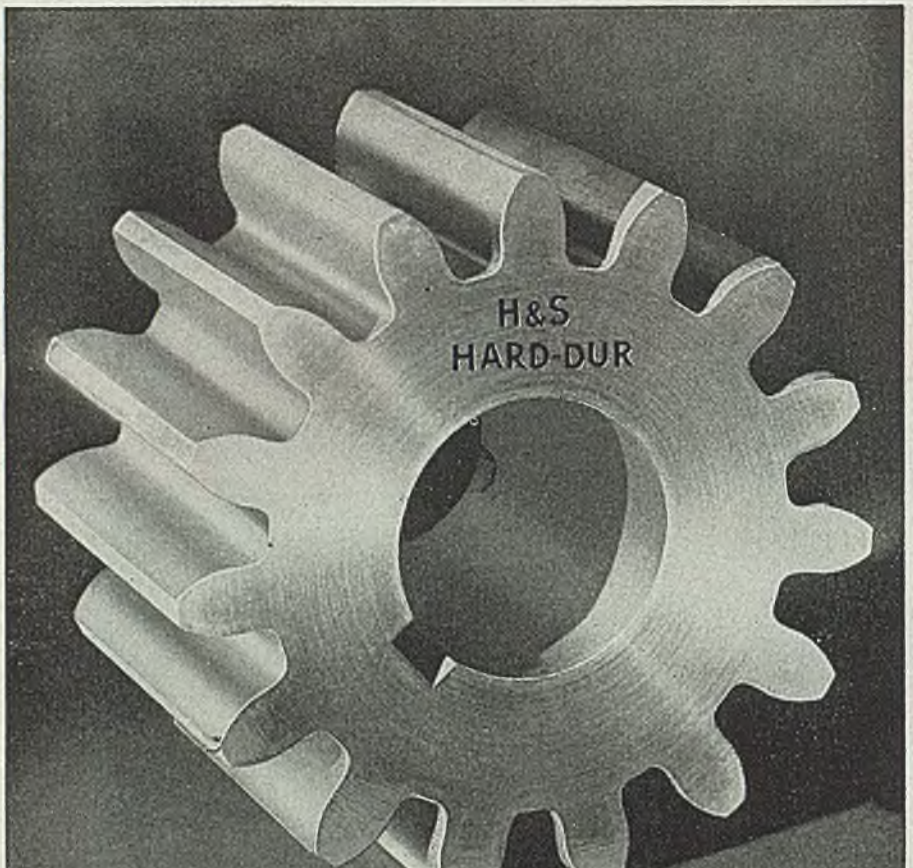
POWER

ARMY E NAVY

Exide
BATTERIES

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32

Exide Batteries of Canada, Limited, Toronto



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"HARD-DUR" Gears handle the tough jobs on which ordinary gears fail and when used on the average job they last almost indefinitely.

Send note on Company Letterhead for 488-Page Catalog 41

THE HORSBURGH & SCOTT CO.

GEARS AND SPEED REDUCERS

5112 HAMILTON AVENUE • CLEVELAND, OHIO, U. S. A.

Multiple Brazing

(*Continued from Page* 111)

steel parts at the brazing temperature and at the same time effectively remove any light oxide films that may already be present. Thus there is no need for flux work to be brazed in such a furnace.

When copper is applied to the joint in the form of granulated or powdered metal, it is usually mixed with lacquer or other vehicle to form a paste that can be applied to the joint area. In this case use of the right vehicle allows all the copper to be drawn into the joint by capillary action so that practically no copper remains on the surfaces near the joints.

The assemblies coming off the chain conveyor of the continuous furnace in Fig. 8 are of this latter type. Heat frames for radio tuning condensers are made by assembling ¼-in. square bars into cutouts in ⅛-in. thick end plates. A paste of granulated copper particles mixed with a vehicle is painted for about ¼-in. all around each joint. Yet upon coming from the brazing furnace no copper is visible around the joint except for a small smooth fillet in the corner where the metal sections are joined, none whatever remaining on the adjacent surfaces.

Preparation Is Simple: No flux is used on the insecticide dispenser. Even though molten copper wets plain carbon steel easily in the controlled atmosphere furnace, best wetting action is assured here by running all steel parts through a degreaser before brazing.

After cleaning, parts are assembled for brazing. Of the various methods for applying copper to the joint—use of copper wire clips, foil bands, filings, molten spray, powder paste, electroplated coatings—the container assembly employs a combination of electroplated parts, copper wire rings and a small slug made from a short length of wire.

Since parts going through the brazing furnace are heated to 2050° F, the assemblies must be put together in such a manner that they maintain their proper relationship. Unless securely positioned, parts can slip from expansion and softening of the metal, causing a faulty assembly.

Best method of assuring maintenance of proper relationship between all parts is to use some form of mechanical locking to hold the mating parts together. Parts can be swaged, spun, staked, expanded, wedged, interlocked, screwed, riveted, pinned, spot or tack welded or otherwise secured in position mechanically.

In the insecticide container, staking and pressing are employed. Fig. 3 first step in the assembly line. Here an operator is shown staking the valve body, puncturable cap and tube assembly. The valve body (M, Fig. 2) is a steel screw machine part. The puncturable cap (G, Fig. 2) is formed from 0.005-in. steel sheet, copper plated

B&W DIRECT-FIRING PULVERIZED-COAL CIRCULATING SYSTEM

SERVICE-CHECKED on all these points

✔ SIMPLE INSTALLATION
Only one pulverizer with a single circulating line for pulverized coal required by the system.

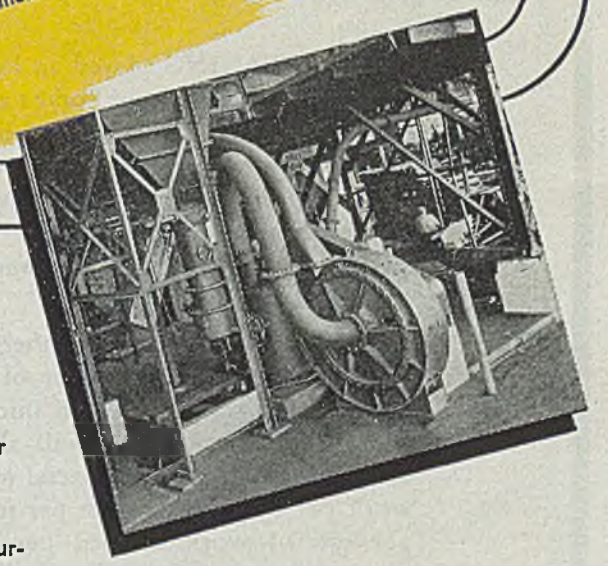
✔ SAVES FLOOR SPACE
Space at furnaces clear for product handling — pulverizer at a distance — circulating loop overhead.

✔ FLEXIBLE MULTI-FURNACE OPERATION
As many take-offs to burners as needed. Burners may be turned on and off as desired.

✔ UNIFORM FURNACE TEMPERATURE
Temperatures easily controlled, by methods similar to those used with gas and oil firing.

✔ SUSTAINED FURNACE CAPACITY
Pulverizer maintains its rated capacity in coal to the fineness required by the installation.

✔ INCREASED FURNACE OUTPUT
Existing installations show shorter heating cycles with lower fuel consumption per ton of castings.



FOR SIMPLIFIED FIRING OF METALLURGICAL FURNACES, investigate the B&W Direct-Firing Pulverized-Coal Circulating System. Its economy and efficiency have been proved on billet heating, reheating, forge, malleable-iron annealing, zinc fuming and other types of metallurgical furnaces.

This method of firing is equally applicable to other metallurgical furnaces, including ingot, bloom and billet heating furnaces; normalizing furnaces; copper, lead, and zinc melting furnaces; multiples of small units such as small forge furnaces and process heating furnaces in chemical industries.

The same B&W pulverizers, used in this system are also providing economical *direct-firing* of individual furnaces. For further details, write for Bulletin 3-333.

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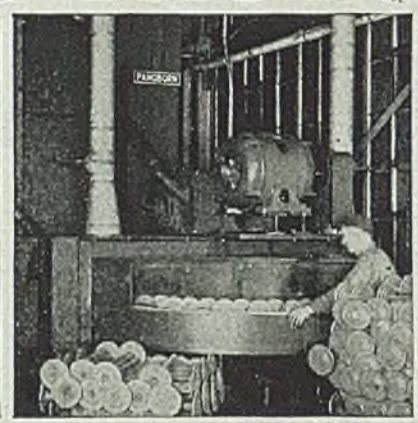
ROTOBLAST* BARREL



ROTOBLAST* TABLE

SPEED lowers cost—increases tonnage—saves abrasive and power

BLAST CLEANING played an important part in the successful production of bombs and shells and tanks and ships for this war. The main objective of the metal industry has been to *speed* production of *better* products. Pangborn engineers provided both Air and Airless equipment to do this job. Industry uses these modern machines to increase speed as much as 300 percent over previous records.

For post-war requirements, other considerations, not so essential as speed, will be of primary interest to businessmen who again will think in terms of costs and profit. Investigation will show that Pangborn Barrels and Tables and Special Machines clean more work per hour at less cost per ton; use less abrasive per ton of work cleaned because pneumatic and gravity operation, featured only by Pangborn, insures continuing re-use of steel shot or grit without waste until every particle is completely worn away; few operating parts and direct transmission of power insure lowest electrical consumption; and man-power is at minimum because one operator does all the work.

For detailed description and data—write for Bulletins.

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PANGBORN

WORLD'S LARGEST MANUFACTURER OF DUST COLLECTING AND BLAST CLEANING EQUIPMENT

PANGBORN CORPORATION • HAGERSTOWN, MD.

The cap and the copper plated steel tube (F, Fig. 2) are fitted into the bottom of the valve body. Dies in the staking press then upset metal of the valve body at three points around the cap and tube, securely locking the assembly.

When the loaded dispenser is to be used, the needle valve controlling release of the contents first punctures a tiny hole in this cap. But previously the contents have not had an opportunity to escape because of the positive seal provided by the brazed-on cap. The insecticides (DDT or pyrethrum, with other components) are dissolved in liquid Freon which turns to gas at room temperatures and pressures. It is the pressure from the Freon that discharges the contents.

At the same time, high temperature from a nearby fire, etc., might cause the pressure in the dispenser to build up to a value where it would explode. But provision for a safety blowout is incorporated at C, Fig. 1, where a small pierced hole is sealed with a low-melting-point alloy for just this purpose.

Fitting Subassemblies: Fig. 4 shows the start of a double line feeding the final joining station at Fig. 5. The dispenser is charged through a small screw-machine part fitted into the bottom half of the container as shown at A, Fig. 1. This fitting is also seen at D, Fig. 2.

At the near station in Fig. 4, this half fitting has the copper ring (E, Fig. 2) slipped over it and then is pressed and staked into the lower half of the container (B, Fig. 2).

At the far station, another operator is placing the valve and tube asssembly in the upper half of the container, where it also is securely locked by pressing and staking dies. This operator also slips the copper ring C, Fig. 2, just inside the mouth of the open end of the shell half where it will be engaged by a shoulder on the mating half as the final assembly is made. Each of the two operators in Fig. 4 places the subassemblies she has made on one of a set of two double decked troughs down which the sections roll to the operator in Fig. 5.

Final Assembly: The two halves of the shell now have all fittings attached and are ready to be fitted together to form the container. This is done at the station shown in Fig. 5 where the two halves are pressed together under some 3000 lb pressure, assuring a tight metal-to-metal fit throughout the entire body joint. A shoulder provided on the turned in portion of the lower shell (see B and B, Figs. 1 and 2) engages the ring made of 0.050-in. copper wire as the two shell halves come together to assure that the brazing copper is properly placed so it will melt and run *into* the joint in the furnace. A wire rack like this seen in extreme foreground, Fig. 5, holds the containers upright while going through the furnace.

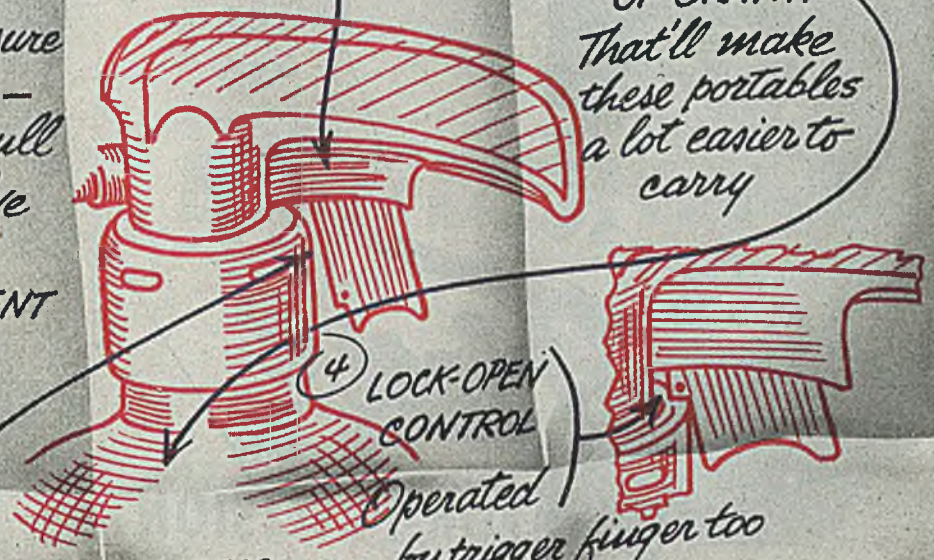
Just before being placed in the furnace, a small slug (K, Fig. 2) made from a $\frac{3}{32}$-in. length of 0.032-in. diameter cop-

TRIGGER-FINGER CONTROL

(For 10, 15 and 20-lb. Fire Extinguishers)

(1) SINGLE-FINGER OPERATION
Balanced pressure does the trick—
Easy trigger pull opens the valve

(2) LOW CENTER OF GRAVITY
That'll make these portables a lot easier to carry



(3) INTERMITTENT OR CONTINUOUS CONTROL

(4) LOCK-OPEN CONTROL
Operated by trigger finger too

(5) NON-JAMMING LOCKING-PIN
Can't get bent over

(6) VISIBLE SEAL WIRE makes inspection easy

(7) IMPROVED RECOIL OUTLET

(8) RECHARGING WITHOUT REPLACEMENT PARTS
Simplifies putting extinguisher back in working condition after use.

(9) HYDROSTATIC TEST WHEN NECESSARY without devalving

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10-, 15-, and 20-pound extinguishers with this new valve will be ready for delivery October 1st. Place your order now.

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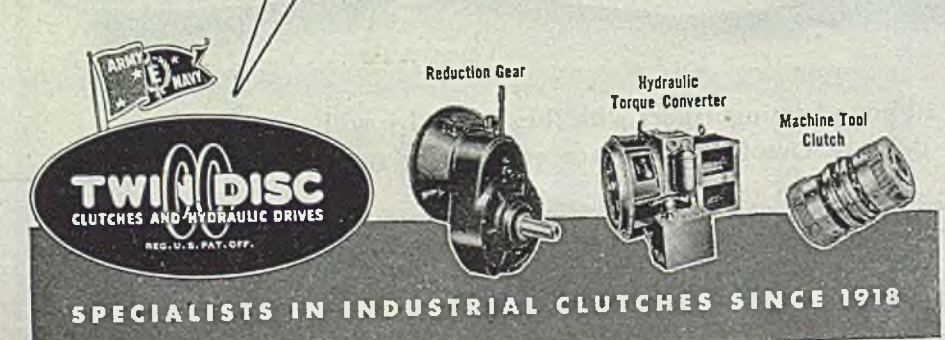

valve body to supply additional copper to be sure that a good seal is formed by the cap. Although the cap itself is copper plated, this slight additional copper is supplied as a further precaution.

Also a copper ring made of 0.032-in. diameter wire (H, Fig. 2) is clipped around the valve body next to the shell.

Five Joints Brazed Simultaneously: Now we have the copper ring E (of 0.032-in. diameter copper wire) and fitting D mounted in lower end of (all Fig. 2), to make the joint shown in section at A, Fig. 1. Copper for the main joint at B, Fig. 1, is supplied by the large ring C, Fig. 2.

Copper to join the valve body to the container shell is supplied by ring Fig. 2. Material to seal the cap in the valve is supplied by the plating on the cap and the slug K, Fig 2. Copper to seal the tube into the valve body and shell is furnished by the plating on the tube as well as from the small slug.

A tray 28 in. long and 18 in. wide holds 50 containers. The Chicago plant of Salkover Metal Processing has two batch type furnaces and a large continuous unit. All three are electrically heated, were furnished by General Electric Co. who also supplied the controlled atmosphere equipment used with them.

Batch type furnaces have doors 10 in. high and 18 in. wide. Heating chamber is 42 in. long, 18 in. wide. Cooling chamber is separated from heating chamber by a door which operates independently from the front door. This chamber is 96 in. long so it can accommodate three trays at one time. This is essential for while it only takes 10 min to get a loaded tray up to a temperature of 2050° F, it requires 30 min to cool it down to the desired discharge temperature of 200—250° F.

Sequence of tray movement is as follows, starting with a loaded furnace holding one tray in heating chamber and three trays in cooling chamber: Operator removes rear tray in cooling chamber, pulls other two to the back of this zone. Tray in heating chamber is then pushed into cooling chamber Fig. 6 and a new tray placed in the heating chamber. As soon as new work has been heated, the cycle of movement is repeated.

Controlled Atmosphere: Each batch furnace is rated 50 kw; both heating and cooling zones being supplied with a controlled atmosphere obtained by partial combustion of city gas rated 800 Btu per cu ft. After cracking at 2000° F the gas is run over a catalyst, producing an atmosphere analyzing about 76 per cent nitrogen, 14 per cent hydrogen with some carbon monoxide, carbon dioxide and methane present, but no oxygen or water vapor.

Each of these furnaces easily handles an output of 200 lb of work per hr and is served by an individual atmosphere unit that supplies 200 cu ft per

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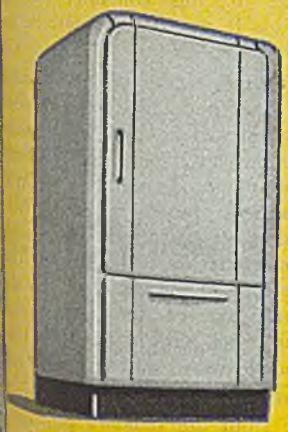

Bonderizing conquers rust on automobiles, household appliances, architectural sheet metal and countless other commercial and industrial products! When buyers start shopping for extra value, Bonderizing will supply that added durability and long-lived finish quality that will be a definite aid in making sales.

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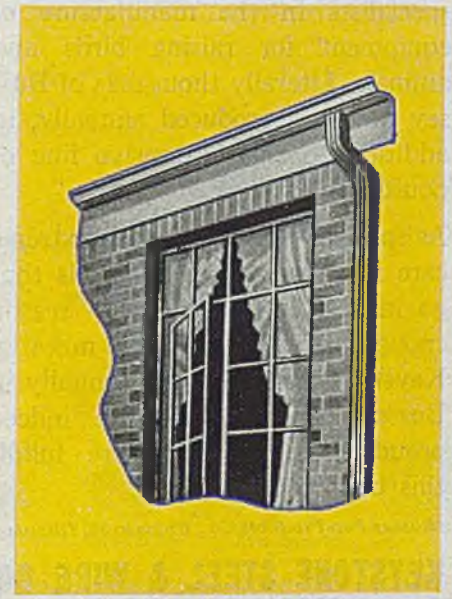

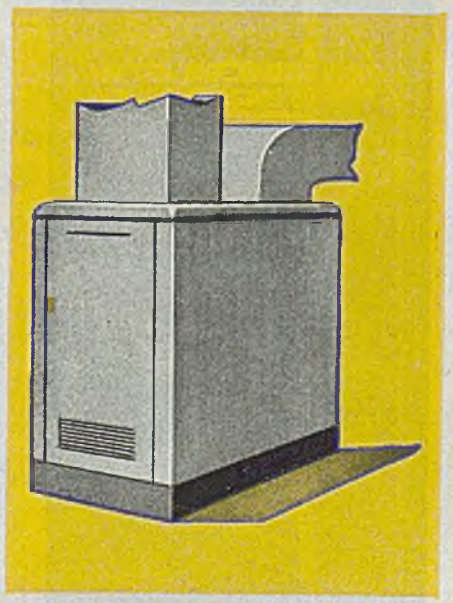

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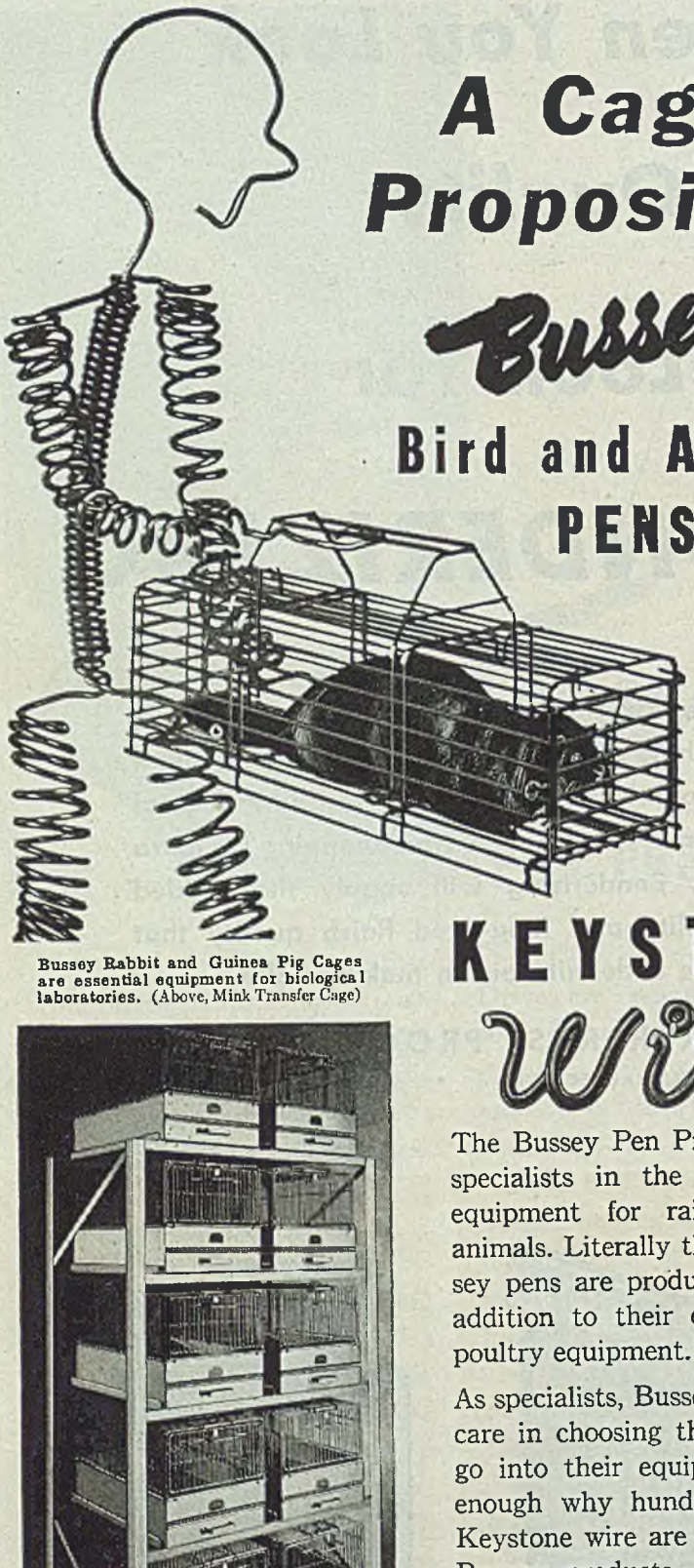

Bussey Rabbit and Guinea Pig Cages are essential equipment for biological laboratories. (Above, Mink Transfer Cage)

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KEYSTONE Wire

The Bussey Pen Products folks are specialists in the manufacture of equipment for raising birds and animals. Literally thousands of Bussey pens are produced annually, in addition to their extensive line of poultry equipment.

As specialists, Bussey's take extreme care in choosing the materials that go into their equipment — reason enough why hundreds of miles of Keystone wire are used annually in Bussey products. We are indeed proud that Keystone wire fulfills this important role.

*Bussey Pen Products Co., Chicago 38, Illinois

KEYSTONE STEEL & WIRE CO.
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Special Analysis Wire for All Industrial Uses

SAMSON SPRING WIRE
KEYSTONE STEEL & WIRE CO. PEORIA, ILL.

Coppered, Tinned, Annealed, Galvanized

of gas mixture for protecting the work.

Continuous Furnace: Figs. 7 and 8 show entrance and exit ends of the continuous unit. Rated 100 kw, this furnace has a chain mesh conveyor belt 20 in. wide. Door opening is 12 in. high, 20 in. wide. Heating chamber is 10 ft long, cooling zone 28 ft long.

Chain speeds are adjustable from 15 to 60 ft per hour to handle various types of work. Heavy sections like those shown being loaded in Fig. 7 require more heating and cooling time because of the larger mass of metal involved. Light assemblies such as the radio tuning condenser frames shown coming off the conveyor in Fig. 8 require little time as they come up to heat rapidly.

The continuous furnace easily handles 400 lb of work per hour. Due to the fact that entrance and exit openings allow escape of considerable amounts of controlled atmosphere, this furnace requires a much larger gas converter than the smaller batch units. Seen at the left in Fig. 8, this converter can supply 2000 cu ft per hr of controlled atmosphere.

All three of the standard atmosphere generators and all three furnaces are interconnected so that any combination can be utilized increasing the flexibility of the plant. In addition a Drycolene atmosphere generator is available to furnish a special atmosphere where high carbon parts are to be brazed. The gas generator is necessary to avoid decarburization of the surface of high carbon steel parts — and the resultant tendency toward softening of the surface.

Main difference between the atmosphere from the standard generators and the Drycolene unit is that the latter has no carbon dioxide. It analyzes approximately 76 per cent nitrogen, 14 per cent hydrogen, with some carbon monoxide and methane, but no oxygen or water vapor. After cracking the city gas at 2000° F, it is passed over hot charcoal which effectively removes any trace of carbon dioxide that might cause decarburization.

Bright Satin Finish: One of the main features of copper brazing in a controlled atmosphere furnace is that the work comes from the furnace with a beautiful bright satin finish. All oxide coatings along with all dust, finger marks, and the like are completely removed. (Of course heavy oxide coatings must be removed prior to brazing, by pickling or a similar method.) The result is a finish that is exceptionally pleasing and clean in appearance.

At the same time careful placement of the copper brazing material will result in all of it being drawn into the joint by capillary attraction, leaving no copper to mar surfaces near the joint.

This desired capillary action depends upon the copper wetting the metal assured by use of proper flux in ordinary brazing work where a gas flame or carbon resistor blocks are employed to heat the work. Requirements of such a flux appear to be the ability to absor

This Grinder Went to College

DoALL has been educated to do more regular run-of-mill surface grinding. It has been designed to do all kinds of precision tool room and laboratory work.

Each DoALL has a diploma—its own tag and test bar, giving in micro inches the finish it will produce.

Its weight (2200 pounds, about twice that of other tool room grinders) absorbs vibration and provides a pillar of strength for the scientifically balanced mechanism. Knee room enables operator to sit and watch the work at close range. In a very short time, even a beginner can turn out perfect finishes.

Think of this—one small manufacturer used a DoALL for 58 separate grinding operations on one product.

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or dissolve off the oxide of the metal being joined, the ability to float these oxides up through the brazing metal, combined with a slight etching action on the base metal.

In electric furnace brazing these requirements are met by use of the proper controlled atmosphere. A slightly reducing atmosphere removes light oxides easily, at the same time providing a etching action. Result is that the copper brazing material flows readily and is drawn throughout all portions of the joint by capillary action. In fact, Mr. Jacobsmeyer states the molten copper will travel through joints a distance of to 6 in. Thus long joints or mating surfaces that are not readily accessible can be brazed with assurance of a good joint.

Often inaccessible mating surfaces have the copper supplied where wanted by cutting a grove in one of the surfaces so that the copper wire can be embedded in the groove which is made just deep enough to receive the wire. This method of applying the brazing material to the joint assures molten metal where wanted and prevents any possibility of discoloring the work from excess copper flowing on surfaces near the joint.

Copper Or Brass: Some engineers prefer to use brass wire as the brazing material in the controlled atmosphere furnace because it melts at a somewhat lower temperature and thus results in less power consumption in heating and longer furnace life.

However, brass usually involves some difficulties from the fact that a flux coating is usually required to help it wet and flow over the surfaces to be joined. Also there is a tendency for the melting point to vary due to distillation and subsequent loss of the zinc from the brass as it comes up to temperature.

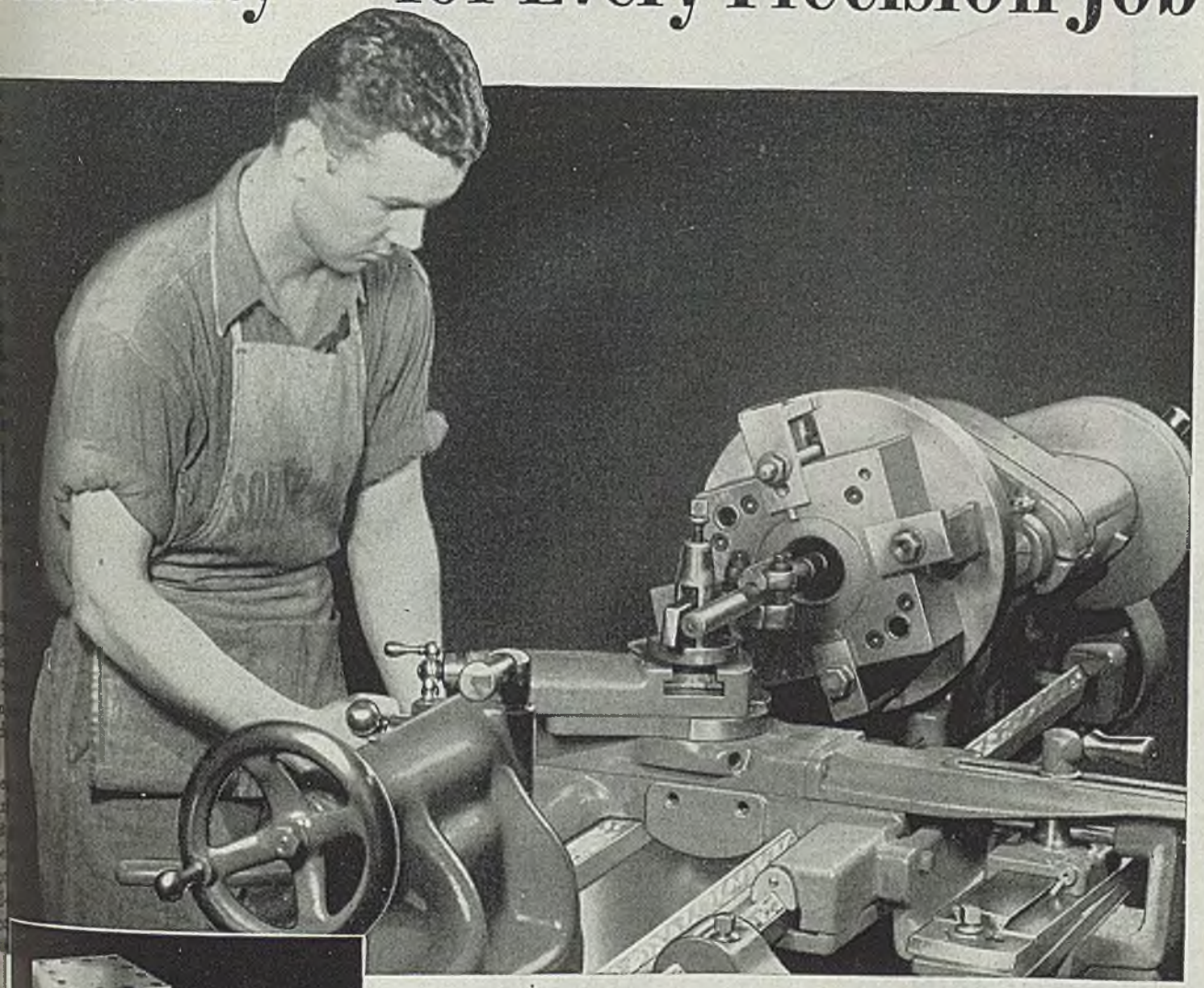
Braze Any Metal: Parts made of almost any ferrous or nonferrous metal can be brazed in the controlled atmosphere furnace provided caution is taken to see that the brazing metal is one which will melt and flow at a temperature appreciably lower than that of the metal parts being joined; will wet the base metal; and is properly placed so it can creep throughout all portions of the joint.

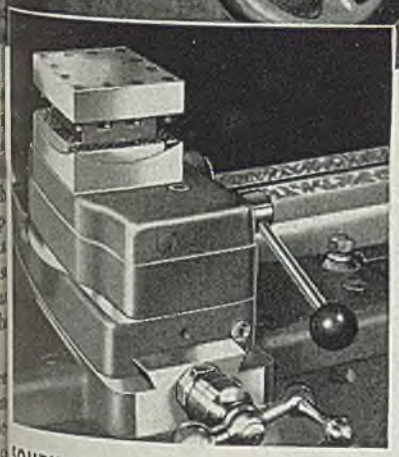
Pure copper wets low carbon steel easily, so that is the combination employed in the insecticide container described here — and in most furnace brazing. Steels containing chromium, silicon, vanadium, aluminum and manganese tend to form oxides which can only be reduced by use of the proper dew point impurities in the furnace atmosphere aiding formation of these oxides and preventing their reduction by the controlled atmosphere.

Nickel, on the other hand, has a great affinity for copper and thus tends to facilitate the required wetting action. So it is a good element to include in steel wherever possible.

Safety "Plug": Coming from the brazing furnace at 2000-2050° F,

Versatility---for Every Precision Job





SOUTH BEND ATTACHMENTS BROADEN THE SCOPE OF YOUR LATHE WORK

A complete line of attachments and accessories simplifies tooling South Bend Lathes for many special and unusual kinds of precision work. They save time and effort, often eliminate the delay and expense of special fixtures, and greatly broaden the scope of your lathe work. Write for Catalog 77-R in which all of these attachments are illustrated and described.

The time-saving versatility which enables South Bend Lathes to handle so many exacting precision operations in essential war industries will be a pertinent profit-making factor when normal production is resumed. The ease and speed with which the lathe can be changed from one set-up to another, and the special attachments available to broaden the range of work, save time and reduce labor costs for the plant that has a variety of precision lathe operations to perform.

South Bend Lathes have a wide range of spindle speeds and power feeds. Full quick change gear mechanism permits instant selection of any thread cutting feed, power turning feed, or power facing-feed. Convenient, quick acting controls and easy reading graduations contribute to smooth lathe operation and efficiency.

South Bend Engine Lathes and Toolroom Lathes are made in five sizes: 9″, 10″, 13″, 14½″, and 16″ swings. Precision Turret Lathes are available in two sizes: ½″ and 1″ collet capacity. Write for new Catalog 100-D giving full descriptions of all lathes.

SOUTH BEND LATHE WORKS

429 EAST MADISON STREET • SOUTH BEND 22, INDIANA • *LATHE BUILDERS FOR 38 YEARS*

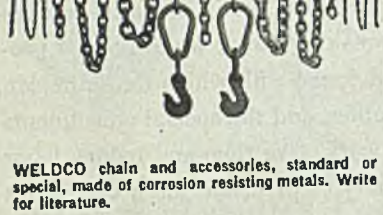
What have you that's Corroding?

ARMY E NAVY

Consult Weldco *Specialists* ···*it will pay you*

Replacing equipment, parts, and products which have untimely failures due to corrosion is The Youngstown Welding and Engineering Company's job. A large engineering staff experienced with corrosion resisting metals, a large factory in which to fabricate and build equipment make the logical combination for correcting costly failures due to corrosion. Write today regarding standard or special requirements.

CHAIN



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STEAM JET

Heats, agitates, and circulates liquid in tanks and vats — resists corrosion, breakproof, low cost, pays for itself quickly. Folder available.

SPECIAL EQUIPMENT

Tanks, kettles, agitators, and miscellaneous processing equipment which resist corrosion. Tailor-made for you.

TUBING

Tubing and fittings in standard or special sizes, 3" I. P. S. and larger of alloy metals . . . large or small quantities. Folder is available.

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insecticide dispensers are allowed to cool to nearly room temperature. Then they go to the final station where the small pierced hole (seen at C, Fig. 1) is sealed by filling it with a low melting point alloy. Electric soldering irons are employed to apply the fusible alloy which has a melting point of 201° F.

Purpose of this safety "plug" is to provide a means for releasing the pressure in the container if for some reason or other its temperature should rise above the 201° F. Such high temperatures would volatize the Freon in the container and cause excessive pressure to be built up with the possibility of a dangerous explosion ensuing, unless released. Other types of insecticide containers employ extremely thin pressure disks designed to rupture as dangerous pressures are developed.

Postwar Redesign: After the war when they become available for civilian use insecticide dispensers like those shown here are expected to find an extremely large market because of the greatly improved effectiveness of the new insecticides and this method of dispersing them in the air.

To lower the cost of the container, it is expected that the design will be changed somewhat, although furnace brazing will still be the preferred method of applying the fittings. It is believed possible to manufacture the container charged with enough insecticide to take care of an average size house for a year so that it can be sold at a price around $2 each. Sales are expected to run into huge figures.

Similar enlarged uses of copper brazing in the controlled atmosphere furnace are predicted by Mr. Salkover whose Chicago and New York plants have already turned out huge quantities of mechanical parts for every branch of the armed forces. His company has a War Department Citation for work done in production of tank track links. Many parts for the Chemical Warfare Section have also been produced.

R. J. Rainier, manager of the New York plant, reports wide use of furnace brazing in the assembly there of many thousand insecticide containers differing only slightly in design from those described here.

Locomotive Suited for Yard or Road Service

A diesel-electric locomotive, suitable both for heavy yard duty and road service is rated at 600 hp, weighs 120 tons, and has a top speed of 55 mph. For use in yard switching, scheduled road hauls, and transfer work, it is adequately powered for passenger-station switching and light-traffic passenger service. It is said to be particularly adapted to freight and passenger service on railroad lines where roadbed and rail weight require limited axle loadings. The four motors and generators making up the electric drive were designed at General Electric's Erie Works.

HELPFUL LITERATURE

Locking Fastener

...mons Fastener Div., Simmons Machine ... Corp.—4-page illustrated bulletin on ...g-Lock Fasteners explains installation pro... and applications of this fastener which is ...djusting and requires no mating parts. ...adaptable for blind hole applications, as ...s for standard assembly uses.

Bronze Bars

...ck Bronze Corp.—12-page illustrated ... describes and lists available sizes of ...ed bars made from Shook 664 phosphor ... bearing alloy. Over 400 stock sizes are ...ed. Listings are given of solid machine ... bars, also.

Wire-Wound Resistors

...cross Mfg. Co.—24-page illustrated bul... contains engineering and application ... Akra-Ohm accurate, fixed wire-wound ... of resistors. Information is presented to ...selection and use of proper resistors in all ... of equipment. Data are included on al... resistance, mountings, dimensions, sealing, ... dissipation, moisture and fungus proofing ...minals.

Magnetic Chuck Blocks

...ge Scherr Co.—8-page illustrated folder ... "Speed Surface Grinding Set-ups" ex... use of Magne-Blox in conjunction with ... chucks to effect difficult holding ...ons in grinding and machining opera-

Carburizing Furnaces

... Rockwell Co.—4-page illustrated bul... No. 412 gives capacities and dimensions ... gas fired or electric rotary carburizing ... for stock such as pins, cams, washers, ... rollers, balls, bolts, rings and other ...parts.

Shaper Planers

...d Machine Tool Co.—4-page illus... bulletin No. 445 describes and lists fea... and advantages of Hy-Draulic shaper... which have hydraulic drive, hydraulic ... constant speed motor. Specifications ... for machines ranging from 42 to ... sizes.

Aluminum Stock

...ds Metals Co.—12-page illustrated ... bulletin No. 31-A covers definitions, ...turing methods, identification, sizes, al... tempers, physical property specifica... general engineering data on aluminum ... and bar stock.

Precision Lathes

... Bend Lathe Works—36-page illustra... No. G-9 shows in full color and ... line of 9-inch engine and toolroom ... Also covered is 9-inch precision turret ... which has ½-inch collet capacity. These ... are adaptable for small parts pro... repair, maintenance and laboratory ... lathe tools, accessories, motors, controls ...ments are described.

Electric Hoists

...ing Chain & Block Corp.—12-page ... bulletin No. 1004 explains flexible ...struction hoisting plan and shows de... hoist, hoisting mechanism, hook and ...sembly, motor and control units. Dimen... and typical drawings of combined units ...luded.

Carbide Tipped Tools

...-Cut Tool Co.—38-page illustrated ... No. R-10 describes complete line of ... tipped cutting tools, including end ... milling cutters, reamers, drills, counter... lathe centers, router bits, boring tools, ...ers and special tools. Dimensions, appli... and list prices are given for each tool.

11. Portable Sander

Sterling Tool Products Co.—4-page illustrated bulletin describes Sterling model E air-driven Speed-Bloc portable sander for sanding, lapping, polishing and other operations on wood, metal or plastic flat or curved surfaces. Design, construction and applications of this versatile tool are shown.

12. Special Shape Turning

Monarch Machine Tool Co.—20-page illustrated booklet "The Shapemaster" describes this unit for turning, boring and facing various types of multisided shapes in irregular contour pieces. Machine consists of Monarch lathe handling work up to 20 inches in diameter fitted with Shapemaster mechanism in place of regular compound rest.

13. Pneumatic Construction Tools

Ingersoll-Rand Co.—Illustrated folder "Air-Operated Tools for Maintenance, Construction, Demolition" presents data on line of pneumatic tools for all kinds of construction and repair work. Included are pavement breakers, pile drivers, drills, reamers, hammers, impact wrenches, saws, borers, grinders, hoists and other equipment.

14. Brake Intensifier

Pesco Products Co.—4-page illustrated folder discusses Univac aircraft brake intensifier to provide fast braking action and low pedal pressures for power braking on airplanes. Diagrams show typical installation and dimensional view.

15. Materials Handling

Revolvator Co.—4-page illustrated bulletin No. 144 contains brief descriptions of complete line of portable and stationary elevators, lift trucks and other materials handling equipment.

16. Industrial Furnaces

Surface Combustion—Two illustrated bulletins, Form SC-117 and Form SC-118, are entitled "Surface Combustion Furnaces in the Steel Wire Industry" and "Applied Gas Chemistry of Prepared Atmospheres in Surface Combustion Furnaces." These bulletins are written for interested parties in metal-producing and metal-working industries.

17. Air Compressors

Sullivan Machinery Co.—8-page illustrated bulletin No. A43R-3044 describes Industrial-Air heavy duty air compressors which feature 100 per cent force feed lubrication and dual-cushion valves.

18. Boring Machines

Stokerunit Corp.—12-page illustrated bulletin and three 2-page inserts present engineering and application data on Simplex unit type precision boring machines. These machines are available in single end, double end, three-way, four-way, knee and angular types. They are adaptable for wide range of precision boring operations and especially suited for production operations.

19. Mounted Abrasive Wheels

Sterling Grinding Wheel Div.—4-page illustrated bulletin on Stermount abrasive wheels with detachable spindles gives dimensions, shapes and list prices of wide range of vitrified and resinoid bonded wheels and shapes.

20. High Strength Steels

Republic Steel Corp.—4-page illustrated folder No. 434 entitled "3 High Strength Steels" gives general characteristics, chemical compositions and physical properties of Republic Aldecor, Cor-Ten and Double Strength steels.

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21. Flexible Shaft Machines

Pratt & Whitney Div., Niles-Bement-Pond Co.—50-page illustrated booklet presents data on line of Kellerflex flexible shaft machines and accessories. Details of each machine and many attachments are given and specifications are included.

22. Resistance Welding

Progressive Welder Co.—60-page illustrated booklet No. WP 44 presents data on portable gun welding, stationary spot welding, seam welding, special uses and machines, and fixtures. Equipment is shown in use and many applications are portrayed.

23. Track

Pressed Steel Car Co.—12-page illustrated catalog No. 72-L describes and gives specifications on rail sections, steel ties, track accessories, portable track joints, switches, ball bearing turntables, track tools, car and locomotive replacers.

24. Atmosphere Furnaces

Lithium Co.—Three bulletins, "Lithium Metallic Vapor Atmosphere Furnaces—Principles and Data", "A Miracle of Chemistry!" and "Lithco Atmosphere Furnaces" and technical reprint "Engineering Applications of Lithium" discuss methods of heat treating. Advantages and applications are set forth.

25. Multiple & Progressive Honing

Micromatic Hone Corp.—Illustrated folder presents information on Micromatic multiple spindle vertical Hydrohoner featuring Micro-dial feed control and automatic rotary indexing of work to provide high speed multiple or progressive honing within uniform size limits of 0.0003 inch.

26. Acidproof Cements

Quigley Co.—8-page illustrated bulletin No. A.P. 122 lists applications, instruction for use and characteristics of acidproof cements for bonding and repairing acid-resisting masonry structures. Other products are described briefly.

27. Radiant Heat Lamps

Westinghouse Electric Corp.—12-page illustrated bulletin No. A-3817 describes radiant heat drying lamps which are recommended for drying, baking and heating processes. Radiant heat is explained and advantages of low cost, flexibility, ease of control and reduced space requirements are covered.

28. Sander Head

Vonnegut Moulder Corp.—8-page bulletin No. 32 contains instructions for loading, setting up and operating the new 32-brush Vonnegut brush-packed sander head which fits on practically any grinding or polishing machine.

29. Valve-Pump Unit

Vickers Inc.—8-page illustrated bulletin No. 38-14 describes double pump and combination valve unit which is suited to many types of hydraulic presses, die casting machines, plastic molding machines, hydraulic clamping devices and machine tools which use traverse and feed cycles of operation.

30. Salt Bath Starting Coil

Upton Electric Furnace Div.—1-page data sheet No. U-212 explains function and operations of new electric salt bath furnace coil which is designed to unfreeze salt baths for rapid initial starting.

31. Staples

E. H. Titchener & Co.—4-page illustrated bulletin entitled "Staples" describes available sizes, types and wire compositions for fastening applications. Also offered is engineering and production service for special staples.

32. Stainless Steel Data

Rustless Iron & Steel Corp.—84-page illustrated engineering manual entitled "Machining of Stainless Steel" is second in series of the Rustless Library of Stainless Steel Information. Data on grades and rates, machine tool equipment required, machining operations, cutting fluids and tool compositions; conversion tables and other pertinent information are given.

33. Shankless Drills

Republic Drill & Tool Co.—44-page illustrated price and technical data manual No. 44 contains full information and data on shankless and All-Flute high speed roll forged drills and drill drivers. Manufacturing methods and facilities of company are described.

34. Motor Lubrication

Reliance Electric & Engineering Co. — 4-page illustrated instruction sheet No. 3002 covers grease lubrication of anti-friction bearings in Reliance alternating and direct current motors, variable speed V-S drives and motor-generator sets.

35. Tachometers

Reeves Pulley Co.—8-page illustrated bulletin entitled "Tachometers" describes mechanical and electrical types for use with company's variable speed drives. These units provide operators of equipment with visible indication for exact speed adjustability.

36. Glassware Heaters

Precision Scientific Co.—4-page illustrated folder No. HP-1850 describes Precision safety heaters for heating complex glassware setups involving distillation columns, flasks, receivers, condensers and other glassware. It includes specifications and time-temperature chart.

37. Grinding Wheels

Robertson Mfg. Co. — 24-page illustrated pocket size manual "How to Buy Production Time" gives principle, examples of use, operating directions, specifications and other information on Cool-Cut grinding wheels.

38. Thread-Milling Cutters

Plan-O-Mill Corp.—Illustrated folder describes high speed steel and carbide thread milling cutters in both shell and shank types. They are furnished either ground or unground with straight or spiral flutes and with or without provision for Higbee cut.

39. Aircraft Equipment

Pesco Products Co., Div. of Borg-Warner—4-page illustrated leaflet No. 8 describes pressure loaded engine driven hydraulic pumps, motor driven and hand operated hydraulic pumps; equalizing flow dividers; hydraulic control valves; engine and motor driven fuel pumps; booster, air and supercharging pumps; air system valves; oil separators and brake intensifiers.

40. Diesel-Electric Locomotives

H. K. Porter Co.—44-page illustrated catalog No. L-45-A covers line of diesel-electric locomotives, standard accessories and equipment. Also included are diesel-mechanical, gasoline, fireless steam and foreign service locomotives and speical designs for unusual requirements.

41. Straight Side Presses

Thomas Machine Mfg. Co.—4-page illustrated bulletin No. 307 presents specifications of line of straight side presses. Machines with capacities of 75, 100 and 500 tons are shown in single and double crank styles.

42. Alloy Iron Castings

Meehanite Research Institute of America Inc.—4-page illustrated bulletin No. 21 shows typical applications of various special heat resisting Meehanite castings and tabulates property data.

43. Tool Room Furnaces

Surface Combustion—4-page illustrated bulletin "Tool Room Flexibility with Standard Rated Surface Combustion Furnaces" describes various equipment which can be utilized for tool steel heat treating. Engineering data tabulates composition and heat treatment of tool steels.

44. Temperature Signals

Tempil Corp.—1-page monthly engineering publication "Tempil Topics" deals with applications of temperature signalling products which are available in stick or crayon, pellet and liquid forms. Will be sent to those interested in applications of temperature indicating mate-

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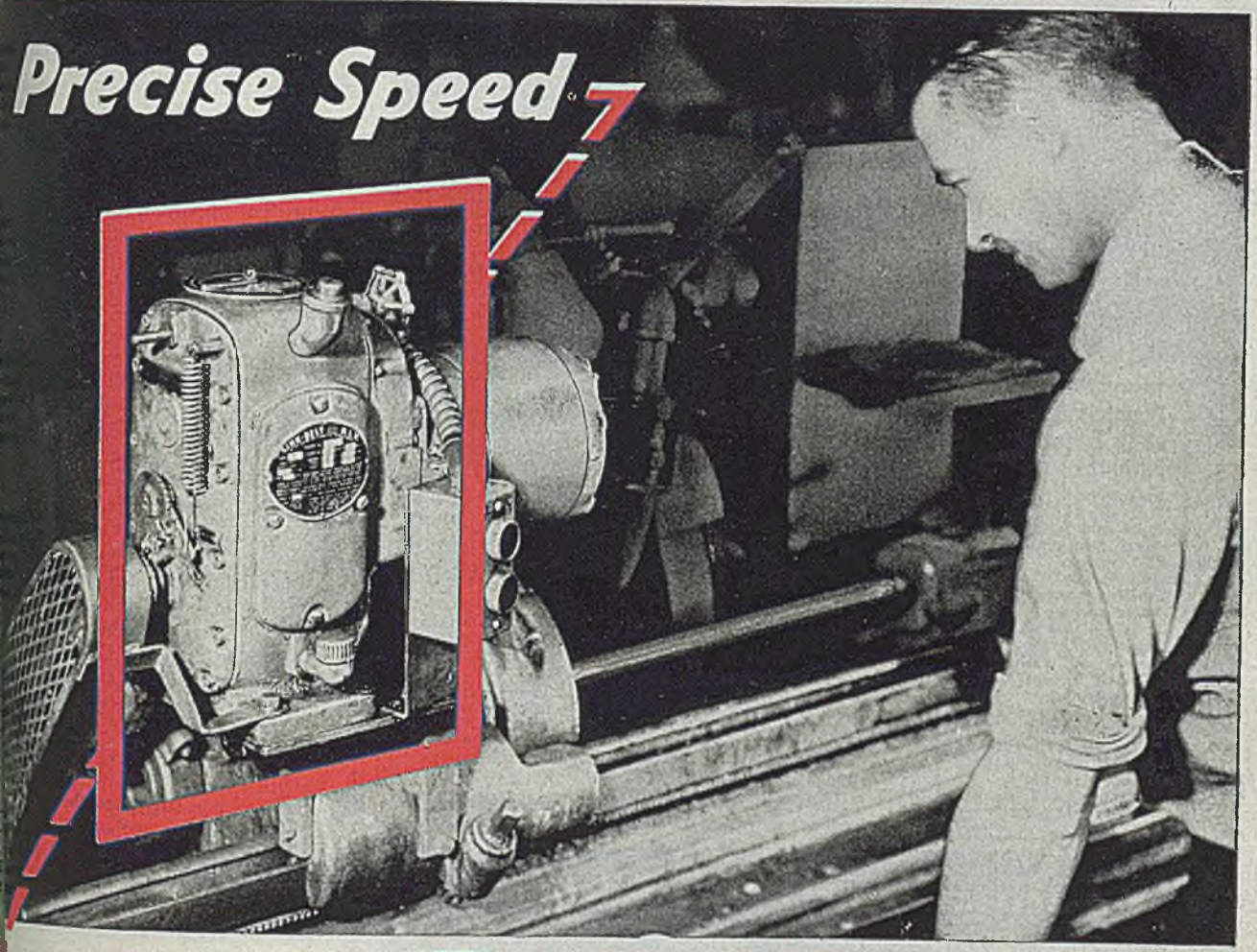

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Get any speed instantly and maintain it accurately with this positive Infinitely Variable speed control unit. Cutaway view shows unique chain transmission—tooth-to-tooth contact—no belts —no slip! Get Book 1874.

In a large gasoline engine manufacturing plant, cylindrical grinding machines are called upon to finish grind numerous parts of various diameters. Best results are obtained when the speed of the work bears the ideal relation to the speed of the grinding wheel. With cone pulley drive to the workhead, only approximate speeds could be obtained, so a Link-Belt P. I. V. gear speed variator was installed on the grinding machine. This device permits infinite variation of the working speed, adjustments are made instantly while the machine is running, and when set, the adjusted speed remains constant, indefinitely.

With speeds regulated to the fraction of a revolution per minute, total operating time is reduced, correct finish is assured, spoilage practically eliminated.

The self-contained, all-metal, P. I. V. Gear is proving indispensable in countless manufacturing processes, where accurate control of speeds affects the final results. Book 1874 will explain how *you* can use the P. I. V. to advantage in *your* plant. Send for it, today!

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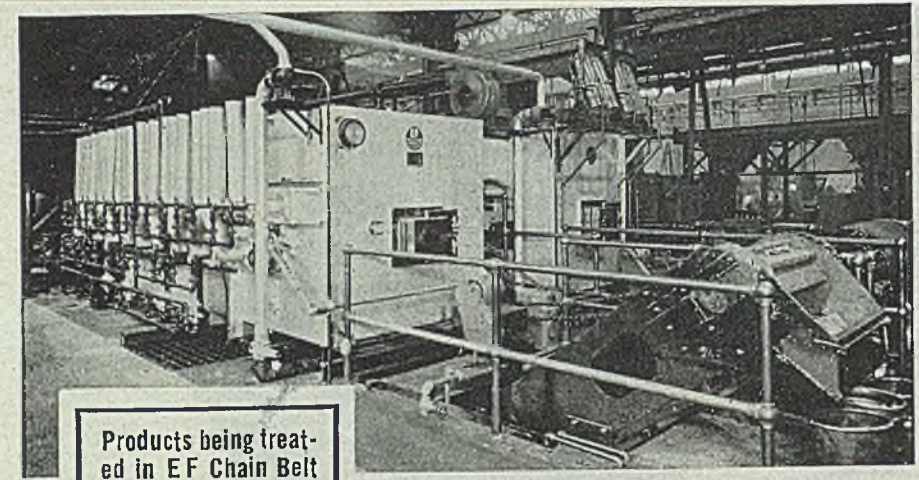

Products being treated in EF Chain Belt Furnaces, include:

Sprockets
Cap screws
Bolts and nuts
Gears and pinions
Flat springs
Coil springs
Small forgings
Valve springs
Spring plates
Tractor links
Rivets and washers
Wrench & tool parts
Bearing parts —cups and cones
Machine gun cartridge clips
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Automotive parts
Rock bits, and many other products

For Hardening Small Parts

175 to 2000 lbs. per hour

Uniformly—Scale-Free—Continuously

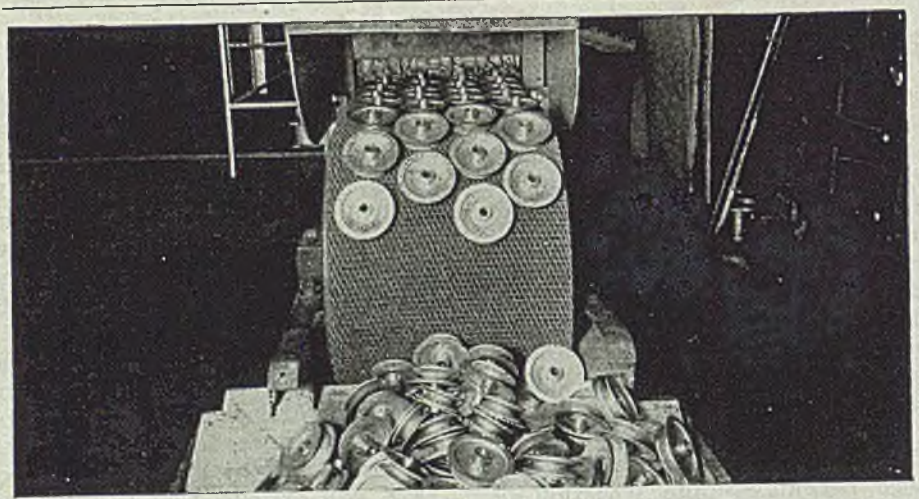
The above gas fired radiant tube chain belt furnace is one of three we installed in one plant. Hundreds are in operation handling products such as listed at left. We build them for gas, oil or electrically heated.

The EF chain belt conveyor type furnace is one of the most satisfactory general purpose furnaces built for the continuous, uniform, economical production heat treatment of small and medium size products. We will be glad to send complete data on these and other types we build.

Send for circulars showing the chain belt and other types of EF production furnaces

The Electric Furnace Co., Salem, Ohio

Gas Fired, Oil Fired and Electric Furnaces---For Any Process, Product or Production



The Completed Assemblies are Discharged

Securely Joined, Bright, Continuously

. . . From EF Brazing Furnaces

Aluminum, brass or steel products ranging in size from small intricate assemblies weighing a fraction of an ounce up to large assemblies weighing several pounds are being neatly and securely joined in EF continuous and batch type brazing and soldering furnaces.

Strong, leak-proof joints are made and the completed units are discharged from the furnace—clean and bright. Any number of joints in the same product or any number of pieces can be joined at one time.

Investigate EF Furnaces for Joining Your Aluminum, Brass, Copper or Steel Parts

Send for printed matter showing various types of EF Brazing Furnaces.

The Electric Furnace Co., Salem, Ohio

Gas Fired, Oil Fired and Electric Furnaces---For Any Process, Product or Production

Guns "Canned"

(*Concluded from Page 113*)

hauling and reapplying preservatives. Since conventional storage requires this be done every year or so and since the new container is expected to be good for 50 years or more, this development presents an important advance in storage methods. Of course, the same procedure is suitable for open-field storage of presses, machine tools, and other plant equipment for similar extended periods.

Significance of the new container is that the original type made of ½-in. thick steel plates resulted in an extremely heavy structure, necessitated by lack of any breathing facility such as is incorporated in the new container. Being hermetically sealed, the original design required the use of the heavy plate to resist expansion and contraction of the gas in the container, as each change in temperature and humidity resulted in an increase or decrease in pressure exerted against the walls of the container.

By providing the "breather" for use in the new units, air is expelled or sucked in with temperature and humidity changes so the extremely light and inexpensive aluminum sheet construction is entirely suitable.

It has been suggested that this method of open-field storage could well be utilized to preserve much of our special machine tools and other production for practically nothing else but of immense value in a national emergency.

New Shock Absorbers Tested on Freight Cars

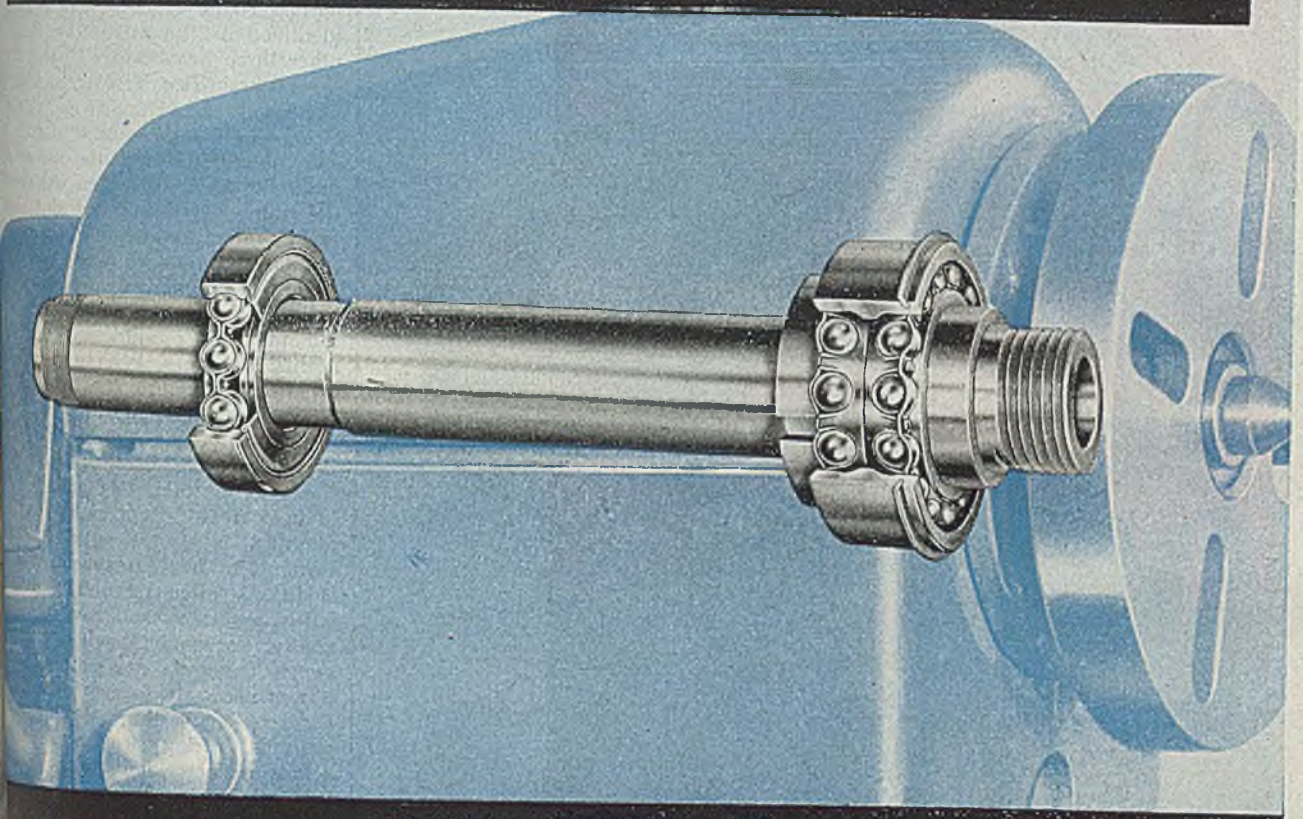
With rail freight equipment being pushed to the limit of usefulness because of reconversion demands, problems of wear and goods spoilage have been emphasized to a greater extent than ever before. Experimental direct-action two-way hydraulic shock absorbers for freight cars are being tested on refrigerator and tank cars for the purpose of reducing losses in food and other merchandise in transit, and to save wear on the cars themselves.

The freight car shock absorbers, made by Monroe Auto Equipment Co., Monroe, Mich., are similar in design and type of mounting to those used successfully on new streamliners and other passenger equipment. They are mounted on the outside of the freight car truck between bolster plank and the spring plate, and do not take the place of any or any part of one set of springs. Full spring action thus is retained to give a freer type of ride.

Tests so far have shown that the two-way hydraulics cut bottoming to a minimum and control rebound as well. Taking the shock load off the bearings of the freight car trucks, the new two-way shocks act to lessen wear on many parts of the car — including springs, brakes, wheels and axles — and thus effect substantial reductions in maintenance costs.

STEEL

Logan A NAME TO REMEMBER WHEN YOU THINK OF BETTER LATHES



Higher Cutting Speeds Without Bearing Adjustment on Logan LATHES

No. 200 Screw Cutting Lathe

No. 825 Cabinet Model Quick Change Gear Lathe

SPECIFICATIONS common to all Logan Lathes: Swing over bed, 10½", Bed width across ways, 6-15/16", Bed length, 43⅛", Size of hole through spindle, 25/32", Spindle nose diameter and threads per inch, 1½"—8, 12 Spindle speeds, 30 to 1450 r.p.m., Size of motor, ⅓ or ½ h.p., 1750 r.p.m., Preloaded precision ball bearing spindle mounting; Drum type reversing motor switch and cord; Precision ground ways, 2 prismatic [illegible]" ways, and 2 flat ways.

THE pre-loaded ball bearing spindle mounting is one of the advanced design features which make Logan Lathes specially adapted to the needs of modern shops. With the resulting increased spindle speeds, full advantage can be taken of the high cutting speeds used with carbide cutting tools. No bearing adjustment is required within the full range of Logan spindle speeds, from 30 r.p.m. to 1450 r.p.m., regardless of the cut being taken. With Logan Lathes, consequently, the precise factory alignment of the spindle is not disturbed by periodic bearing adjustments, and original spindle accuracy is sustained. Grease-sealed, the ball bearings require no further lubrication or attention throughout their long service life. Maintenance costs and down time are kept at a minimum. The ball bearing spindle mounting is another reason why Logan Lathes increase output and decrease unit costs on production lines, and reduce the man-hours per cutting job in tool rooms. For full information on all models of Logan Lathes, see your nearest Logan dealer, or write direct for descriptive catalog.

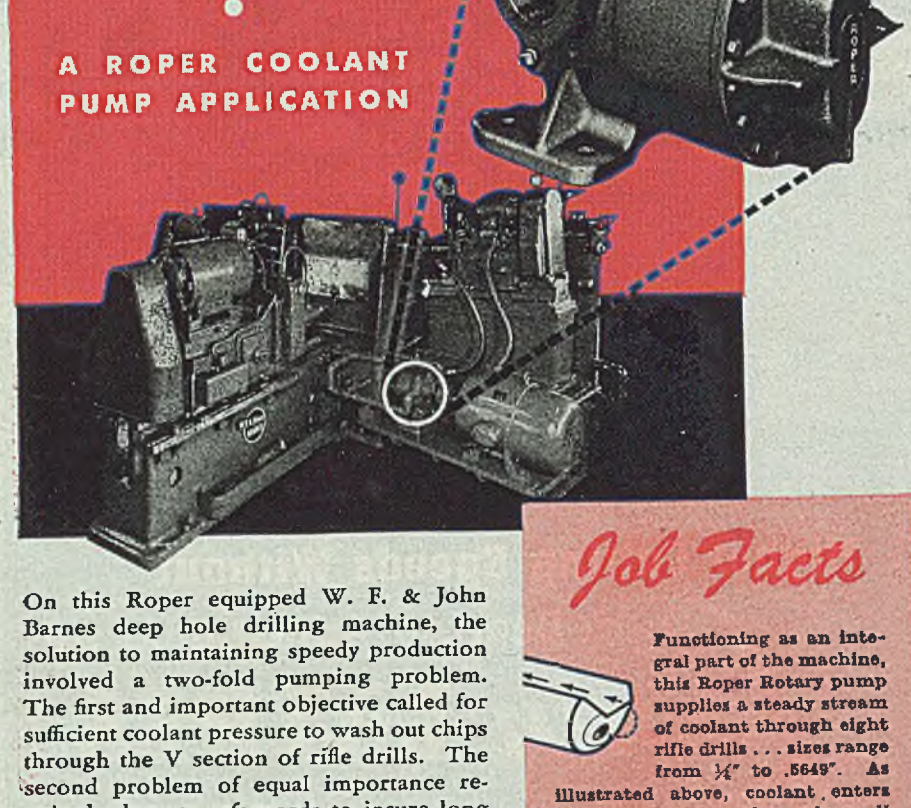
F-1

LOGAN ENGINEERING CO.

CHICAGO 30, ILLINOIS

SOLVING A *Chip Problem* IN DEEP HOLE DRILLING

A ROPER COOLANT PUMP APPLICATION



On this Roper equipped W. F. & John Barnes deep hole drilling machine, the solution to maintaining speedy production involved a two-fold pumping problem. The first and important objective called for sufficient coolant pressure to wash out chips through the V section of rifle drills. The second problem of equal importance required adequate safeguards to insure long pump life and efficient performance. The success of this Roper application, worked out in collaboration with Barnes' engineers, is indicated by the excellent war production record of this modern machine tool. Eight deep hole drilling operations are handled simultaneously . . . cycle time 1.68 minutes . . . machining time cut from 60 minutes to 1.8 minutes on magnesium aircraft engine housing. Perhaps Roper engineers can suggest a solution to your pumping problems. Service offices in principal cities.

GEO. D. ROPER CORPORATION
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Modern Heat Treating

(*Continued from Page* 116)

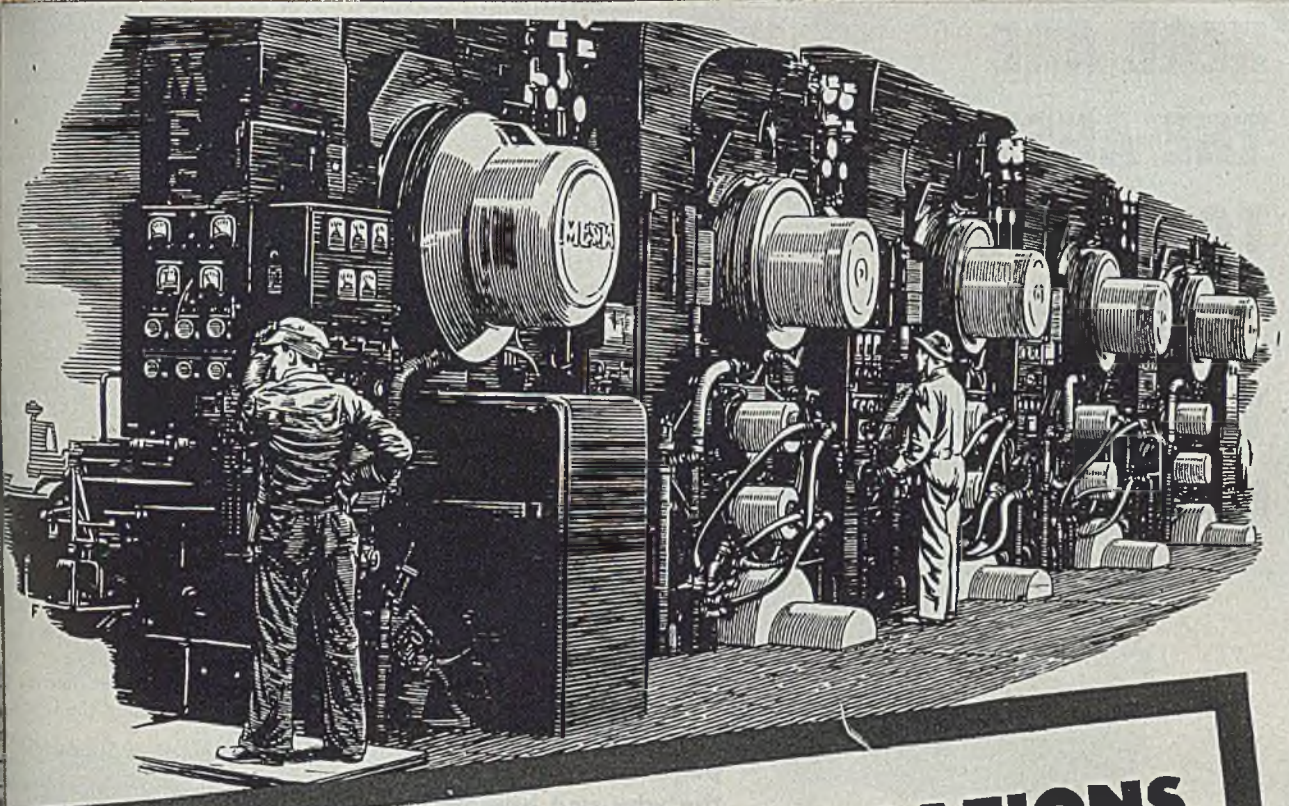
other heats. McQuaid-Ehn Tests were run on these heats of which four showed normal coarse-grain structure and were identified as the satisfactory heats; the other three heats had a duplex and abnormal grain size. Tracing back the open-hearth practice of the seven heats, it was found that the three unsatisfactory heats were deoxidized with the use of aluminum. Research work then was started to determine the effect of aluminum on grain size and normality of the steel. The results of this work were that a small amount of aluminum produced a coarse-grain normal steel. Adding still more aluminum would produce a duplex and abnormal structure. With still further addition of aluminum, the structure would be fine-grain normal.

The use of fine-grain normal steel was found to have many advantages over coarse-grain steel. Fine-grain steel used in heat treated parts resulted in higher ductility, impact strength and less distortion in heat treatment. Fine-grain steels are often referred to as shallow hardening steels and have less hardenability. For equivalent hardenability between fine-grain and coarse-grain steel it was necessary to increase the manganese content of the fine-grain steel. For example, spring steels when furnished coarse grain were specified carbon 0.80-0.95 per cent and manganese 0.25-0.50 per cent. The fine-grain steels were changed to carbon 0.80-0.95 per cent and manganese 0.60-0.90 per cent. Today grain size is an accepted quality of commercial steels and has been adopted and published by ASTM. Charts classifying the various grain sizes, numbered 1 to 8, are published in many technical and reference books.

Inherent austenite grain size may also be judged by the fracture of a piece of steel after hardening by quenching. Such fractured grain-size standards known as Shepherd Standards consist of 10 samples rated 1 - 10, inclusive. Microscopically they conform substantially with the grain sizes as rated by the ASTM chart. The Shepherd P-F or penetration-fracture is a comparison test for both hardenability and grain size. It is used mostly on steels which have a well-defined border between case and core, such as carbon tool steels.

Jominy End-Quench Test

The Jominy end-quench test was first described by A. L. Boegehold and W. Jominy in 1937. This method of measuring hardenability consists of cooling the end of a 1-in. round with water and measuring the hardness from the water-cooled end. The quenching fixture is mounted so that a column of water at 75° F, plus or minus 5°, is directed against the bottom face of the hot piece. The water passes through an opening ½-in. in diameter and is under sufficient pressure to rise to a height of 2½ in. above the opening before the specimen is placed in the fixture. (STEEL, May 17, 1943, p. 106, for c



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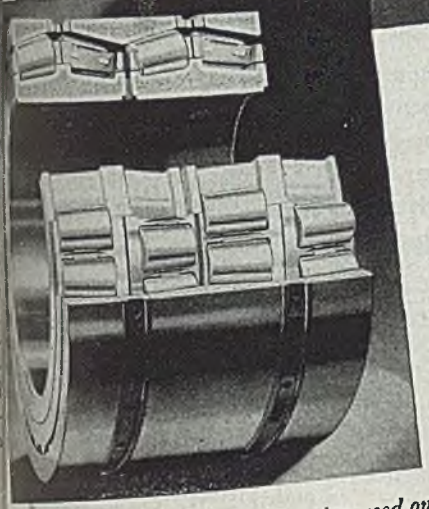

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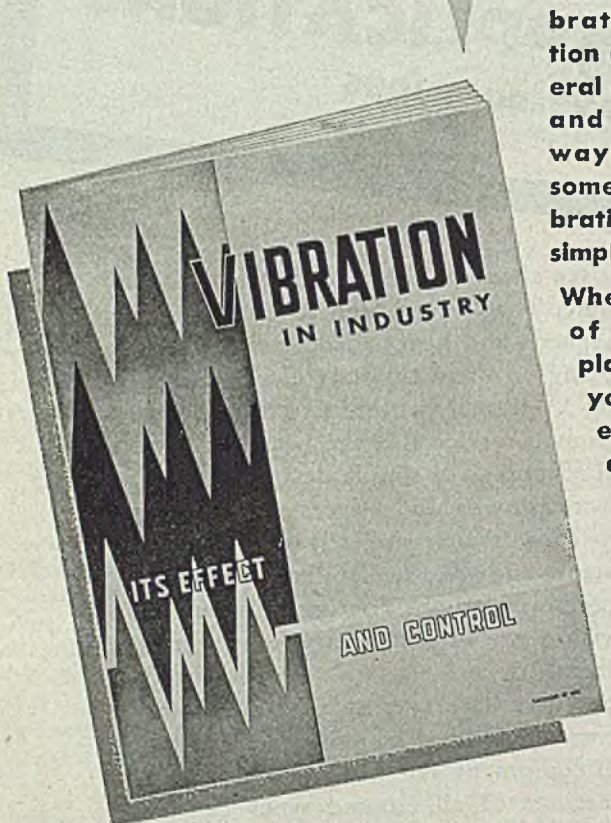

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plete description of Jominy test in use

In performing this test, water supply is shut off with a quick-opening valve, the hot specimen placed in the fixture over the water pipe so that its bottom is ½-in. from the opening of the nozzle, and the water quickly turned on. The sample is kept on the fixture until cool, or for at least 10 min, and then quenched in water until cold.

Test bars should be normalized by heating to 150° F above the Ac_3 point and holding 30 min at heat. Following this treatment, the bar is finish-machined and heated for hardening to 75° F above the Ac_3 point, holding 20 min at heat. In order to minimize scaling, the bar should be heated in a small closed container having a layer of cast iron chips about 1-in. deep.

After quenching the fixture, two flat surfaces, 180° apart, are ground 0.015-in. deep on the side of the bars, care being exercised not to heat the bar so as to affect the hardness. Hardness readings then are made over the length of the bar at 1/16-in. intervals with a rockwell tester, using the C scale.

Accepted as Standard Test

This method of test has been used so successfully that it has been accepted as a standard test by the steel industry and the AISI; also it has been proven as a method that laboratories can use to check with each other closely. Many heat treating plants have adopted the end-quench as a routine test of different heats of parts required to have hardenability within certain limits. It will predict in advance how the steel will respond to heat treating. For the past few years the test has been used with a fair degree of success as a method for determining which of the so-called alternate or NE steels can be substituted for the old SAE steels.

The Jominy test is now proposed as a means of specifying the hardenability of heat treated steel. When the hardenability band is specified, the chemical composition limits have been modified somewhat from the limits applicable to the same steels as specified by chemical composition only. At the present time the test is the simplest and most practical method for testing hardenability; further, it can be interpolated to Grossmann's (D_1) critical diameter and prediction of the hardness to be obtained in various sections can be made.

M. A. Grossmann, M. Asimow and F. Urban have contributed some valuable work on hardenability and quenching. Their paper "Hardenability, Its Relation to Quenching, and some Quantitative Data" (ASTM-1938), presents a method of determining the critical diameter (D_c), which is a measure of hardenability, and of the H-Value, a measure of the severity of quench. The knowledge of these two factors makes it possible to calculate a standard ideal diameter from which a variety of useful predictions is made possible from quench

Consider Fig. 9, a diagrammatic representation of a series of etched cross sections of an SAE 3140 steel quench

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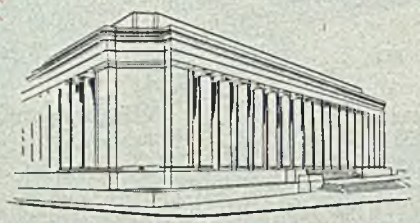

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in oil, and a series for the same steel quenched in water. This illustration shows two well-known facts: (1) Depth of hardening becomes less as the bar diameter is increased, using the same quench; and (2) with the milder oil quench, size of the unhardened core increases more rapidly with increase in bar diameter than is the case with the more severe water quench. This relative increase of unhardened core is highly characteristic of the severity of a quench.

Determining Critical Hardness

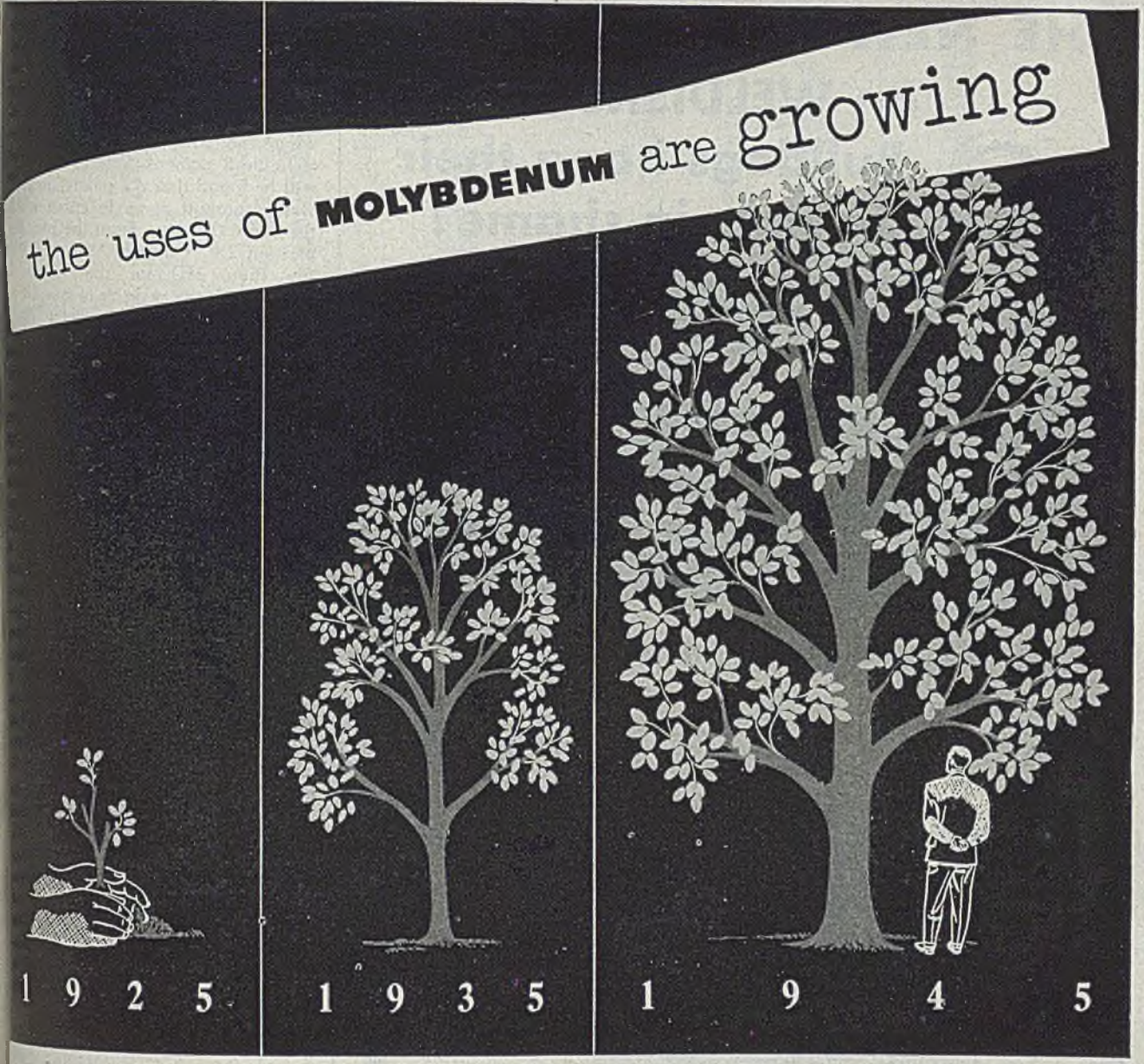
When a bar is quenched from the austenitic state to harden, it is found that the inner portion of the bar is less fully hardened than is the outer portion. Microscopic examination of the cross section would show the outer zone martensite and as the hardness drops off, the amount of martensite decreases and nodular pearlite or primary troosite increases. At some point there are approximately equal parts of both constituents. This point at which there is 50 per cent martensite and 50 per cent pearlite is called the critical hardness. A rockwell hardness survey of the same bar would show that the inner portion of the bar is less fully hardened than the outer portion. If the hardness is plotted in a hardness-traverse curve, the familiar U-curve generally results, from which the critical diameter can be determined from the curve shown in Fig. 10.

Another method of determining the critical hardness is to etch a polished cross-section of the bar in 1 to 1 HCl. The different rate of etching of martensite and pearlite will show a demarcation between the martensitic rim and pearlite core. Martensitic zone will have a lighter etch than that of the unhardened center. Critical diameter can be estimated quite accurately from the etch test.

By plotting the original diameter (D) as the abscissae (logarithmic scale) and the unhardened diameter (D_u) as the ordinates, from the water and oil-quenched bars (Fig. 11), the curve will show that the slope is controlled by severity of quench. This becomes the basis for evaluating the severity of quench. In the water quench, the 1.83-in. diameter is the critical size, whereas critical size in the oil-quenched bar is 1.25-in. diameter.

In Fig. 9 it is shown that as size of the quenched bar is increased, proportion of unhardened core increases more rapidly with a mild quench than when the quench is more severe. When the data in Fig. 9 is plotted as in Fig. 11, curves are obtained which vary in slope, the degree of slope being characteristic of the severity of quench. To find the numerical value for the severity of quench, a curve so obtained must be moved over the chart in Fig. 7 until it matches one of the curves. To do this a transparent cover-slide of tissue paper or celluloid is laid over chart in Fig. 7 with the bottom edge of the paper or celluloid coinciding with the lower edge of the chart.

Plot the points on the right-hand curve



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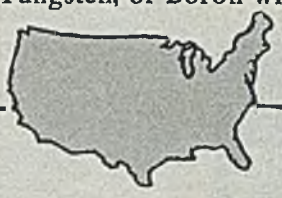

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in Fig. 11, placing points A, B, etc. on the cover-slide at the proper position, as previously described for Fig. 7. Now move the cover-slide to right or left, until the points fall on a single curve or as close as possible. In this case, when the cover-slide is moved to the right until point A falls at about 2.6, it will be found that the points are grouped closely around a single curve which is the curve that rises from the base line at position 2.6. This new value 2.6 is now the value HD for the 1.83-in. bar, namely, (H, the severity of quench) multiplied by (D, the diameter of bar). Therefore, to obtain the H-value, we have

$$H = \frac{HD}{D} = \frac{2.6}{1.83} = 1.4$$

which is the numerical value for H-severity of this quench. The oil quench then has a severity of quench H = 0.41.

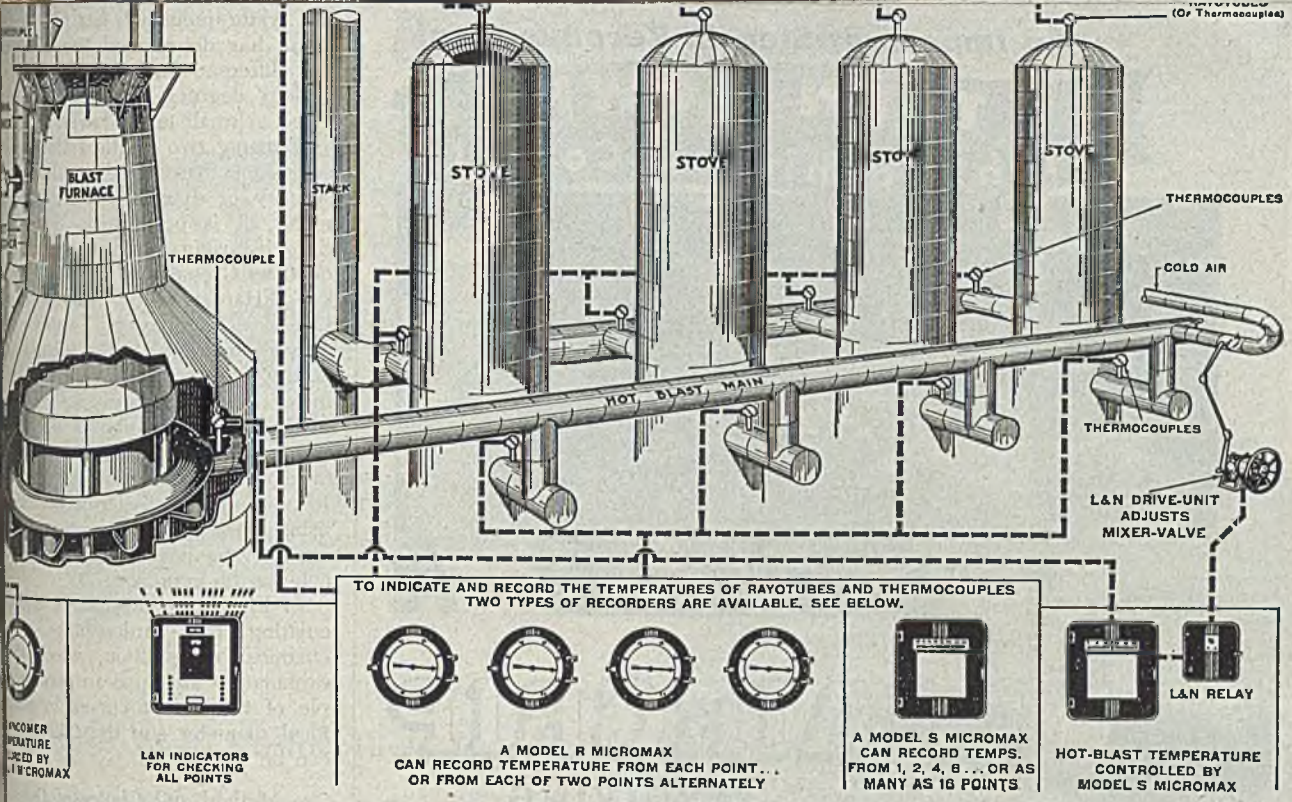
Instead of measuring the unhardened diameter (D_u) on etched cross-section, it is equally valid to ascertain the diameter, D_u from the transverse-hardness curves. The boundary of the unhardened core is at the point of the critical hardness. It can be measured from the slope as shown in Fig. 10.

Choose Curve to Fit

To determine H-value from hardness-distribution curves (Fig. 7), always select hardnesses where the curves are steep, as the flat portions lead to inaccuracies. Also, never determine H-values from only two sizes, since any slight discrepancies become greatly exaggerated in matching curves. Always use four or more sizes and choose the curve which fits the points most closely.

Knowing the critical bar diameter (D_c) of a steel and the severity of the quench (H-value), it is possible from the curves in Fig. 12 to calculate the ideal diameter (D_I). The ideal diameter has been defined as that diameter at which the unhardened core would disappear if the piece were quenched with the severest possible quench, termed "ideal quench" with H-value infinite. This ideal diameter value is used as the basic reference for defining hardenability. In Fig. 12 the ordinates at the left are marked D_c values, and these refer to the actual critical size as found in the test. The abscissae as marked at the bottom are called D_I values, indicating the critical size which would have been obtained had the quench been ideal, H-value equals infinite.

In the case of SAE 3140, where critical diameter for the water-quench bar D_c equals 1.83, follow the horizontal line until it intersects the incline line which at its upper right-hand end is marked 1.4. From this intersection, follow down to read the D_I value at the bottom of the page and it will be found that the ideal diameter (D_I) equals 2.54. The oil-quench SAE 3140 bar—which has a critical diameter of D_c equals 1.25, and a severity of quench of H-value equals 0.41, it will be found the ideal diameter is D_I equals 2.66. This is considered a reasonably-close check with



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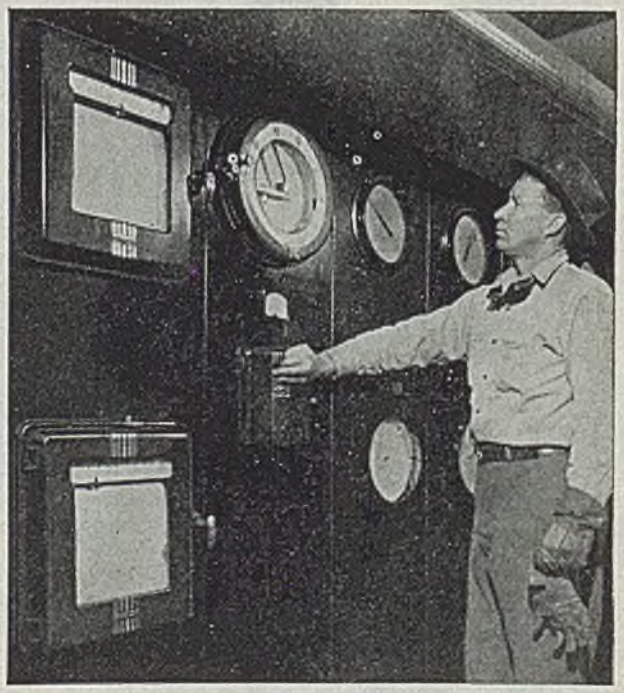

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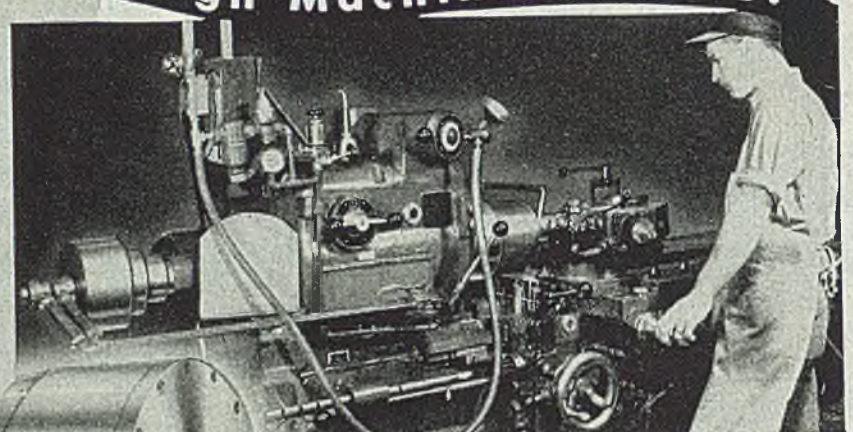

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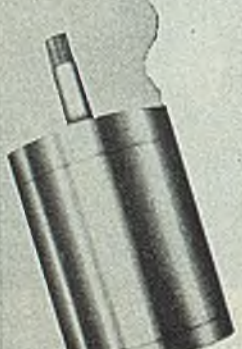

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the water-quenched bar. M. A. Grossmann has determined the H-values for the different quenching mediums with various degrees of agitation. They are listed in small table, lower right, Fig. 8.

Knowing two of the following factors concerning hardenability, ideal diameter, severity of quench, or the critical diameter, it is possible to determine the third by using the various curves developed by Grossmann. His report to A.I.M.E. on "Hardenability Calculated from Chemical Composition" shows that it is possible to calculate the relative hardenability of steel in terms of ideal diameter with a fair degree of accuracy if the complete analysis, including the residuals — such as chromium, nickel, molybdenum and grain size—are known. Ideal critical diameter is determined by using various multiplication factors for each of the common chemical elements and for the grain size.

In Fig. 8 are the curves used in calculating the hardenability from the chemical composition, which are self-explanatory and give an excellent example of the use of curves by which the ideal diameter and the critical diameter can be determined.

Method and Choice of Quench

The method and the choice of quenching media are just as important as heating for hardening. The selection of the quenching medium is determined by the steels to be treated, the size and shape of the pieces and the properties desired. In other words, each steel has a critical quenching rate which will harden the surface as well as part of the interior to a definite depth when a piece of a certain size is quenched. A lesser or greater depth of hardness penetration will be obtained after a given type of quench. A small piece may harden entirely through its section while a large piece may not harden at all. Both of these results may be objectionable since the smaller piece may be too brittle and the large may be unsuitable because of the insufficient increase in hardness. Under these conditions, it is necessary to choose a quenching medium which will provide a slower rate of cooling for the small piece, while the larger piece will require means for more rapid cooling, unless the proper steel is selected.

There are two universally used liquid quenching media, namely water and oil. Water provides the fastest cooling rate attainable in practice and one which closely approaches the theoretical maximum. It is fast enough to harden under ideal conditions the surface of even very heavy sections of plain carbon steels. It is, nevertheless, a temperamental medium requiring numerous precautions to secure uniform hardening. Water quenching, properly applied to the carbon and low alloy steels, commonly designated as shallow hardening steels, in which a thin hardened layer is produced by virtue of the extremely fast surface cooling obtained in water. This hardened surface layer causes a stress condition. Carbon steels in complicated or unsymmetrical sections cannot be water-hardened with

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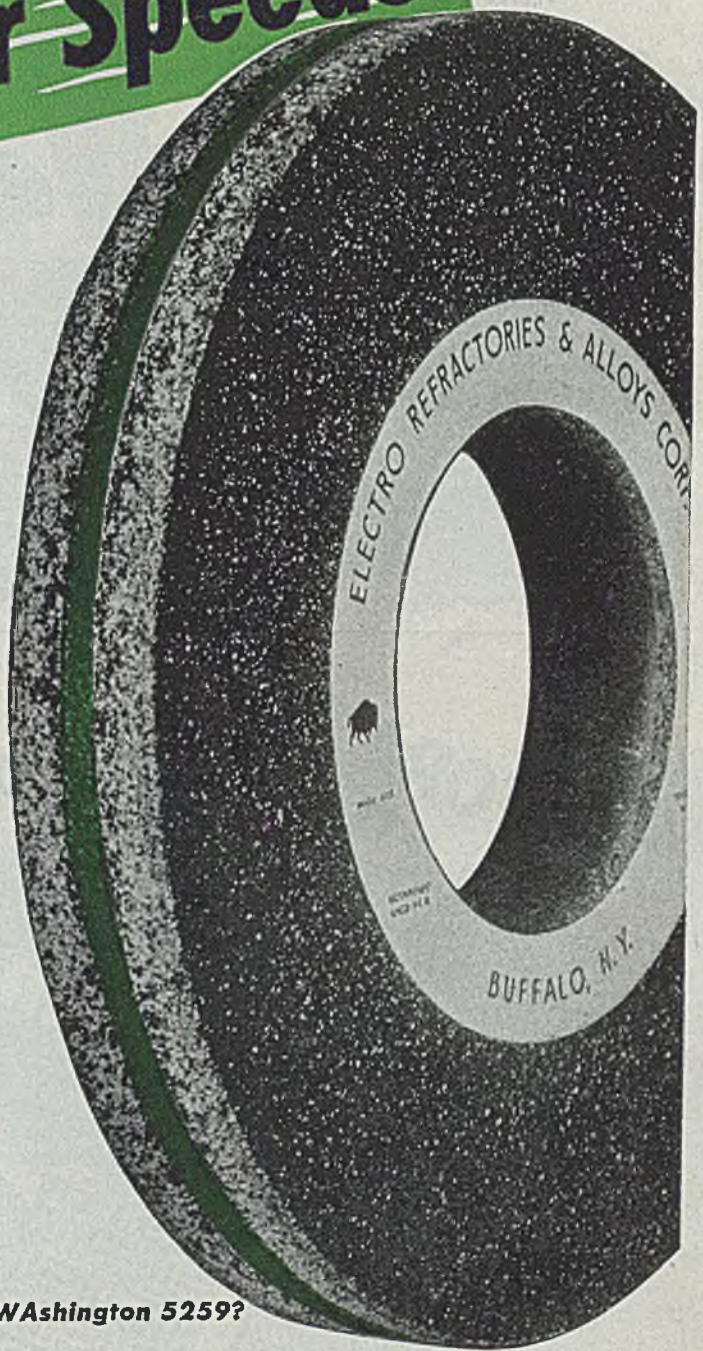

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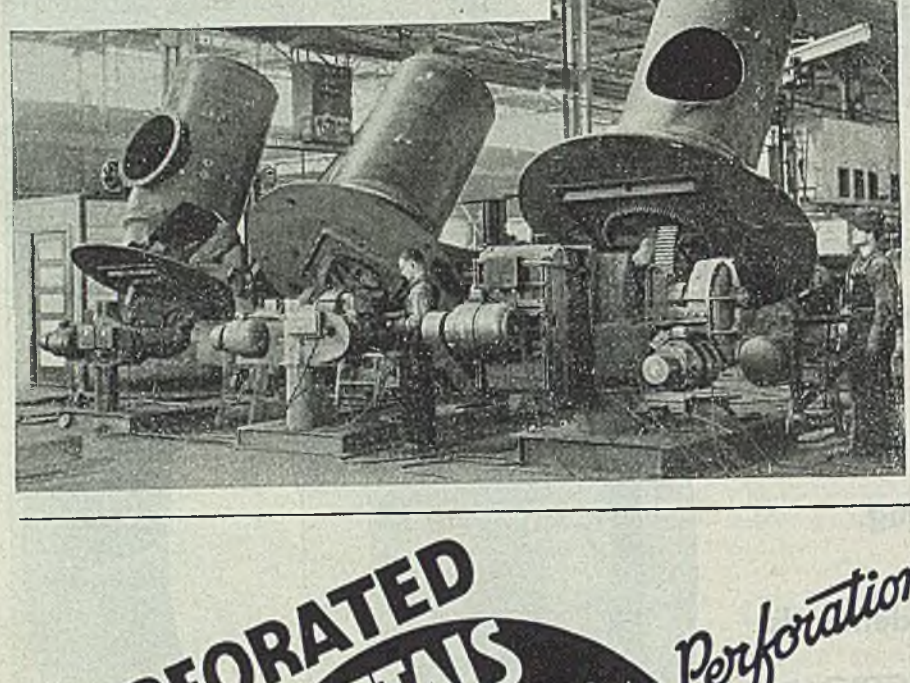

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out excessive distortion or danger of cracking. Oil quenching reduces but does not always eliminate distortion, because cooling is still relatively fast and temperature gradients corresponding large. Consequently, complex shapes such as blanking dies, must be hardened with a still milder quench; namely air or salt quench.

Three Stages of Quenching

Cooling of a red-hot object by immersion in water occurs in three distinct stages, and understanding of which is essential for coping with the problems of water quenching.

The first stage, beginning immediately upon immersion, is characterized by the formation of a complete vapor envelope about the hot object. Heat transfer is by radiation and conduction through the vapor film. It is therefore relatively slow and persistence of this stage is highly undesirable. Secondly, there ensues a collapse of the vapor film and wetting of the steel surface by the quenching liquid accompanied by active boiling. Here cooling is very rapid, heat is carried away by large masses of steam and deposited at a distance by the recondensing vapor, and the unique cooling powers of the water quench are realized. Eventually the surface temperature of the immersed work falls below the boiling point of the aqueous medium, the second stage of cooling ceases, and cooling proceeds by liquid conduction and convection. This is the final stage, in which cooling again is relatively slow and proceeds to temperature equilibrium.

Persistence of the initial vapor stage or of localized vapor masses in the second stage will cause slow cooling of the affected areas and permit the incidence of the pearlite transformation and soft spots. This is a common difficulty encountered with water quenches.

Water Quenching: Two counteractive measures immediately suggest themselves; namely, the use of a cold bath to shorten the life of vapor formation and agitation, such as in a submerged spray quench, to dislodge these vapor obstructions. However, the most general useful expedient is the addition of an inorganic solute to the quenching bath. The two most common and effective agents are common salt and caustic soda. An addition of 9 per cent of the former has been found optimum for this purpose, and 3 per cent of caustic soda has equivalent effectiveness.

These additions, by their release from solution during vaporization and by subsequent explosive decrepitation of minute crystals at the hot work-surface, destroy the stability of vapor films and thereby promote rapid early cooling. However, increasing amounts of the agents progressively lower the cooling rate in the second quenching stage and therefore should be used in the given concentrations for maximum efficiency. It can be seen that a brine bath is not an infinitely severer quench than plain water, as is often supposed, but that the salt addition merely permits full use of the cooling power latent in water by

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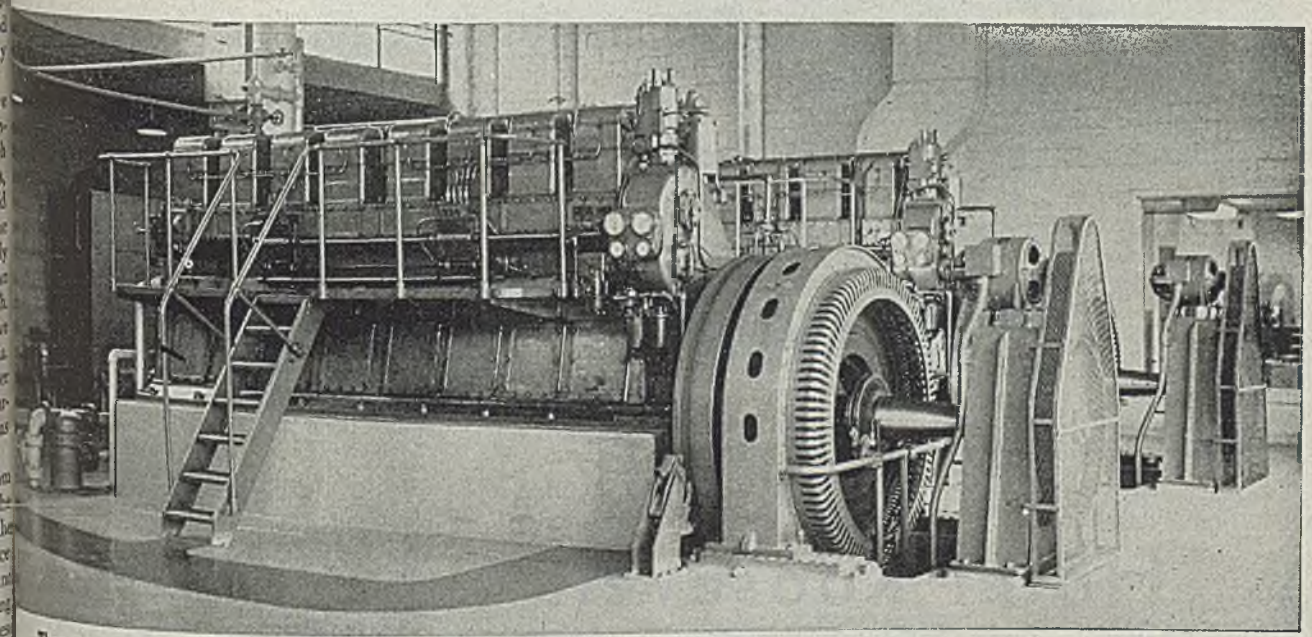
Seems incredible, especially when you consider all the allied engine parts such as rings, liners, bearings, pins and valves. Still there is no evidence whatever that any repair or maintenance is needed — and there never has been! Since standby engines were unobtainable despite greatly increased power demand, such dependability has been welcome, indeed.

This case history is not intended to discourage planned or pre-timed maintenance, but it does provide further evidence that exceptional stamina, unusual resistance to wear, and prolonged efficiency are Cooper-Bessemer engineering accomplishments — advantages that are downright life-savers in an emergency . . . certain in any case to protect the profit side of your ledger.

Cooper-Bessemer welcomes the chance to cooperate with you or with your consulting engineers in determining the correct engines for your requirements . . . stationary or mobile, on land, at sea, or on the rails.



These two Cooper-Bessemer engines, Type JS 8-cylinder 600 hp diesels, are installed in the R.E.A. Tri-County Electric Cooperative at Portland, Michigan. Under the supervision of Mr. S. Don King, Superintendent, they have piled up 17,000 continuous operating hours without repair and with no indication that any maintenance whatever is needed.

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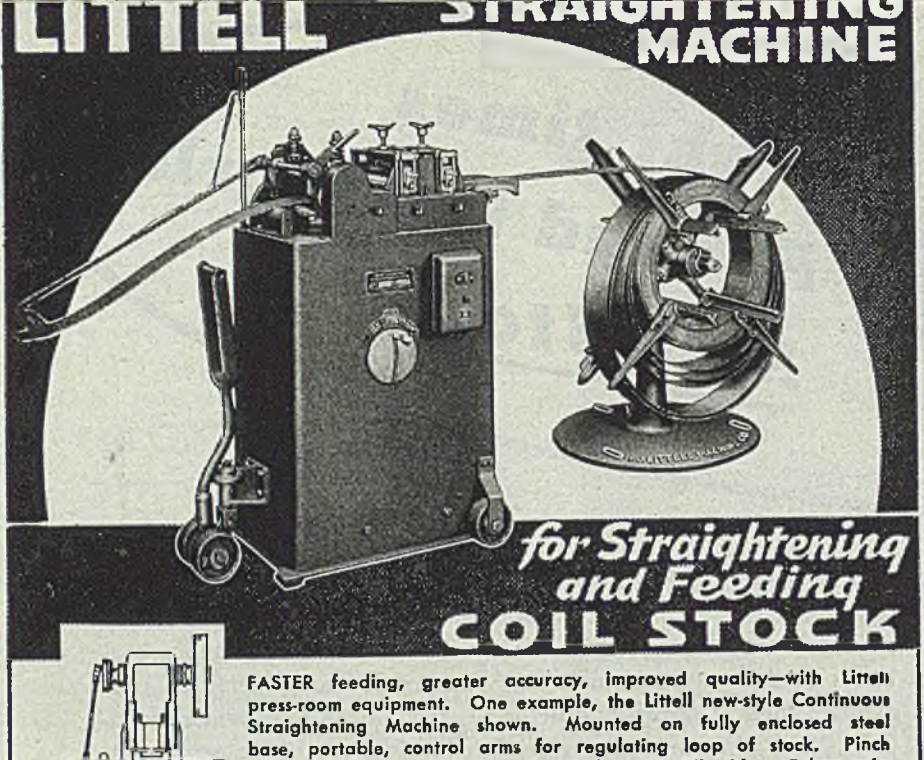

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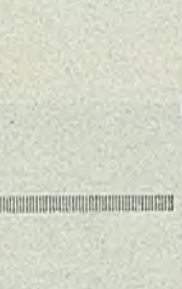

FASTER feeding, greater accuracy, improved quality—with Littell press-room equipment. One example, the Littell new-style Continuous Straightening Machine shown. Mounted on fully enclosed steel base, portable, control arms for regulating loop of stock. Pinch rolls 3½" dia. by 8½" long for stock up to 8" wide. Other units for wider stock. Standard speed, 10' to 60' per min. Floor space, 17" x 36". Littell No. 3 Automatic Centering Reel shown, capacity 300 lbs. Littell also makes other press-room units.

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moving the vapor phase interference.

The other major problem attendant upon the use of water quenching is the generation of high stresses in the cooled article. These stresses may lead to cracking or warpage, depending upon the size and shape of the work. Changes in section thickness of an object to be water quenched should be held to a minimum, and, where unavoidable, should be in the form of a gradual taper or a generous fillet. Sharp re-entrant angles lead to stress concentrations and very likely failure by cracking.

Critical Sizes Apt to Crack

Even uniform sections, such as perfect cylinders, are apt to crack, particularly in certain critical sizes. This is due to the magnitude of the residual stresses remaining in the steel as a result of its martensitic transformation in the presence of a steep thermal gradient during the latter part of the water quench. In the case of large sections, where hardening penetrates only to a limited depth and a soft core remains, the condition of the surface stress is generally not harmful, but actually beneficial, since residual stresses are compressive and tend to counteract tensional service stresses. However, a water-quenched part which hardens completely through has a state of residual tensional stress at the surface, the value of which may be exceedingly high and often leads to cracking of the work even while still in the quench, or at some time thereafter. The tendency of water-quenched steels to crack in certain critical sizes is generally insurmountable when the critical conditions exist, and recourse to oil, salt or air-hardening steels is the most economical way out.

Certain devices are sometimes utilized in an effort to avoid this fatal cracking, such as attempts to lessen the severity of the water quench by certain solute additions, or the withdrawal of the quenched part from the bath while still hot and immediately tempering, etc. Such practices are rarely consistently satisfactory, and it has often been demonstrated that substitution of oil hardening or even air hardening steels in such cases is, in the long run, cheaper than the use of the lower-cost carbon steels with the attendant probability of loss by cracking of a certain percentage of the work.

The use of a compressed air stream as a source of agitation in such quenching tanks is not to be recommended, since contact of air with the hot work-surface may be as detrimental as the presence of steam. In the case of a caustic soda bath, actual deterioration of its quenching efficiency may result from the use of an air stream, due to accelerated formation of sodium carbonate at the expense of the beneficial hydroxide.

Agitation by properly located and immersed motor-driven propeller blades or by use of directed, pump-driven streams of the quenching medium, are the preferable methods. Agitation should be planned and applied to obtain a symmetrical action on all sides of the in-

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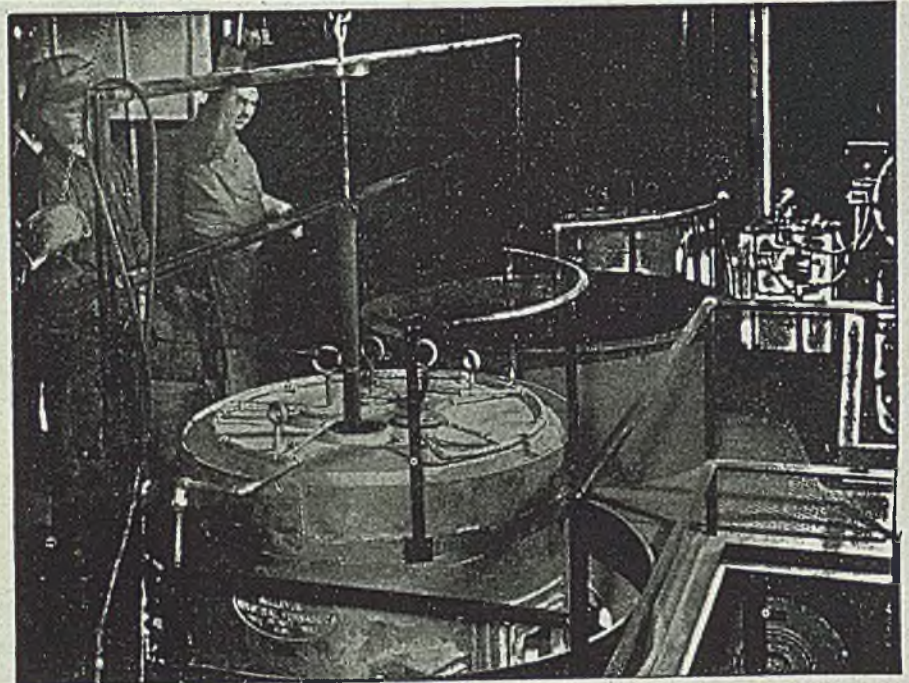

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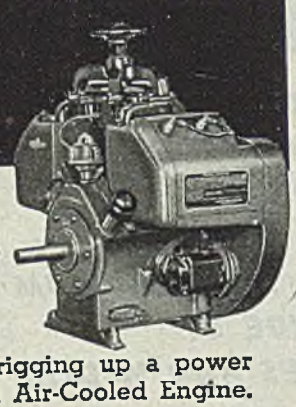

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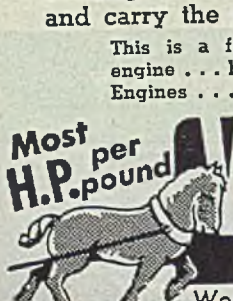

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mersed work: this is particularly important to minimize warpage of relatively slender parts. In this respect a brine quench has the advantage of more uniform action than can be secured by manual or mechanical agitation in a fresh-water bath.

Oil Quenching: Plain carbon steels are oil quenched for full martensitic hardness only in very light sections; for example in the case of knife blades. In larger sizes only partial hardening can be expected. Oil quenching of plain carbon steels is sometimes used in the stress-relieving heat treatment of severely cold-worked parts such as cold-headed bolts. Most commonly, however, oil quenching is applied to moderately or highly-alloyed steels to obtain full martensitic hardening with a minimum of distortion. Such steels may be high-carbon steels for tool applications or case-carburized steels for machinery or constructional purposes.

The initial, slow-cooling vapor stage in an oil quench is generally of longer duration than in a water quench, because the insulating properties of the vapor film are apparently lower than those of a steam envelope, cooling actually occurs somewhat faster in the first stage with the use of oil. For this reason and because of the low critical cooling rate of oil hardening steels, difficulty with soft spot occurrence due to vapor interference is not encountered in oil quenches. Because of the high boiling point of oils, the use of a hot quenching bath does not materially increase the persistence of the vapor stage.

In the second quenching stage the relatively low rate of vaporization of oil gives a cooling power much lower than

Fillip in Research

Since the close of the war, there has been a decided fillip in research activities, this apparently being attributable to the many outstanding technical developments arising out of the war. The atomic bomb publicity also has given research a popular flavor. In addition, government-sponsored research would be extended by two bills now pending in Congress.

Clyde Williams, director, Battelle Memorial Institute, Columbus, O., reports that his organization now has a volume of research activity which is one-third larger than a year ago. Mr. Williams expects that research programs will be conducted more intensively in the future, and Battelle is planning to expand its facilities.

Battelle will bring in men who are doing advanced work in college and train them in research methods. These men will serve "internships," in somewhat the same manner as graduates of medical schools in hospitals.

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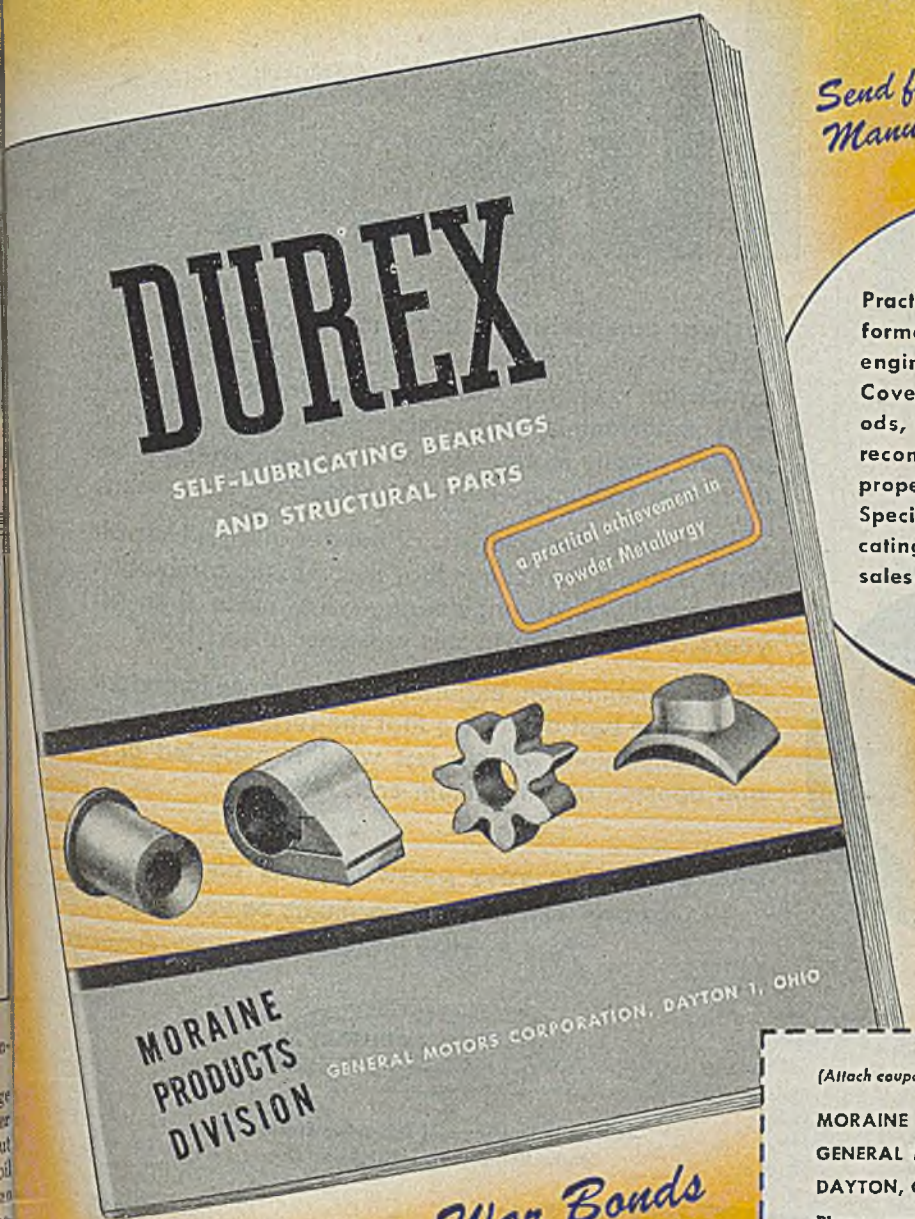

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that of water in the corresponding stage of the quenching period. Warming of the bath, however, decreases the viscosity and imparts mobility to the oil, permitting increased convection and faster heat transfer, and, accordingly, the best quenching speeds are secured with a bath temperature ranging from 90 to 140°F.

Final cooling stage in an oil bath sets in at a considerably higher temperature than in the case of water, and the cooling power here is only about half that of water. As a result of these two facts, the temperature of the hardening transformation is reached. Therefore residual stresses which favor cracking and warping are of lower degree in an oil quench. Occasional cracking of certain tool steel parts which harden completely through may still occur in an oil quench. Here withdrawal of the hot work from the quench and finish cooling in air is more easily accomplished at a given work temperature than in the case of water because of the lower cooling rates involved. However, this expedient is not generally applicable where large difference in work thickness exists.

The metallurgical development of heat treatment in the past 10 to 15 years has been far greater than in any other era. With these new developments it is possible to reproduce uniform results with maximum properties, if they are furnished with uniform material. The metallurgist today believes that in most instances controlled chemistry is not his answer to uniform results. For example:

1. It is possible to have several heats of steel furnished to the same specification, each heat possessing different hardenability.
2. Alloy steels, regardless of composition, have strikingly similar tension qualities when fully hardened.
3. Some of the present chemical specifications have too wide a hardenability band to be practical.
4. It requires a minimum hardenability to obtain desired results and often, if the hardenability is too great, trouble occurs.

Steel users and manufacturers now appreciate these facts and have appointed committees which represent the Iron and Steel Committee of the War Engineering Board, the General Standards Committee of the Society of Automotive Engineers and the Technical Committee of Alloy Steel of the American Iron and Steel Institute. It is their purpose to standardize specifications to serve the mutual interests of the users and manufacturers of steel. The work of the latter committee has been reported and published as "Contributions to the Metallurgy of Steel—No. 11", entitled "Tentative Hardenability Band."

(*Continued next week*)

—o—

Several improvements in cellular glass insulation have been made by Pittsburgh Corning Corp., Pittsburgh. One change increases the number of cells per cubic foot from 5,000,000 to 10,000,000, thus providing additional thermal protection. Foamglas is an inorganic material.

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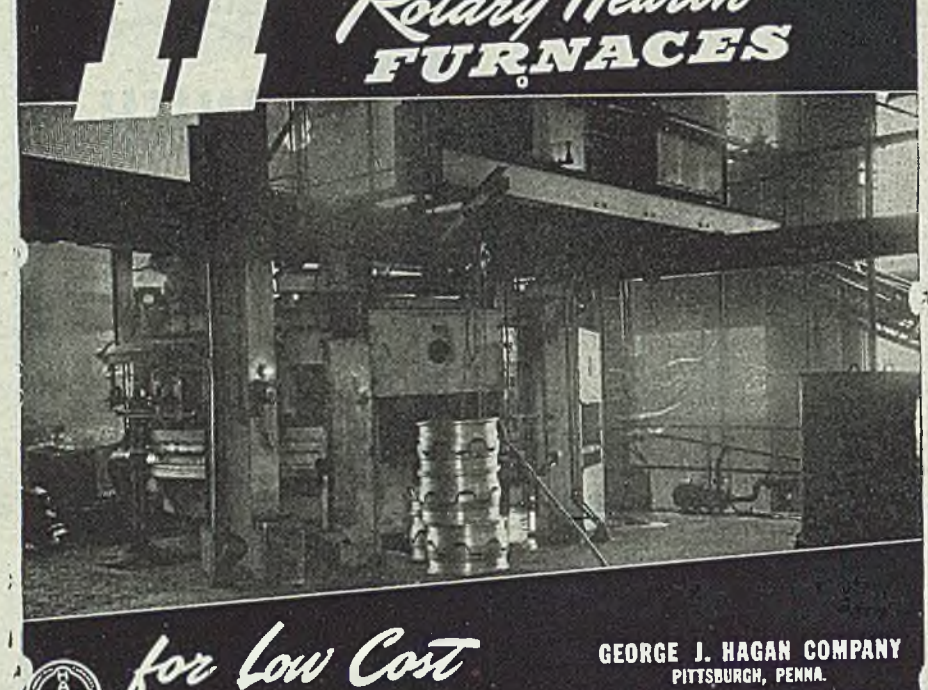

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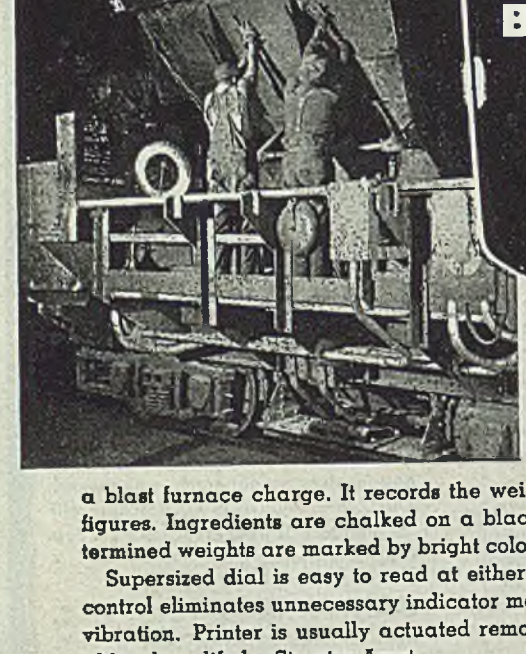

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Tungsten-Free German Cutting Alloy Discovered

The super-cutting alloy discovered in Germany by Gregory Comstock, director of research in powder metallurgy, Stevens Institute of Technology, while working in that country as a field expert for the Technical and Industrial Intelligence Committee, is said by him to have been a direct result of impending exhaustion of German tungsten stocks toward close of the war.

The material, a titanium-vanadium carbide identified as V814 and one which had a brief but definitely successful career in tool tips applied to mass production operations, had been under development for 4 or 5 years. German scientists were seeking a tungsten-free hard carbide cutting material that could be used as a substitute for S1, one of the ten high-tungsten carbides on which German industry standardized during the war, according to Professor Comstock.

Composition of V814 is 45 per cent vanadium carbide, 45 per cent titanium carbide, either 7 or 10 per cent nickel, and 3 per cent cobalt. In contrast, the composition of S1, for which it was to substitute, was 78 per cent tungsten carbide, 16 per cent titanium carbide, and 6 per cent cobalt. Grade S1, like its companion types S2 and S3 on the standardized list, was designed primarily for steel cutting. Although V814 can be made by the cold-press vacuum sintering method, it generally was produced on the metal powder hot press.

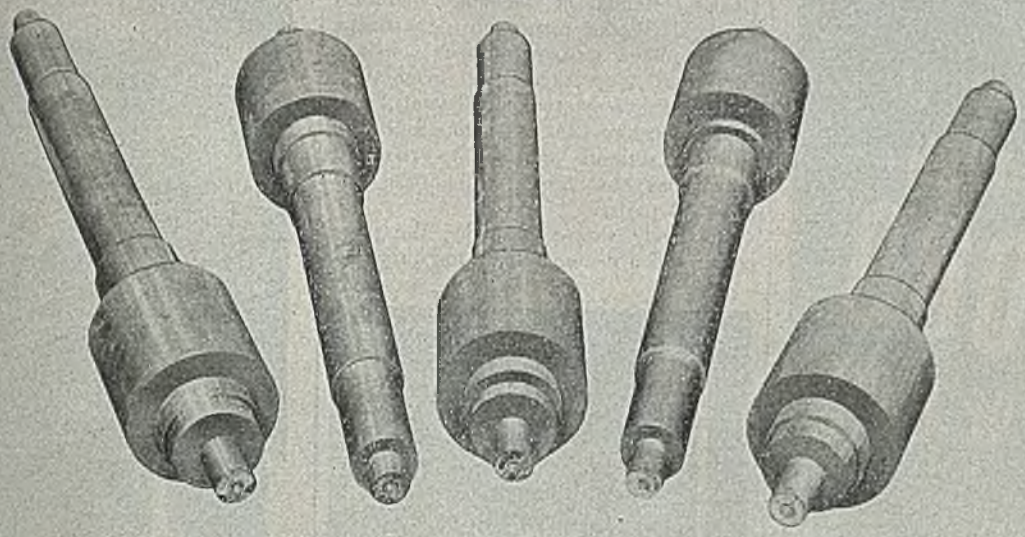
Data on physical properties and performance of the super-cutting alloy is expected to be made available upon completion of tests now going on in Great Britain and the United States.

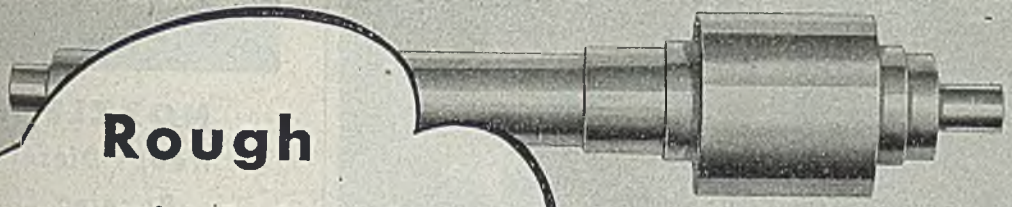
Synthetic Useful in Air-Cleaning Apparatus

A special type of Plioweld, or acid-resistant synthetic rubber, has been developed by Goodyear Tire & Rubber Co., Akron, O., for steel, chemical and powder plant air-cleansing apparatus, according to W. C. Winings, manager, Mechanical Goods Division, and N. E. Kimball, head of the tank-lining department.

The rubber is employed wherever water or moisture, laden with acids removed from the air, might come in contact with the metal with which the air purifiers are built. Plioweld is sealed to the metal in varying thicknesses from $\frac{1}{16}$ to $\frac{1}{4}$-in.

Smallest of the fourteen sizes of air purifiers made requires about 450 lb of Plioweld. An average of 1000 lb of the specially compounded synthetic rubber is required for the largest unit.





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Above:—Smooth Forged and Finish Machined Spindles Illustrating the Advantage of Our Close Limit Forging. *Below:*—Three Smooth Forged and One Rough Machined Pitman Screws.

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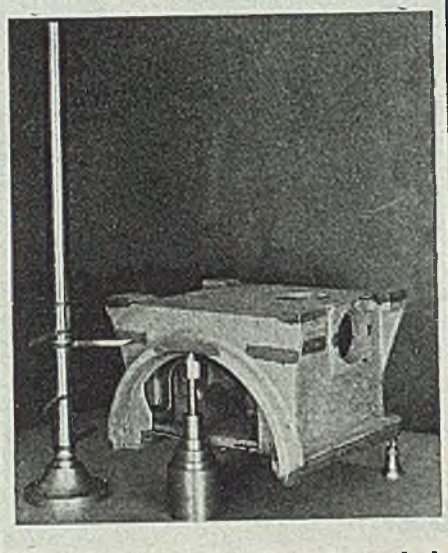
Gage for Inspecting Gear Housings

Multiple height gage designed by Charles Rohlfs of General Electric's Pittsfield Works inspection department has simplified scribing of gear housings and their inspection after machining, and considerably reduced layout time. Dial indicators can be clamped to the multiple scribers and set to required dimensions to inspect quantities of identical parts.

Relatively simple to make, the gage consists of a center column-rod threaded



into the base and secured by a lock nut. Spacers and scribers, hardened and ground, are drilled to slide-fit the column rod. Spacers are ground to dimensions that will place the scribers correctly for the layout of the required lines for machining. After these are placed on the rod and correctly spaced, the assembly is secured by a cap nut. To compensate for the variations in unmachined castings, the complete assembly of spacers and scribers can be adjusted higher or lower, without distributing any of the dimensions between the scribers, by loosening the lock nut and screwing the center column rod in or out of the base, as the case may be.

By using a set of spacers for each drawing, the scribers are easily spaced and secured, and any quantity of identical parts can be rapidly laid out. This new gage eliminates use of the conventional gage, which had to be set for each line and the reading checked before scribing.

Gasoline Powered Welders Converted to Natural Gas

Thirty-five 300 amp gas engine-driven arc welders have been used at Todd Houston Shipbuilding Corp., Texas, in places where electric power was not readily available. It was accordingly necessary to use engine-driven welders until this area in the shipyard could be provided with sufficient electrical power to operate the electric drive welders

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Light in weight yet built for heavy duty service, it enables any mechanic to make quick accurate tests on injector opening pressure, spray pattern, etc., and detect stuck needle valves and leakage around valve seats. Tests both large and small injectors, on bench or engine, at pressures up to 10,000 p. s. i. Prevents costly delay and possible damage to engine.

Ideal for testing hydraulic devices.

TESTS FUEL INJECTO AND HYDRAULIC D VICES at Pressures to 10,000 p.s.i.

•

Write for bulletin on this practical, low-cost unit.

AIRCRAFT & DIES EQUIPMENT COR

DEPT. 17: 4411 N. RAVENSWOOD A CHICAGO 40, ILLINO

STE

Upton ELECTRIC SALT BATH FURNACES

What Depth do You Want?

15 FT. 25 FT. 50 FT. ?

pton Electric Salt Bath Furnaces with
trodes at the very bottom of the pot
opened up a new era in heat
ting.

, slender work can be heat
ed vertically without distor-
, because the temperatures
ughout the entire depth
e pot are *uniform.*

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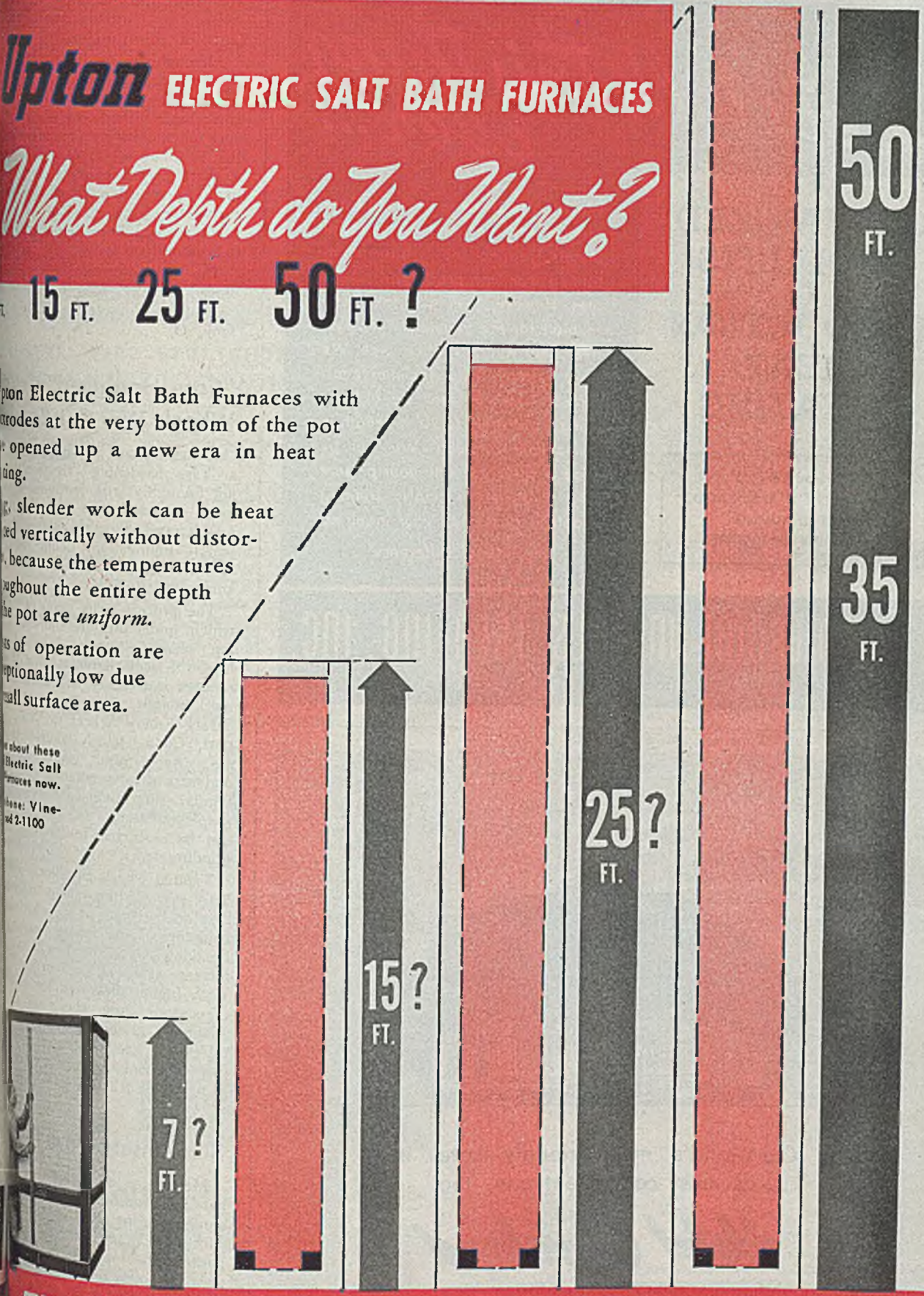
all surface area.

about these
Electric Salt
urnaces now.

hone: Vine-
od 2-1100



Upton ELECTRIC FURNACE DIV.

7455 MELVILLE AT GREEN • DETROIT 17, MICHIGAN

Let's talk this thing over...

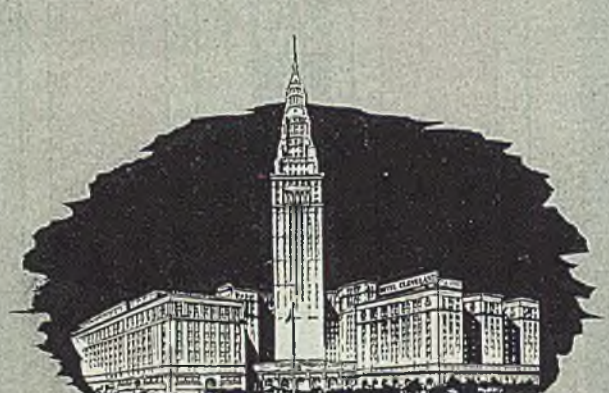
GALVANIZED PRODUCTS AND PRODUCTION HEAT TREATING

Manufacturers of
GALVANIZED & FABRICATED
WELDED TUBING
TENT POLE HARDWARE

We can't sit down to a Peace Conference just yet and Commercial Metals Treating, Inc. is busy maintaining war-time production schedules. However, we must take time to plan for the peacetime changeovers that will inevitably come. We have expanded our facilities enormously and will soon be able to handle pieces up to 20' in length in galvanized products. We will be glad to assist you with your present and post-war metals treating problems and invite your inquiries.

"A Material Difference"

COMMERCIAL METALS TREATING, INC.
TOLEDO, OHIO



Cleveland's most friendly hotel is its most convenient one, too.

Hotel Cleveland

CLEVELAND, OHIO

Directly connected with Union Passenger Terminal

and free the gasoline engine-driv welders for portable welding in other parts of the yard.

Although originally equipped with gasoline carburetors, these engine-driven arc welders ran for several months on natural gas rather than gasoline. Whenever engine-driven equipment such as this is to be set in one place for even a short period of time, it was found to be practicable to change over the carburetor from gasoline to a natural gas type and hook the engine directly to a natural gas feed.

The engine-driven arc welders employed on this project were produced by Hobart Brothers Co., Hobart Square, Troy, O.

"Case Hardened" Grinding Wheels Will Cut Carbides

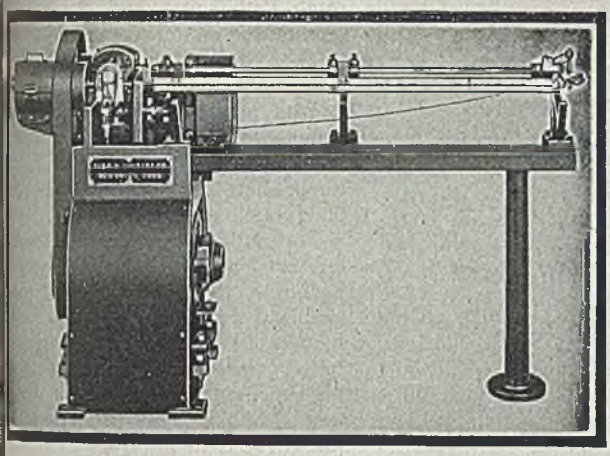
A method of giving grinding wheels a "case hardening" treatment comparing favorably with hardness of the diamond wheel is now, after years of research and test by Connecticut Research Foundation, being incorporated in standard production of the product known as BuXite.

The process coats grain of the wheel which, under pressure and heat of grinding, changes into a "case" or surface layer of such hardness that it rapidly reduces sintered carbide tools and other hard metals, according to Bridgeport Safety Emery Wheel Co. Inc., Bridgeport, Conn., which controls the process. As a result, previously difficult and expensive grinding can be done by regular shop workmen under ordinary shop conditions, and diamond wheels can be restricted to the most difficult grinding tasks.

Treated wheels cut cleanly and easily. This easy cutting quality relieves pressure on the grain of the wheel, allowing it to cut longer before wearing out or breaking out of bond, with consequent increase of wheel life from 5 to 20 times. With higher gloss and less break-down of contour, these wheels are said to be adaptable to form grinding, in addition to giving good results on tool steel, cast iron, brass, etc., whether employed in precision grinding or roughing cuts.

Steel Inserts Save Fuel

Meters for measuring the amount of gasoline transferred from one tank to another during flight of a Pan American Airlines' Clipper must be disconnected periodically for testing. Even though periodic, such removal made it impossible to prevent leaks, as the soft threads of the ports became worn after a few operations. Installation of Rosan lock-in steel inserts, manufactured by Rosan well & McAlister Inc., Hollywood, Calif., eliminated this condition, providing a hard-metal threaded opening, impervious to ordinary wear, and insert becomes an integral part of parent material.



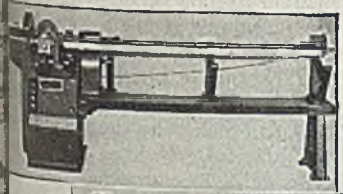
SHUSTER WIRE STRAIGHTENER TYPE A
Wire Capacity 1/32"—1/16" Diameter

Faster Cutting Speeds
GREATER PRODUCTION!

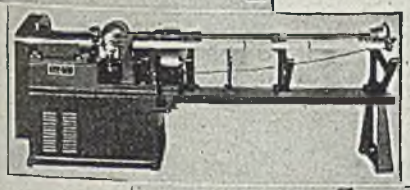
Outstanding Features—

Almost continuous wire travel
Lightning cut-off assures square-cut ends
High speed, direct driven 5-die straightening flier
Quiet, highly efficient V-belt motor drive
Ball and roller bearings throughout
Extremely rigid construction
Fully guaranteed as to material and workmanship.

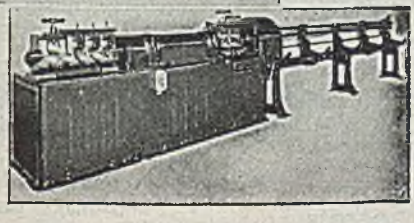
Descriptive folder on request.



Type 1A
1/16"—3/16"
Dia.



Type 2A
⅛"—¼"
Dia.



Type 3A
3/16"—3/8" Dia.
Type 4A (not shown)
3/8"—5/8" Dia.

The F. B. Shuster Mfg. Co., Inc., New Haven, Conn.

SHUSTER
Automatic
WIRE STRAIGHTENING
AND CUTTING
MACHINES
Since 1866

Give Solder STAYING Power

Photo Courtesy of Stanley Tools

USE KESTER FLUXES for Permanence!

Don't risk service difficulties, mechanical failures, with solder flux that won't hold tight! Chemically correct flux—and different fluxes for different types of operations—are imperative for permanent soldering. That's why Kester fluxes are scientifically compounded to form tight, clean solder-bonds resistant to shock, vibration, bending, contraction and expansion. They insure the lasting quality of your product!

For over 45 years Kester Fluxes have been tried, tested and proved dependable. There is a wide range of Kester flux formulas to fit every possible solder operation.

Consult Kester engineers for practical, experienced help in solving any solder problem you may have. They'll gladly suggest the right flux to protect your product—and at no obligation.

☆ BUY WAR BONDS ☆

KESTER SOLDER COMPANY
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Canadian Plant: Brantford, Ont.

KESTER
Solder Fluxes
STANDARD FOR INDUSTRY

Deep Drawn Refrigerator Hydrator Trays. Dies of Strenes. 2,000,000 Stampings When War Stopped the Run.

You

WILL BE A STRENES METAL ENTHUSIAST!

If you could cast to shape and lower the machining time on your die castings from ⅓ to ½—the saving in both time and cost would help immeasurably on your post-war tooling.

If you could draw and form several times as many pieces as formerly, even on deep draws, between redressings, that also would help.

Strenes metal dies for drawing and forming press work can give you the above results and should be investigated at once.

Practically all manufacturers of automobiles, trucks, tractors, farm implements, refrigerators, stoves use Strenes metal dies—as do firms in many other fields. So can you—and to your advantage in cost and time.

Names of users on request.

THE ADVANCE FOUNDRY CO.
119 Seminary Avenue
Dayton 3, Ohio

STRENES METAL
DRAWING AND FORMING DIE METAL

Book Notes

Welding Design Series By Kinkead Completed

Practical Design for AC Welding, Vol. III, by Robert E. Kinkead; cloth, 200 pages, 8½ x 11 inches; published by Hobart Bros. Co., Troy, O., for $3.50 three volume set, $10.

In the third and final volume of the Hobart welding design series, in addition to more idea stimulators in the first volumes the author has developed three lines of thought of interest to welding designers and fabricators. Twenty design plates show valuable hints on what not to do in designing for arc welding, showing common design faults, with suggestions for avoiding. In another 20 plates are shown the natural origin of many complex modern design principles. The final 20 pages show typical patents granted in connection with the welding process, suggesting that new methods may be protected by patents. Volumes I and II still are available at $3.50 each or $10 for the three.

Training for Supervisory Positions in Industry

Training for Supervision in Industry, by George H. Fern; cloth, 188 pages, 6 x 8½ inches; published by McGraw-Hill Book Co., New York, for $2.

This is one of the McGraw-Hill industrial organization and management series. The author is director of the Michigan State Board of Control for Vocational Education and is interested in other worker training projects. This work is an understandable treatment for those concerned with problems of training men for supervisory positions in industry, containing much that also will help the supervisor with his own program of upgrading and his training program. It explains the conference method and recommends it for accomplishing training and deals specifically with such supervisory problems as maintaining mental health in industry, handling problems of women workers, promoting safety, training new workers, disciplinary problems and other matters.

Industry Has Secrets To Make the World Over

Secrets of Industry, by Lewis C. Ord; cloth, 255 pages, 5 x 7⅜ inches; published by Emerson Books Inc., 251 West Nineteenth street, New York 11, for $3

The author has made a careful research into industry, labor and management, compared industrial methods in many countries and analyzes requirements and techniques of industrial efficiency. He believes that the wealth and trade of the nation depend on securing maximum industrial efficiency. In many industries the methods used to attain efficiency are closely guarded secrets and in others not even realized.

The volume contains valuable practical information for all whose concern is with large and economical output of commodities and there are implications bearing on future standards of living in the United States and the whole country of domestic and foreign trade.

The author concludes that these matters are intimately bound up with the welfare of the American people and with problems of world peace. Careful attention to the factors involved, combined with sound decisions, properly implemented, could yield for America a degree of prosperity and well being unprecedented in history.

Piping Handbook in New Edition Is Enlarged

Piping Handbook, by Sabin Crocker; fourth edition; cloth, 1376 pages, 4½ x inches; published by McGraw-Hill Book Co. Inc., New York, for $7.

In this fourth edition of this standard treatise its scope has been increased to include gas, refrigerating, hydraulic power and transmission piping and corrosion. The chapter on water supply piping has been considerably augmented and supplementary material of interest to hydraulic engineers has been added to the section on flow of water in pipes including several formulas.

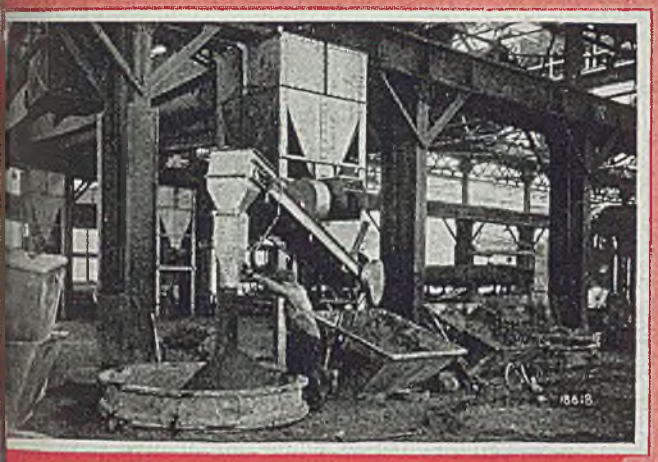
The volume makes available to the engineer, designer and contractor a compilation of data necessary to the effective use of piping in engineering and industrial applications, everything from water distribution to hydraulic systems for airplanes. It covers scientific fundamentals, materials, design and installation practice. It gives many useful and dependable construction details, cost analyses, dimensional standards, material specifications, definitions, charts and formulas.

—o—

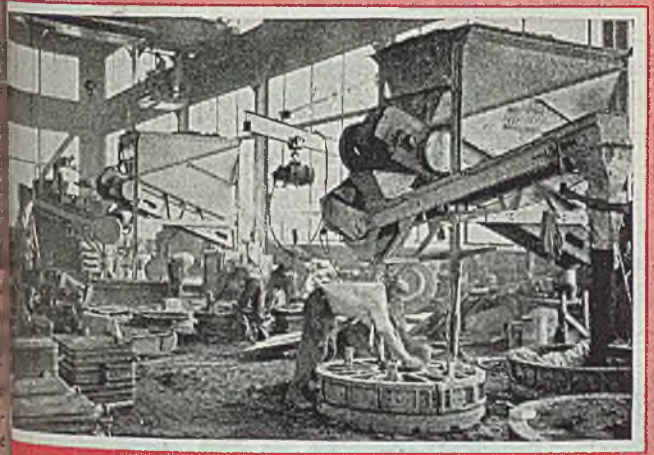
Mercury Arc Rectifiers Offer Extended Application

Use of Ignitron mercury arc rectifiers is expected to make practical extended electrification of railways in peacetime. It will be developed to a point where it can handle tremendous voltages and make possible transmission of direct current over long distances, according to Dr. Joseph Slepian, associate director of Westinghouse Research Laboratories, Pittsburgh.

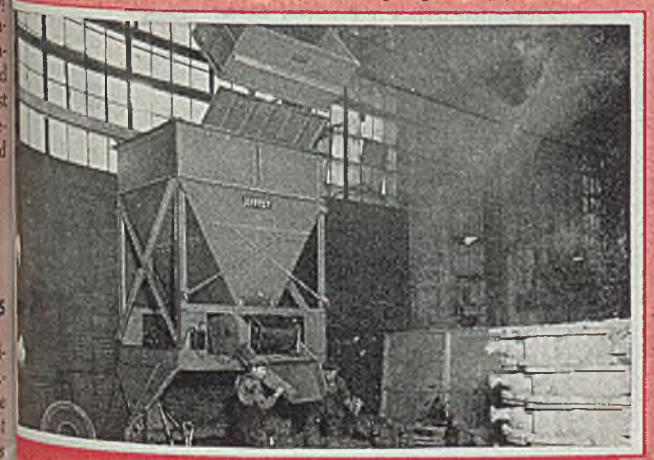
The Ignitron is made up of an evacuated tube containing a mercury pool in which is dipped an igniter, usually boron carbide, and having opposite it the other main electrode of anode. The mercury tube and its igniter at the bottom of the tube make up the cathode of the device. As the cathode only can emit electrons, a one-way street for the current is set up which does not pass the reverse cycle of alternating current, resulting in a pulsating or direct current.



JEFFREY FLASK FILLERS



TO FIT EVERY FOUNDRY



Fill Every Need

WITH THE TOUCH OF A BUTTON

Time for preparing a mold is often reduced one-third to one-half with Jeffrey Flaskfillers.

They eliminate back-breaking shoveling by directing a constant, easily-handled flow of sand into the flask under push-button control.

There are Jeffrey Flaskfillers in styles and sizes to meet every foundry condition. Let a Jeffrey Foundry Engineer make recommendations.

THE JEFFREY MANUFACTURING COMPANY

ESTABLISHED 1877

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Baltimore 2 Buffalo 2 Cleveland 13 Harlan Milwaukee 11 Pittsburgh 22
Birmingham 2 Chicago 1 Denver 2 Houston 6 New York 7 St. Louis 3
Boise 16 Cincinnati 2 Detroit 13 Huntington 19 Philadelphia 3 Salt Lake City 1
Scranton 3

THE BUSINESS TREND

Barometers Indicate Confidence in Future

SATISFACTION with the way total reconversion got started and confidence that readjustment of the nation's economy will be orderly and rapid are reflected in a number of business barometers, particularly stock market activity.

Through the latest week, industrial stocks continued their steady, upward trend and closed higher than at any time in the past eight years. Railroad and utilities stocks, while not as active as the industrials, showed marked gains in the latest week.

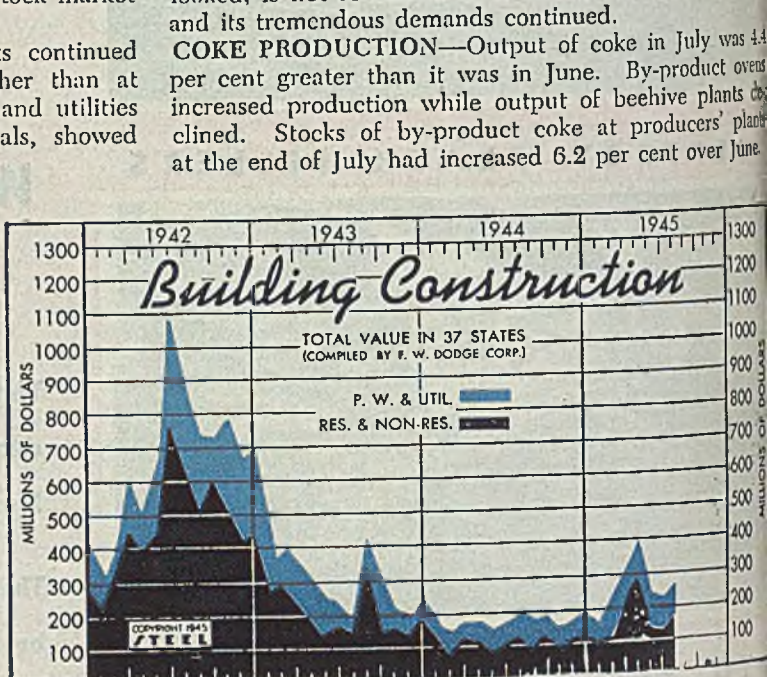
Uncertainties that accompany reconversion have had no dampening effect on financial institutions in their search for places to invest idle money. This situation was illustrated emphatically when a large oil company replaced $64.5 million 2⅞ per cent debenture bonds with a $50 million ten-year bank loan carrying the remarkably low rate of 1.72 per cent.

STEEL PRODUCTION — Reflecting its strength for peacetime operations, the steel industry has been staging a steady comeback in its ingot production rate from a victory holiday low. The Labor Day holiday had a temporary arresting effect on the rise of the weekly ingot rate, but unless some unexpected labor disturbances arise the weekly ingot rate is expected to resume its show of strength.

RETAIL TRADE—Despite country-wide layoffs, retail trade, a good barometer of the ability of the public to buy and of its optimism for the future, enjoyed a moderate increase in the latest week compared with the corresponding week of last year. Some economists have suggested that as some war-scarce commodities return to stores that the pent-up demand for them will be so great that even those people temporarily unemployed will use war savings to make purchases they otherwise would defer until they were re-employed. This consumer demand, those economists say, would stimulate industry and increase the speed toward a goal of full employment.

COAL OUTPUT—Bituminous coal production in the week ended Aug. 25 was at the highest rate since July 14, and was nearly equal to that of the corresponding week a year ago. Although production thus far in 1945 is 7.6 per cent less than it was for the corresponding period of last year that deficit, which cannot be overlooked, is not as serious as it would have been had war and its tremendous demands continued.

COKE PRODUCTION—Output of coke in July was 4.4 per cent greater than it was in June. By-product ovens increased production while output of beehive plants declined. Stocks of by-product coke at producers' plants at the end of July had increased 6.2 per cent over June.



Construction Valuation In 37 States
(Unit—$1,000,000)

	Total		Public Works-Utilities			Residential and Non-Residential		
	1945	1944	1945	1944	1943	1945	1944	194
January	140.9	159 2	39.8	50.3	85.8	101.2	108.9	284
February	147.0	137.2	32.0	55.1	112.9	115.0	82.1	280
March	328.9	176.4	90.6	61.3	123.0	238.3	115.1	216
April	395.8	179 3	111.9	72.0	127.7	283.9	107.3	175
May	242.5	144.2	107.9	55.8	95.8	134.6	88.4	168
June	227.3	163.9	95.0	70.7	73.3	132.3	93.1	156
July	257.7	190.5	89.9	80.5	50.0	167.8	110 0	183
August	....	169.3	....	69.4	73.4	....	99.9	840
September	....	175.7	....	64.1	175.1	....	111.6	125
October	....	144.8	....	52.2	63.5	....	92.6	150
November	....	164.9	....	48.0	59.0	....	116.9	185
December	....	188.5	....	66.6	67.4	....	121.8	184
Total	....	1,993.9	....	746.0	1,106.9	....	1,247.7	2,291

FIGURES THIS WEEK

	Latest Period*	Prior Week	Month Ago	Year Ago
INDUSTRY				
Steel Ingot Output (per cent of capacity)	75	70	89.5	96.5
Electric Power Distributed (million kilowatt hours)	4,200†	4,116	4,432	4,415
Bituminous Coal Production (daily av.—1000 tons)	2,008	1,157	1,988	2,013
Petroleum Production (daily av.—1000 bbls.)	4,590†	4,892	4,922	4,658
Construction Volume (ENR—Unit $1,000,000)	$35.3	$23.0	$76.4	$60.3
Automobile and Truck Output (Ward's—number units)	13,845	14,880	18,690	20,055
TRADE				
Freight Carloadings (unit—1000 cars)	885†	853	864	898
Business Failures (Dun & Bradstreet, number)	6†	16	18	14
Money in Circulation (in millions of dollars)‡	$27,600	$27,506	$27,130	$23,221
Department Store Sales (change from like week a year ago)‡	+6%	−17%	+15%	+18

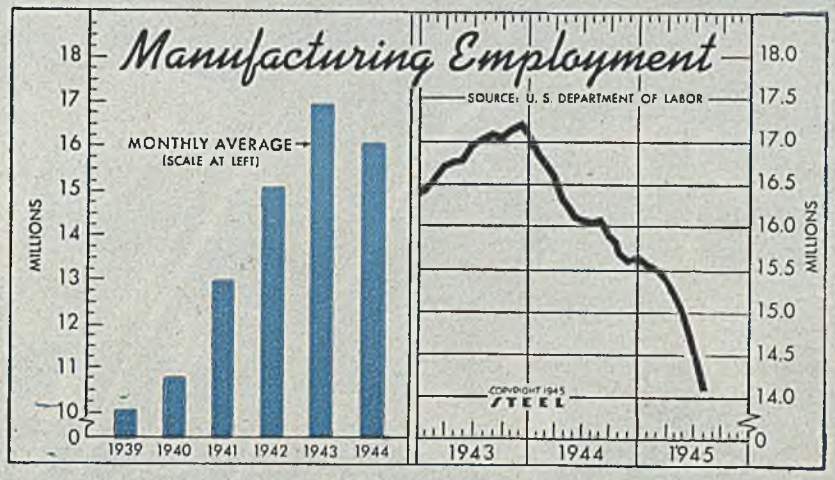
*Dates on request. †Preliminary.

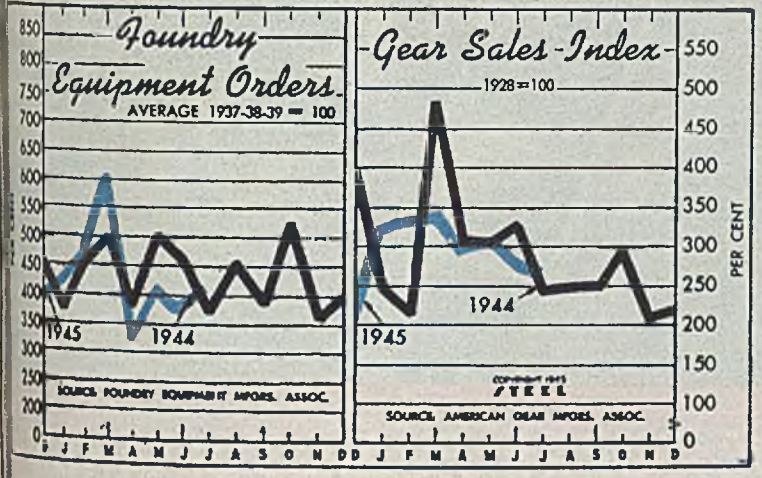
†Preliminary. ‡Federal Reserve Board.

Factory Employment

(000 omitted)

	1945	1944	1943
January	15,535	16,825	16,423
February	15,517	16,735	16,599
March	15,368	16,559	16,747
April	15,102	16,309	16,774
May	14,811	16,122	16,753
June	14,528	16,093	16,908
July	14,100	16,013	17,059
August	.....	16,023	17,182
September	.....	15,843	17,136
October	.....	15,692	17,194
November	.....	15,607	17,238
December	.....	15,632	17,080
Monthly Ave.	.....	16,121	16,924



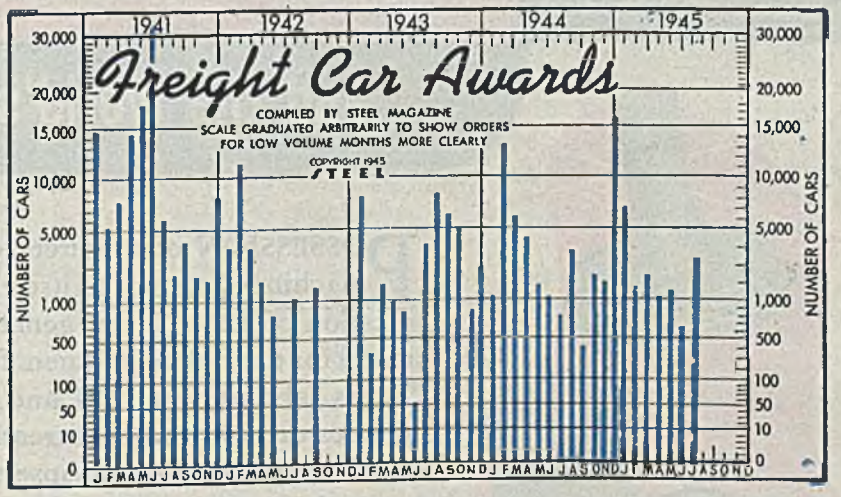


Foundry Equipment Orders and Gear Sales

	Foundry Equipment Orders, Monthly Average (1937-38-39=100)			Gear Sales Index (1928=100)		
	1945	1944	1943	1945	1944	1943
Jan.	422.4	378.3	429.8	323	216	268
Feb.	465.3	456.8	399.5	331	214	303
Mar.	601.7	498.4	562.7	339	485	334
Apr.	325.0	385.7	362.7	296	308	240
May	401.7	503.9	348.9	309	305	312
June	375.4	466.1	413.6	271	328	401
July	411.7	375.8	379.4	264	212	374
Aug.	....	450.5	390.1	...	217	312
Sept.	....	388.0	346.6	...	248	320
Oct.	....	526.5	436.6	...	293	368
Nov.	....	369.5	388.0	...	209	387
Dec.	....	397.4	442.8	...	219	387
Ave.	....	433.1	408.4	...	279	336

Freight Car Awards

	1945	1944	1943	1942
.....	7200	1,020	8,365	4,253
.....	1,750	13,240	350	11,725
.....	2,300	6,510	1,935	4,080
.....	1,120	4,519	1,000	2,125
.....	1,526	1,952	870	822
.....	670	1,150	50	0
.....	3,500	795	4,100	1,025
.....	....	3,900	8,747	0
.....	....	400	6,820	1,863
.....	....	2,425	5,258	0
.....	....	1,065	870	0
.....	....	16,245	2,919	135
.....	....	53,221	41,374	26,028



FINANCE

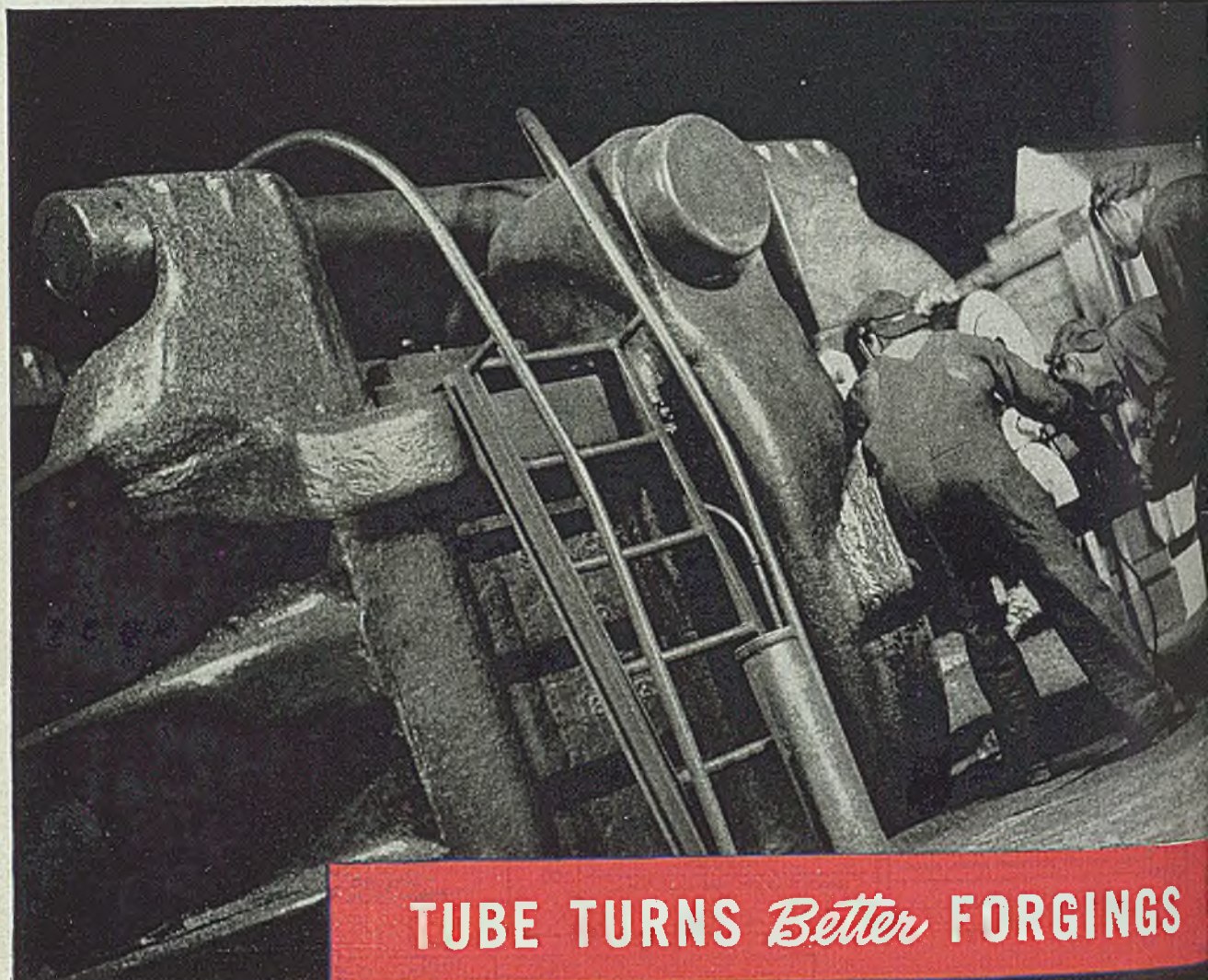
	Latest Period*	Prior Week	Month Ago	Year Ago
Bank Clearings (Dun & Bradstreet—millions)	$9,943	$9,023	$10,477	$8,639
Federal Gross Debt (billions)	$263.4	$263.2	$262.5	$211.2
Bond Volume, NYSE (millions)	$118.9	$42.9	$19.6	$24.9
Stocks Sales, NYSE (thousands)	5,767	5,756	3,541	3,311
Loans and Investments (billions)†	$62.7	$63.1	$63.9	$55.9
United States Gov't. Obligations Held (millions)†	$46,455	$46,770	$47,312	$41,875

†Member banks, Federal Reserve System.

PRICES

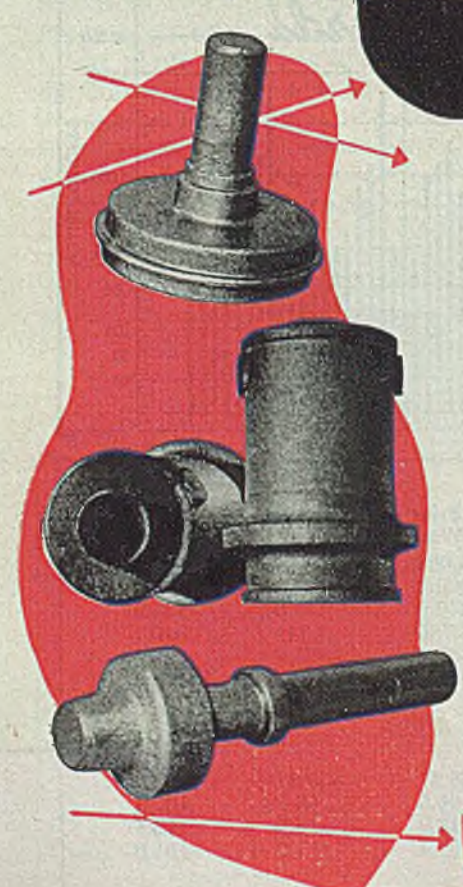
STEEL's composite finished steel price average	$58.27	$58.27	$58.27	$56.73
All Commodities†	105.5	105.5	105.8	103.5
Industrial Raw Materials†	116.9	116.9	118.5	112.5
Manufactured Products†	102.1	102.1	101.9	101.0

†Bureau of Labor Statistics Index, 1926 = 100.



TUBE TURNS *Better* FORGINGS

and the world's largest upsetter



POSSESSION of a battery of the world's largest upset forgi machines does not of itself prove top quality. Rather, it is an dication of Tube Turns' general attitude toward equipment—a mand for the right equipment for the right job whether it be in Tu Turns laboratories, tool and die shop, in upset and mechani presses or precision heat treating furnaces.

It is true that this giant upsetter and its mates have achieved res never before known, with steel and light alloys. Top-flight Tu Turns metallurgists developed new technique and abilities to m wartime emergencies. These new skills and methods are now ava able to improve peacetime products of American industry. So a are the magnificent facilities of the great Tube Turns plants.

Let these facilities and the experience of these men work for to consider how forgings can help your products compete the active markets of the near future. Write, without obligation Tube Turns (Inc.), Louisville 1, Kentucky.

TUBE TURNS *Forgings for Industr*

eelmakers Face Problems Adjusting to Peace

Disposal of CMP orders and effect of new priorities not clear . . . Progress made in scheduling production—All markets firm

STANTIAL headway is being made in setting up schedbut steel mills still find problems ahead, apart from those from cancellations and the difficulty of many conin appraising their requirements accurately.

ough there will be no further Controlled Material Plan nts after Sept. 30, the question still puzzles many whether validated orders already on books for fourth r should be given preference over the general run of requirements. Informed opinion is that WPB imposes obligation, with the matter entirely up to the producers es. Undoubtedly as many of these orders represent ntracts they will be filled to the general satisfaction of sumers.

re also is renewed speculation as to the extent of MM tonnage that may develop next quarter. Such busiuld take precedence over ordinary civilian work. While ected at best to be too heavy, the opinion nevertheless that that MM tonnage may be heavier than originally d. Also, CC ratings, proposed for expediting essenilian work, may cover a wider scope than earlier ex- Some trade interests look not only for canners to such ratings but possibly the automobile industry and particularly with regard to rails, and the utilities, others.

to be cleared up more definitely are the policies reexports, particularly with regard to substantial comsmade originally under lend-lease and still, it is unto be held on the books. Meanwhile some large tions are still being noted, although in general the of canceled tonnage is shrinking appreciably and pro-

DISTRICT STEEL RATES

Percentage of Ingot Capacity Engaged in Leading Districts

	Week Ended Sept. 8	Change	Same Week 1944	Same Week 1943
Pittsburgh	65.5	+0.5	89	100
Chicago	72	—9	99.5	99
Eastern Pa.	72	None	95	95
Youngstown	72	—4	90	97
Wheeling	95	+4	97	99
Cleveland	78.5	—5	92	94
Buffalo	72	+7	88.5	90.5
Birmingham	95	None	95	100
New England	80	+2	85	95
Cincinnati	82	+2	87	94
St. Louis	65	None	87	90.5
Detroit	89	None	89	90
Average	73.5	—1.5	96	99.5

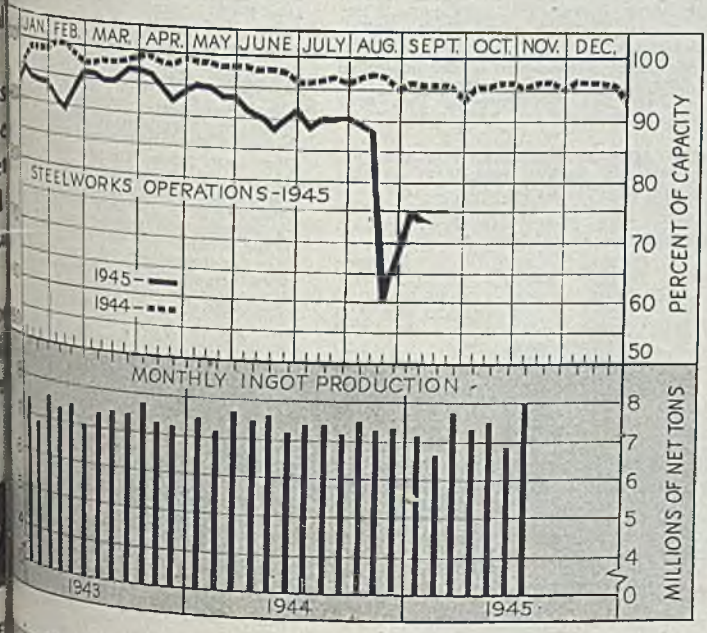
*Based on steelmaking capacities as of these dates.

ducers are booking tonnage more freely. Sheet and strip orders are fast filling up cancellation gaps in fourth quarter schedules and in some lines, notably galvanized and silicon sheets, most mills are booked solidly well into next year. However, full effect of MM and CC ratings remains to be seen.

Steelworks operations last week showed effects of shutdowns for Labor Day and the national rate is estimated at 73½ per cent of capacity, a drop of 1½ points from the prior week. A number of districts overcame the holiday effect and advanced production slightly. Cincinnati gained 2 points to 82 per cent, Pittsburgh ½-point to 65½, Wheeling 4 points to 95, New England 2 points to 80 and Buffalo 7 points to 72. Chicago dropped 9 points to 72, Youngstown 4 points to 72 and Cleveland 5 points to 78½. Rates were unchanged as follows: Birmingham 95, St. Louis 65, eastern Pennsylvania 72, and Detroit 89.

Strength in scrap continues, with large consumers paying ceiling prices for steelmaking grades and no weakness visible, except perhaps in lack of buying of borings and turnings, which are in far smaller supply than formerly. With a view to enlarged steel production and following usual preparations for a reserve for winter melters are taking all offerings of best grades.

Despite slackened steel production while industry readjusts to peacetime conditions movement of iron ore from Lake Superior mines shows little change. August saw 10,731,804 gross tons loaded at the head of the lakes, only 1,556,449 tons less than moved in August last year. To Sept. 1 the tonnage moved was 51,128,672 tons, compared with 54,574,672 tons to the same date in 1944. Expected heavy steel production during the winter causes consumers to desire to build up reserves to a better level than existed last winter. Qualified observers believe the season total will be close to 80 million tons, compared with 81,170,538 tons in the 1944 season.



COMPOSITE MARKET AVERAGES

	Sept. 8	Sept. 1	Aug. 25	One Month Ago Aug., 1945	Three Months Ago June, 1945	One Year Ago Aug., 1944	Five Years Ago Aug., 19
Finished Steel	$58.27	$58.27	$58.27	$58.27	$58.27	$56.73	$56
Semifinished Steel	37.80	37.80	37.80	37.80	36.45	36.00	36
Steelmaking Pig Iron ..	24.05	24.05	24.05	24.05	24.05	23.05	23
Steelmaking Scrap	19.17	19.17	19.17	19.07	19.07	19.17	19

Se .inished 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, Chi ago, Cleveland, Neville Island, Granite City and Youngstown. Steelmaking Scrap Composite:—Average of No. 1 heavy melting steel prices at Pittsburgh, Chicago and eastern Pennsylvania. Finished steel, net tons, o

COMPARISON OF PRICES

Representative Market Figures for Current Week; Average for last Month, Three Months and One Year Ago

Finished Material	Sept. 8, 1945	Aug., 1945	June, 1945	Sept., 1944
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	2.17	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 5/16-inch, Pitts.	2.15	2.15	2.15	2.00

Pig Iron	Sept. 8, 1945	Aug., 1945	June, 1945
Bessemer, del. Pittsburgh	$26.19	$26.19	$26.19
Basic, Valley	24.50	24.50	24.50
Basic, eastern del. Philadelphia	26.34	26.34	26.34
No. 2 fdry., del. Pitts., N.&S. Sides...	25.69	25.69	25.69
No. 2 foundry, Chicago	25.00	25.00	25.00
Southern No. 2, Birmingham	21.38	21.38	21.38
Southern No. 2 del. Cincinnati	25.30	25.30	25.30
No. 2 fdry., del. Philadelphia	26.84	26.84	26.84
Malleable, Valley	25.00	25.00	25.00
Malleable, Chicago	25.00	25.00	25.00
Lake Sup., charcoal del. Chicago	37.34	37.34	37.34
Gray forge, del. Pittsburgh	25.19	25.19	25.19
Ferromanganese, del. Pittsburgh	140.33	140.33	140.33

Scrap			
Heavy melting steel, No. 1 Pittsburgh	$20.00	$20.00	$20.00
Heavy melt. steel, No. 2, E. Pa.	18.75	18.75	18.45
Heavy melting steel, Chicago	18.75	18.75	18.75
Rails for rolling, Chicago	22.25	22.25	22.25
No. 1 cast, Chicago	20.00	20.00	20.00

Coke			
Connellsville, furnace, ovens	$7.50	$7.50	$7.50
Connellsville, foundry ovens	8.25	8.25	8.25
Chicago, by-product fdry., del.	13.35	13.67	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 1945. The schedule covers all iron or steel ingots, all semifinished iron or steel products, all finished hot-rolled, cold-rolled iron or steel pro and any iron or steel product which is further finished by galvanizing, plating, coating, drawing, extruding etc., although only principal e lished basing points for selected products are named specifically. Seconds and off-grade products are also covered. Exceptions applying to vidual 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 Kaiser Co. Inc., $43, f.o.b. Pacific ports.)

Alloy Steel Ingots: Pittsburgh, Chicago, Buffalo, Bethlehem, Canton, Massillon; uncrop, $45.

Rerolling Billets, Blooms, Slabs: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Sparrows Point, Birmingham, Youngstown, $36; Detroit, del. $38; Duluth (bll) $38; Pac. Ports, (bll) $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., Kaiser Co. Inc., $58.64, Pac. ports.)

Forging Quality Blooms, Slabs, Billets: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham, Youngstown, $42. Detroit, del. $44; Duluth, billets, $44; forg. bll. 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., Kaiser Co. Inc., $64.64, Pacific ports.)

Open Hearth Shell Steel: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Youngstown, Birmingham, base 1000 tons one size and section; 3-12 in., $52; 12-18 in., excl., $54.00; 18 in. and over $56. Add $2.00 del. Detroit; $3.00 del. Eastern Mich. (Kaiser Co. Inc., $76.64, f.o.b. Los Angeles.)

Alloy Billets, Slabs, Blooms: Pittsburgh, Chicago, Buffalo, Bethlehem, Canton, Massillon, $54, del. Detroit $56, Eastern Mich. $57.

Sheet Bars: Pittsburgh Chicago, Cleveland, Buffalo, Canton, Sparrows Point, Youngstown, $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.ob. mill.)

Skelp: Pittsburgh, Chicago, Sparrows Point, Youngstown, Coatesville, lb., 1.90c.

Wire Rods: Pittsburgh, Chicago, Cleveland, Birmingham, 5—5/16 in. inclusive, per 100 lbs., $2.15 Do., over 5/16—47-in., incl., $2.30; Galveston, base, 2.25c and 2.40c, respectively. Worcester add $0.10; Pacific ports $0.50 (Pittsburgh Steel Co., $0.20 higher.)

Bars

Hot-Rolled Carbon Bars and Bar-Size Shapes under 3 : Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham base 20 tons one size, 2.25c; Duluth, base 2.35c; Mahoning Valley 2.32½c; 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. & Suply Co., may quote 2.35c, Chicago base; Sheffield Steel Corp., 2.75c, f.o.b. St Louis.)

Rail Steel Bars: Same prices as for hot-rolled carbon bars except base is 5 tons.

(Sweet's Steel Co., Williamsport, Pa., may quote rail steel merchant bars 2.33c f.o.b. mill.)

Hot-Rolled Alloy Bars: Pittsburgh, Chicago, Canton, Massillon, Buffalo, Bethlehem, base 20 tons one size, 2.70c; Detroit, del., 2.80c.

(Texas Steel Co. may use Chicago base price as maximum f.o.b. Fort Worth, Tex., price on sales outside Texas, Oklahoma.)

AISI Series	(*Basic O-H)	AISI Series	(*Basic O-H)
1300.....	$0.10	4100	(.15-.25 Mo) 0.70
			(.20-.30 Mo) 0.75
2300.....	1.70	4300	..... 1.70
2500.....	2.55	4600	..... 1.20
3000.....	0.50	4800	..... 2.15
3100.....	0.85	5100	..... 0.35
3200.....	1.35	5130 or 5152....	0.45
3400.....	3.20	6120 or 6152....	0.95
4000.....	0.45-0.55	6145 or 6150....	1.20

*Add 0.25 for acid open-hearth; 0.50 electric.

Cold-Finished Carbon Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, base 20,000-39,999 lbs., 2.75c; 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 f on hot-rolled bars from Buffalo to Mansf

Cold-Finished Alloy Bars: Pittsburgh, Ch Gary, Cleveland, Buffalo, base 3.35c; De del. 3.45c; Eastern Mich. 3.50c.

Reinforcing Bars (New Billet): Pitts Chicago, Gary, Cleveland, Birmingham, rows Point, Buffalo, Youngstown, base Detroit del. 2.25c; Eastern Mich. and T 2.30c; Gulf ports, dock 2.50c; Pacific dock 2.55c.

Reinforcing Bars (Rail Steel): Pittsburgh cago, Gary, Cleveland, Birmingham, Yo town, Buffalo base 2.15c; Detroit, del. Eastern Mich. and Toledo 2.30c; Gulf dock 2.50c.

Iron Bars: Single refined, Pitts. 4.40c; refined 5.40c; Pittsburgh, staybolt, 5.75c; Haute, single ref., 5.00, double ref., 6.2

Sheets, Strip

Hot-Rolled Sheets: Pittsburgh, Chicago, Cleveland, Birmingham, Buffalo, Youngs Sparrows Pt., Middletown, base 2.20c; G City, base 2.30c; Detroit del. 2.30c; E Mich. 2.35c; Phila. del. 2.37c; New York 2.44c; Pacific ports 2.75c.

(Andrews Steel Co. may quote hot-rolled for shipment to Detroit and the Detroit on the Middletown, O., base; Alan Wood Co., Conshohocken, Pa., may quote 2. hot carbon sheets, nearest eastern basing

Cold-Rolled Sheets: Pittsburgh, Chicago, land, Gary, Buffalo, Youngstown, Middl base, 3.05c; Granite City, base 3.15c; del. 3.15c; Eastern Mich. 3.20c; New Yo 3.30c; Phila. del. 3.37c; Pacific ports

Galvanized Sheets, No. 24: Pittsburgh cago, Gary, Birmingham, Buffalo, Young Sparrows Point, Middletown, base 3.70c; ite City, base 3.80c; New York del. Phila. del. 3.87c; Pacific ports 4.25c.

(Andrews Steel Co. may quote galv sheets 3.75c at established basing po

Corrugated Galv. Sheets: Pittsburgh, C Gary, Birmingham, 29 gage, per square

Culvert Sheets: Pittsburgh, Chicago, Birmingham, 16 gage not corrugated, alloy 3.60c; Granite City 3.70c; Pacific 4.25c; copper iron, 3.90c; pure iron 3.85 coated, hot-dipped, heat-treated, No. 24 burgh, 4.25c.

Sheets: 10-gage; Pittsburgh, Chi- Gary, Cleveland, Youngstown, Middle- base, 2.85c; Granite City, base 2.95c; del. 2.95c; eastern, Mich. 3.00c; Pa- ports 3.50c; 20-gage; Pittsburgh, Chicago, Cleveland, Youngstown, Middletown, 3.45c; Detroit del. 3.55c; eastern Mich. Pacific ports 4.10c.

Sheets No. 24:

	Pittsburgh Base	Pacific Ports	Granite City
grade	3.30c	4.05c	3.30c
ature	3.65c	4.40c	3.75c
ctrical	4.15c	4.90c	4.25c
	5.05c	5.80c	5.15c
amo	5.75c	6.50c	5.85c
ansformer			
	6.25c	7.00c	.....
	7.25c	8.00c	.....
	7.75c	8.50c	.....
	8.55c	9.30c	.....

Rolled Strip: Pittsburgh, Chicago, Gary, land, Birmingham, Youngstown, Middle- base 1 ton and over, 12 inches wide less 2.10c; Detroit del. 2.20c; Eastern 2.25c; Pacific ports 2.75c (Joslyn Mfg. may quote 2.30c, Chicago base.)

Rolled Strip: Pittsburgh, Cleveland, stown, 0.25 carbon and less 2.80c; Chi- base 2.90c; Detroit, del. 2.90c; Eastern 2.95c; Worcester base 3.00c.

modity C. R. Strip: Pittsburgh, Cleveland gstown, base 3 tons and over, 2.95c; 3.05c; Detroit del. 3.05c; Eastern 3.10c; Worcester base 3.35c.

Finished Spring Steel: Pittsburgh, Cleve- bases, add 20c for Worcester; .26-.50 2.80c; .51-.75 Carb., 4.30c; .76-1.00 6.15c; over 1.00 Carb., 8.35c.

Terne Plate

Plate: Pittsburgh, Chicago, Gary, 100-lb. box, $5.00; Granite City $5.10.

Tin Plate: Pittsburgh, Gary, 100- box, 0.50 lb. tin, $4.50; 0.75 lb. tin

Mill Black Plate: Pittsburgh, Chicago, base 29 gage and lighter, 3.05c; Granite 3.15c; Pacific ports, boxed 4.05c.

Ternes: Pittsburgh, Chicago, Gary, No. assorted 3.80c; Pacific ports 4.55c.

facturing Ternes: (Special Coated) Pitts- Chicago, Gary, 100-base box $4.30; City $4.40.

Ternes: Pittsburgh base per pack- sheets; 20 x 28 in., coating I.C. 8-lb. 15-lb. $14.00; 20-lb. $15.00; 25-lb. $16; $17.25; 40-lb. $19.50.

...les

Steel Plates: Pittsburgh, Chicago, Cleveland, Birmingham, Youngstown, Point, Coatesville, Claymont, 2.25c; York, del. 2.44c; Phila., del. 2.30c; 2.49c; Boston, del. 2.57-82c; Pacific 2.80c; Gulf ports, 2.60c.

City Steel Co. may quote carbon 2.35c f.o.b. mill; 2.65c f.o.b. D.P.C. Kaiser Co. Inc., 3.20c, f.o.b. Los Angeles. Iron & Steel Co. 2.50c f.o.b. basing Geneva Steel Co., Provo, Utah, 3.20c, Pac. ports.)

Plates: Pittsburgh, Chicago, 3.50c; ports, 4.15c.

Hearth Alloy Plates: Pittsburgh, Chi- Coatesville, 3.50c; Gulf ports 3.95c; ports 4.15c.

Iron Plates: Pittsburgh, 3.80c.

...pes

Shapes: Pittsburgh, Chicago, Gary, ham, Buffalo, Bethlehem, 2.10c; New 2.27c; Phila., del. 2.215c; Pacific 2.75c.

Iron Co., Phoenixville, Pa., may carbon steel shapes at 2.35c at estab- basing points and 2.50c, Phoenixville, Sheffield Steel Corp., 2.55c f.o.b. Geneva Steel Co., 3.25c, Pac. ports; Co. Inc., 3.20c f.o.b. Los Angeles).

Steel Piling: Pittsburgh, Chicago, Buf-

Products, Nails

Pittsburgh, Chicago, Cleveland, Birm- (except spring wire) to manufac- carloads (add $2 for Worcester, $1

basic, bessemer wire 2.75c
wire 3.35c
Pittsburgh Steel Co., 0.20c higher.)

Products to the Trade:
and Cement-coated wire nails, staples, 100-lb. keg, Pittsburgh, Birmingham, Cleveland, Du- $2.90; galvanized, $2.55; Pac. .... $3.40 and $3.05
fence wire, 100-lb., Pittsburgh, Cleveland 3.20c
fence wire, 100 lb., Pitts- Chicago, Cleveland 3.55c
15½ gage and heavier, per .... .67c
80-rod spool, Pittsburgh, Chicago, Birmingham, column 70; twisted wire, column 70.

...Goods

Pipe: Base price in carloads, threaded and coupled to consumers about $200 per net ton. Base discounts on steel pipe Pittsburgh and Lorain, O.; Gary, Ind. 2 points less on lap weld, 1 point less on butt weld. Pittsburgh base only on wrought iron pipe.

Butt Weld

Steel In.	Blk.	Galv.	Iron In.	Blk.	Galv.
⅛	56	33	½	24	3½
¼ & ⅜	59	40½	¾	30	10
½	63½	51	1-1¼	34	16
¾	66½	55	1½	38	18½
1-3	68½	57½	2	37½	18

Lap Weld

Steel In.	Blk.	Galv.	Iron In.	Blk.	Galv.
2	61	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
9-19	64½	52	4	33½	18
11-12	63½	51	4½-8	32½	17
			9-12	28½	12

Boiler Tubes: Net base prices per 100 feet f.o.b. Pittsburgh in carload lots, minimum wall, cut lengths 4 to 24 feet, inclusive.

O.D. Sizes	B.W.G.	—Seamless— Hot Rolled	Cold Drawn	—Lap Weld— Steel	Charcoal Iron
1"	13	$ 7.82	$ 9.01	.....	.....
1¼"	13	9.26	10.67	.....	.....
1½"	13	10.23	11.72	$ 9.72	$23.71
1¾"	13	11.64	13.42	11.06	22.93
2"	13	13.04	15.03	12.38	19.35
2¼"	13	14.54	16.76	13.79	21.63
2¼"	12	16.01	18.45	15.16	.....
2½"	12	17.54	20.21	16.58	26.57
2¾"	12	18.59	21.42	17.54	29.00
3"	12	19.50	22.48	18.35	31.38
3½"	11	24.63	28.37	23.15	39.81
4"	10	30.54	35.20	28.66	49.90
4½"	10	37.35	43.04	35.22	.....
5"	9	46.87	54.01	44.25	73.93
6"	7	71.96	82.93	68.14	.....

Rails; Supplies

Standard rails, over 60-lb., f.o.b. mill, gross ton, $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, base, cents per lb.; Reg. carbon 14.00c, extra carbon 18.00c; special carbon 22.00c; oil-hardening 24.00c; high car.-chr. 43.00c.

Tung.	Chr.	Van.	Moly.	Pitts. base per lb
18.00	4	1	...	67.00c
1.5	4	1	8.5	54.00c
.....	4	2	8	54.00c
6.40	4.15	1.90	5	57.50c
5.50	4.50	4	4.50	70.00c

Stainless Steels

Base, Cents per lb.—f.o.b. Pittsburgh

Type	Bars	Plates	Sheets	H. R. Strip	C. R. Strip
CHROMIUM NICKEL STEEL					
302...	24.00c	27.00c	34.00c	21.50c	28.00c
303...	26.00	29.00	36.00	27.00	33.00
304...	25.00	29.00	36.00	23.50	30.00
308...	29.00	34.00	41.00	28.50	35.00
309...	36.00	40.00	47.00	37.00	47.00
310...	49.00	52.00	53.00	48.75	56.00
312...	36.00	40.00	49.00	.....	.....
*316...	40.00	44.00	48.00	40.00	48.00
†321...	29.00	34.00	41.00	29.25	38.00
‡347...	33.00	38.00	45.00	33.00	42.00
431...	19.00	22.00	29.00	17.50	22.50
STRAIGHT CHROMIUM STEEL					
403..	21.50	24.50	29.50	21.25	27.00
**410..	18.50	21.50	26.50	17.00	22.00
416..	19.00	22.00	27.00	18.25	23.50
††420..	24.00	28.50	33.50	23.75	36.50
430..	19.00	22.00	29.00	17.50	22.50
‡‡430F.	19.50	22.50	29.50	18.75	24.50
440A.	24.00	28.50	33.50	23.75	36.50
442..	22.50	25.50	32.50	24.00	32.00
443..	22.50	25.50	32.50	24.00	32.00
446..	27.50	30.50	36.50	35.00	52.00
501..	8.00	12.00	15.75	12.00	17.00
502..	9.00	13.00	16.75	13.00	18.00
STAINLESS CLAD STEEL (20%)					
304..	.....	§§18.00	19.00	.....	.....

*With 2-3% moly. †With titanium. ‡With columbium. **Plus machining agent. ††High carbon. ‡‡Free machining. §§Includes annealing and pickling.

Basing Point Prices are (1) those announced by U. S. Steel Corp. subsidiaries for first quarter of 1941 or in effect April 16, 1941 at designated basing points or (2) those prices announced or customarily quoted by other producers at the same designated points. Base prices under (2) cannot exceed those under (1) except to the extent prevailing in third quarter of 1940.

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 prices, wasters 75%, waste-wasters 65% except plates, which take waster prices; tin plate $2.80 per 100 lbs.; terne plate $2.25; semifinished 85% of primes; other grades limited to new material ceilings.

Export ceiling prices may be either the aggregate of (1) governing basing point or emergency basing point (2) export extras (3) export transportation charges provided they are the f.a.s. seaboard quotations of the U. S. Steel Export Co. on April 16, 1941.

Bolts, Nuts

F.o.b. Pittsburgh, Cleveland, Birmingham, Chicago. Discounts for carloads additional 5%, full containers, add 10%

Carriage and Machine

½ x 6 and smaller ....65½ off
Do., $\frac{7}{16}$ and ⅝ x 6-in. and shorter....63½ off
Do., ¾ to 1 x 6-in. and shorter...... 61 off
1⅛ and larger, all lengths .... 59 off
All diameters, over 6-in. long .... 59 off
Tire bolts .... 50 off
Step bolts .... 56 off
Plow bolts .... 65 off

Stove Bolts

In packages with nuts separate 71-10 off; with nuts attached 71 off; bulk 80 off on 15,000 of 3-inch and shorter, or 5000 over 3-in.

Nuts

	U.S.S.	S.A.E.
Semifinished hex		
$\frac{7}{16}$-inch and less	62	64
½-1-inch	59	60
1⅛-1½-inch	57	58
1⅝ and larger	56	

Hexagon Cap Screws

Upset 1-in., smaller .... 64 off
Milled 1-in., smaller .... 60 off

Square Head Set Screws

Upset, 1-in., smaller .... 71 off
Headless, ¼-in., larger .... 60 off
No. 10, smaller .... 70 off

Piling

Pittsburgh, Chicago, Buffalo 2.40c

Rivets, Washers

F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham

Structural 3.75c
$\frac{7}{16}$-inch and under ....65-5 off
Wrought, Washers, Pittsburgh, Chicago, Philadelphia, to jobbers and large nut, bolt manufacturers l.c.l.....$2.75-3.00 off

Metallurgical Coke

Price Per Net Ton

Beehive Ovens

Connellsville, furnace	*7.50
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	†13.75
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 13.25c
Do., tank cars 11.50c

Eastern Plants, per lb.
Naphthalene flakes, balls, bbls., to jobbers 8.00c

Per ton, bulk, f.o.b. port
Sulphate of ammonia $29.20

WAREHOUSE STEEL PRICES

Base delivered price, cents per pound, for delivery within switching limits, subject to established extras.

	Hot rolled bars	Structural shapes	Plates	Floor plates	Hot rolled sheets (10 gage base)	Hot rolled bands (12 gage and heavier)	Hot rolled hoops (14 gage and lighter)	Galvanized flat sheets (24 gage base)	Cold-rolled sheets (17 gage base)	Cold finished bars	Cold-rolled strip	NE hot bars 8600 series	NE hot bars Zi
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[21]	4.715	6.012[22]	6.01[2]
New York	3.853[1]	3.758[1]	3.768[1]	5.574[1]	3.590[1]	3.974[1]	3.974[1]	5.010[13]	4.613[14]	4.203[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[13]	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[26]	4.172[21]	4.772	5.816[22]	5.860
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[26]	4.152[21]	.....	.....	.....
Washington	3.941[1]	3.930[1]	3.798[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.*	.....	3.45[1]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Claymont, Del.*	.....	.....	3.45[1]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Coatesville, Pa.*	.....	.....	3.45[1]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Buffalo (city)	3.35[1]	3.40[1]	3.68[1]	5.26[1]	3.35[1]	3.819[1]	3.819[1]	4.75[15]	4.40[10]	3.85[21]	4.669	5.60[22]	5.75
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[22]	5.75
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[15]	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[15]	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[15]	4.40[24]	3.85[21]	4.45[21]	5.60[22]	5.65
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[13]	4.500[24]	3.900[21]	4.659	5.93[22]	5.95
Omaha (city, delivered)	4.115[1]	4.165[1]	4.165[1]	5.765[1]	3.865[1]	4.215[1]	4.215[1]	5.608[13]	5.443[24]	4.543[13]	.....	.....	.....
Omaha (country, base)	4.015[1]	4.065[1]	4.065[1]	5.665[1]	3.765[1]	4.115[1]	4.115[1]	5.508[13]	.....	.....	.....	.....	.....
Cincinnati	3.611[1]	3.691[1]	3.661[1]	5.291[1]	3.425[1]	3.675[1]	3.675[1]	4.825[13]	4.475[24]	4.111[21]	4.711	6.10	6.20
Youngstown, O.*	.....	.....	.....	.....	.....	.....	.....	4.40[13]	.....	.....	.....	.....	.....
Middletown, O.*	.....	.....	.....	.....	3.25[1]	3.50[1]	3.50[1]	4.65[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[22]	5.85
Chicago (country)	3.637[1]	3.687[1]	3.687[1]	5.237[1]	3.387[1]	3.737[1]	3.737[1]	5.272[15]	4.337[24]	3.987[21]	4.787	5.987[22]	6.05
Milwaukee	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[22]	6.18
Indianapolis	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
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
St. Louis	3.647[1]	3.697[1]	3.697[1]	5.297[1]	3.897[1]	3.747[1]	3.747[1]	5.172[15]	4.347[24]	4.131[21]	4.981	6.131[22]	6.23
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]	5.908[1]	3.45[1]	3.70[1]	3.70[1]	4.75[15]	4.852[24]	4.64	5.215	.....	.....
New Orleans (city)	4.10[4]	3.90[4]	3.90[4]	5.85[4]	4.058[6]	4.20[4]	4.20[4]	5.25[30]	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[30]	4.10[10]	3.75[21]	.....	.....	.....
Los Angeles	4.40[4]	4.65[4]	4.95[4]	7.20[4]	5.00[4]	4.95[4]	6.75[4]	6.00[13]	7.20[4]	5.688[21]	5.613	5.85[22]	5.95
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[22]	8.49
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]	6.80[15]	5.688[21]	.....	.....	8.00
Tacoma	4.35[8]	4.45[8]	4.75[8]	6.50[4]	4.85[8]	4.25[8]	5.45[8]	5.95[15]	7.60[15]	5.883[21]	.....	.....	8.00
Seattle	4.35[9]	4.45[8]	4.75[8]	6.50[6]	4.85[9]	4.25[9]	5.45[8]	5.95[15]	7.05[15]	5.883[21]	.....	.....	.....

*Basing point cities with quotations representing mill prices, plus warehouse spread.
NOTE—All prices fixed py Office of Price Administration in Amendments Nos. 10 to 33 to Revised Price Schedule No. 49. Deliveries outside ab 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]—300 to 1499 pounds; [11]—one bundle to 39,999 pounds; [12]—150 to 8249 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 bund [18]—one to six bundles; [19]—100 to 749 pounds; [20]—300 to 1999 pou [21]—1500 to 39,999 pounds; [22]—1500 to 1999 pounds; [23]—1000 39,999 pounds; [24]—400 to 1499 pounds; [26]—1000 to 1999 pou [26]—under 25 bundles. Cold-rolled strip, 2000 to 39,999 pounds, b [27]—300 to 4999 pounds.

Ores

Lake Superior Iron Ore

Gross ton. 51½% (Natural)
Lower Lake Ports

Old range bessemer	$4.75
Mesabi nonbessemer	4.45
High phosphorus	4.35
Mesabi bessemer	4.60
Old range nonbessemer	4.60

Eastern Local Ore

Cents, units, del. E. Pa.

Feugdry and basic 56-63% contract	18.00

Foreign Ore

Cents per unit, c.i.f. Atlantic ports

Manganiferous ore, 45-53% Fe., 6-10% Mang.	Nom.
N. African low phos.	Nom.
Spanish, No. African basic, 50 to 60%	Nom.
Brazil iron ore, 68-69% f.o.b. Rio de Janeiro	7.50-8.00

Tungsten Ore

Chinese wolframite, per short ton unit, duty paid	$24.00

Chrome Ore

(Equivalent OPA schedules):

Gross ton f.o.b. cars, New York, Philadelphia, Baltimore, Charleston, S. C., Portland, Ore., or Tacoma, Wash.

(S/S paying for discharging; dry basis; subject to penalties if guarantees are not met.)

Indian and African

48% 2.8:1	$41.00
48% 3:1	43.50
48% no ratio	31.00

South African (Transvaal)

44% no ratio	$27.40
45% no ratio	28.30
48% no ratio	31.00
50% no ratio	32.80

Brazilian—nominal

44% 2.5:1 lump	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 Reservev 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 Pueble, C 91.0c; prices include duty o ported ore and are subject to miums, penalties and other p sions of amended M.P.R. No. effective as of May 15. Price basing points which are also p of discharge of imported ma nese ore is f.o.b. cars, shipside dock most favorable to the bu

Molybdenum

Sulphide conc., lb., Mo. cont., mines	....

NATIONAL EMERGENCY STEELS (Hot Rolled)

(Extras for alloy content)

Designation	Chemical Composition Limits, Per Cent — Carbon	Mn.	Si.	Cr.	Ni.	Mo.
NE 8612	.10-.15	.70-.90	.20-.35	.40-.60	.40-.70	.15-.25
NE 8720	.18-.23	.70-.90	.20-.35	.40-.60	.40-.70	.20-.30
NE 9415	.13-.18	.80-1.10	.20-.35	.30-.50	.30-.60	.08-.15
NE 9425	.23-.28	.80-1.20	.20-.35	.30-.50	.30-.60	.08-.15
NE 9442	.40-.45	1.00-1.30	.20-.35	.30-.50	.30-.60	.08-.15
NE 9722	.20-.25	.50-.80	.20-.35	.10-.25	.40-.70	.15-.25
NE 9830	.28-.33	.70-.90	.20-.35	.70-.90	.85-1.15	.20-.30
NE 9912	.10-.15	.50-.70	.20-.35	.40-.60	1.00-1.30	.20-.30
NE 9920	.18-.23	.50-.70	.20-.35	.40-.60	1.00-1.30	.20-.30

Basic open-hearth Electric fur

Bars per 100 lb.	Billets per GT	Bars per 100 lb.	Bi
$0.65	$13.00	$1.15	$
.70	14.00	1.20	
.75	15.00	1.25	
.75	15.00	1.30	
.80	16.00	1.15	
.65	13.00	1.80	
1.30	26.00	1.55	
1.20	24.00	1.55	
1.20	24.00		

Extras are in addition to a base price of 2.70c, pe r pound on finished products and $54 per gross t semifinished steel major basing points and are in cents per pound and dollars per gross ton. No prices q on vanadium alloy.

STE

Pig Iron

...es (in gross tons) are maximums fixed by OPA Price Schedule No. ...ective June 10, 1941, amended Feb. 14, 1945. Exceptions indicated ...notes. Base prices bold face, delivered light face. Federal tax ...ight charges, effective Dec. 1, 1942, not included in following prices.

	Foundry	Basic	Bessemer	Malleable
...hem, Pa., base	$26.00	$25.50	$27.00	$26.50
...ark, N. J., del.	27.53	27.03	28.53	28.03
...oklyn, N. Y., del.	28.50	.....	.....	29.00
...boro, Pa., base	26.00	25.50	27.00	26.50
...ngham, base	†21.38	†20.00	26.00	.....
...imore, del.	26.61	.....	.....	.....
...ton, del.	26.12	.....	.....	.....
...cago, del.	25.22	.....	.....	.....
...cinnati, del.	25.06	23.68	.....	.....
...veland, del.	25.12	24.24	.....	.....
...wark, N. J., del.	27.15	.....	.....	.....
...iladelphia, del.	26.46	25.96	.....	.....
... Louis, del.	25.12	24.24	.....	.....
...lo, base	25.00	24.00	26.00	25.50
...ston, del.	26.50	26.00	27.50	27.00
...hester, del.	26.53	.....	27.53	27.03
...acuse, del.	27.08	.....	28.08	27.58
...as, base	25.00	24.50	25.50	25.00
...waukee, del.	26.10	25.60	26.60	26.10
...skegon, Mich., del.	28.19	.....	.....	28.19
...land, base	25.00	24.50	25.50	25.00
..., Canton, O., del.	26.39	25.89	26.89	26.39
..., base	25.00	24.50	25.50	25.00
...inaw, Mich., del.	27.31	26.81	27.81	27.31
..., base	25.50	25.00	26.00	25.50
... Paul, del.	27.63	27.13	28.13	27.63
... Pa., base	25.00	24.50	26.00	25.50
..., Mass., base	26.00	25.50	27.00	26.50
...ton, del.	26.50	26.00	27.50	27.00
... City, Ill., base	25.00	24.50	25.50	25.00
... Louis, del.	25.50	25.00	.....	25.50
..., O., base	25.00	24.50	.....	25.00
...nnati, del.	25.44	25.61	.....	26.11
... Island, Pa., base	25.00	24.50	25.50	25.00
...tsburgh, del.				
No. & So. sides	25.69	25.19	26.19	25.69
... Utah, base	23.00	22.50	.....	.....
...ville, Pa., base	25.00	24.50	25.50	25.00
...s Point, base	26.00	25.50	.....	.....
...more, del.	26.99	.....	.....	.....
..., Pa., base	.....	25.50	.....	26.50
...and, Pa., base	26.00	25.50	27.00	26.50
...delphia, del.	26.84	26.34	.....	27.34
..., O., base	25.00	24.50	25.50	25.00
...town, O., base	25.00	24.50	25.50	25.00
..., O., del.	26.94	26.44	27.44	26.94

...ade, silicon 1.75-2.25%; add 50 cents for each additional 0.25% ... or portion thereof; deduct 50 cents for silicon below 1.75% on ...y iron. †For phosphorus 0.70% or over deduct 38 cents. §For ... Rocks, Pa., add .55 to Neville Island base; Lawrenceville, Home-... McKeesport, Ambridge, Monaca, Aliquippa, .84; Monessen, Monon-... City .97 (water); Oakmont, Verona 1.11; Brackenridge 1.24.
...: Add 50 cents per ton for each 0.50% manganese or portion ... over 1.00%.
... differentials: Under 0.50%, no extra; 0.50% to 0.74% incl., $2 ...; for each additional 0.25% nickel, $1 per ton.

High Silicon, Silvery

6.00-6.50 per cent (base)	$30.50		
6.51-7.00	$31.50	9.01- 9.50	36.50
7.01-7.50	32.50	9.51-10.00	37.50
7.51-8.00	33.50	10.01-10.50	38.50
8.01-8.50	34.50	10.51-11.00	39.50
8.51-9.00	35.50	11.01-11.50	40.50

F.o.b. Jackson county, O., per gross ton, Buffalo base prices are $1.25 higher. Prices subject to additional charge of 50 cents a ton for each 0.50% manganese in excess of 1.00%.

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. (For higher silicon irons a differential over and above the price of base grades is charged as well as for the hard chilling iron, Nos. 5 and 6.)

Charcoal Pig Iron

Northern

Lake Superior Furn. $34.00
Chicago, del. 37.34

Southern

Semi-cold blast, high phos., f.o.b. furnace, Lyles, Tenn. $28.50
Semi-cold blast, low phos., f.o.b. furnace, Lyles, Tenn. 33.00

Gray Forge

Neville Island, Pa. $24.50
Valley base 24.50

Low Phosphorus

Basing points: Birdsboro, Pa., $30.50; Steelton, Pa., and Buffalo, N. Y., 30.50 base; 31.74, del., Philadelphia. Intermediate phos., Central Furnace, Cleveland, $27.50

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 59.35
Ohio 47.70

Second Quality

Pa., Ill., Md., Mo., Ky. 49.35
Alabama, Georgia 40.30
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.) war chemicals.

Ferroalloy Prices

...manganese (standard) 78-82% ... ton, duty paid, $135; add ... packed c.l., $10 for ton, ...ss-ton, f.o.b. cars, Baltimore, Philadelphia or New York, ...r is most favorable to buyer; ...ckdale or Rockwood, Tenn.; ... Tennessee Products Co. is ... Birmingham, Ala., where ...effield Steel & Iron Co. ...; $1.70 for each 1%, or ... contained manganese over ... under 78%; delivered Pitts-... $140.33.

...nganese (Low and Medium ...; per lb. contained manganese, eastern zone, low carbon, ... c.l., 23c; 2000 lb. to c.l., ... medium, 14.50c and 15.20c; ... low carbon, bulk, c.l., ... 2000 lb. to c.l., 24.40c; ... 14.80c and 16.20c; western ... carbon, bulk, c.l., 24.50c, ... to c.l., 25.40c; medium, ... and 17.20c; f.o.b. shipping ... freight allowed.

...eisen! 19-21% carlots per ..., Palmerton, Pa., $36; 16-... $35.

...ytic Manganese: 99.9% plus, ... lots, per lb. 37.6 cents.

...um Metal: 97% min. chromium, ... max. .50% carbon, eastern ... lb. contained chromium ... c.l., 79.50c, 2000 lb. to c.l. ... central 81c and 82.50c; western ... and 84.75c; f.o.b. shipping ... freight allowed.

...columbium: 50-60%, per lb. ... columbium in gross ton ... contract basis, R.R. freight ... eastern zone, $2.25; less-... $2.30. Spot prices 10 cents ... higher.

...: High carbon, eastern ... 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, 10.75, packed 11.25c, ton lots 11.75c, less 12.25c, eastern, freight allowed; 11.25c, 11.75c and 12.50c, central; 13.25c and 13.75c, 14.50c and 15.00c, western, spot up .25c.

Ferro-Boron: (Bor. 17.50% min., sil. 1.50% max., alum. 0.50% max. and car. 0.50% max.) per lb. of alloy contract ton lots, $1.20, less ton lots $1.30, eastern, freight allowed; $1.2075 and $1.3075 central; $1.229 and $1.329, western; spot add 5c.

Manganese-Boron: (Mang. 75% approx., boron 15-20%, iron 5% max. sil. 1.50% max. and carbon 3% max.), per lb. of alloy. Contract, ton lots, $1.89, less, $2.01, eastern, freight allowed; $1.903 and $2.023 central, $1.935 and $2.055 western, spot up 5c.

Nickel-Boron: (Bor. 15-18%, alum. 1% max., sil. 1.50% max., car. 0.50% max., iron 3% max., nickel, balance), per lb. of alloy. Contract, 5 tons or more, $1.90, 1 ton to 5 tons, $2.00, less than ton $2.10, eastern, freight allowed; $1.9125 $2.0125 and $2.1125, central; $1.9445, $2.0445 and $2.1445, western; spot same as contract.

Chromium-Copper: (Chrom. 8-11%, cu. 88-90%, iron 1% max. sil. 0.50% max.) contract, any quantity, 45c, eastern, Niagara Falls, N. Y., basis, freight allowed to destination, except to points taking rate in excess of St. Louis rate to which equivalent of St. Louis rate will be allowed; spot up 2c.

Vanadium Oxide: (Fused: Vanadium oxide 85-88%, sodium oxide approx. 10% and calcium oxide approx. 2%, or Red Cake; Vanadium oxide 85% approx., sodium oxide, approx. 9% and water approx.

2.5%) Contract, any quantity, $1.10 eastern, freight allowed per pound vanadium oxide contained; contract carlots, $1.105, less carlots, $1.108, central; $1.118 and $1.133, western; spot add 5c to contracts in all cases.

Calcium metal; cast: Contract ton lots or more $1.80, less, $2.30, eastern zone, freight allowed, per pound of metal; $1.809 and $2.309 Central., $1.849 and $2.349, western; spot up 5c.

Calcium-Manganese-Silicon: (Cal. 16-20% mang. 14-18% and sil. 53-59%), per lb. of alloy. Contract, carlots, 15.50c, ton lots 16.50c and less 17.00c, eastern, freight allowed; 16.00c, 17.35c and 17.85c, central; 18.05c, 19.10c and 19.60c western; spot up .25c.

Calcium-Silicon: (Cal. 30-35%, sil. 60-65% and iron 3.00% max.), per lb. of alloy. Contract, carlot, lump 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; .066, .0685c, .0855c and .088c, western; spot up .25c.

Briquets: Ferrochrome, containing exactly 2 lb. cr., eastern zone, bulk, c.l., 8.25c per lb. of briquets, 2000 lb. to c.l., 8.75c; central, add .3c for c.l. and .5c for 2000 lb. to c.l.; western, add .70c for c.l., and .2c for 2000 lb. to c.l.; **silicomanganese,** eastern, containing exactly 2 lb. manganese and approx. ½ lb. silicon, bulk, c.l., 5.80c, 2000 lbs. to c.l., 6.30c; central, add .25c for c.l. and 1c for 2000 lb. to c.l.; western, add .5c for c.l., and 2c for 2000 lb. to c.l.; **ferrosilicon,** eastern, approx. 5 lb., containing exactly 2 lb. silicon, or weighing approx. 2½ lb. and containing exactly 1 lb. of silicon, bulk, c.l., 3.35c, 2000 lb. to c.l., 3.80c; central, add 1.50c for c.l., and .40c for 2000 lb. to c.l.; western, add 3.0c for c.l. and .45c for 2000 to c.l.; f.o.b. shipping point, freight allowed.

Ferromolybdenum: 55-75% per lb. contained molybdenum f.o.b. Langeloth and Washington, Pa., furnace, any quantity 95.00c.

Ferrophosphorus: 17-19%, based on 18% phosphorus content, with unitage of $3 for each 1% of phosphorus above or below the base; gross tons per carload f.o.b. sellers' works, with freight equalized with Rockdale, Tenn.; contract price $58.50, spot $62.25.

Ferrosilicon: Eastern zone, 90-95%, bulk, c.l., 11.05c, 2000 lb. to c.l., 12.30c; 80-90%, bulk c.l., 8.90c, 2000 lb. to c.l., 9.95c; 75%, bulk, c.l., 8.05c, 2000 lb. to c.l., 9.05c; 50%, bulk c.l., 6.65c and 2000 lb. to c.l., 7.85c; central 90-95%, bulk, c.l., 11.20c, 2000 lb. to c.l., 12.80c; 80-90%, bulk, c.l., 9.05c, 2000 to c.l., 10.45c; 75%, bulk, c.l., 8.20c, 2000 lb. to c.l., 9.65c; 50% bulk, c.l., 7.10c, 2000 lb. to c.l., 9.70c; western, 90-95%, bulk, c.l., 11.65c, 2000 lb. to c.l., 15.60c; 80-90%, bulk, c.l., 9.55c, 2000 lb. to c.l., 13.50c; 75%, bulk, c.l., 8.75c, 2000 to c.l., 13.10c; 50%, bulk, c.l., 7.25c, 2000 to c.l., 8.75c; f.o.b. shipping point, freight allowed. Prices per lb. contained silicon.

Silicon Metal: Min. 97% silicon and max. 1% iron, eastern zone, bulk, c.l., 12.90c, 2000 lb. to c.l., 13.45c; central, 13.20c and 13.90c; western, 13.85c and 16.80c; min. 96% silicon and max. 2% iron, eastern, bulk, c.l., 12.50c, 2000 lb. to c.l., 13.10c; central, 12.80c and 13.55c; western, 13.45c and 16.50c f.o.b. shipping point, freight allowed. Price per lb. contained silicon.

Manganese Metal: (96 to 98% manganese, max. 2% iron), per lb. of metal, eastern zone, bulk, c.l., 36c 2000 lb. to c.l., 38c, central, 36.25c, and 39c; western 36.55c and 41.05c; 95 to 97% manganese, max. 2.50% iron, eastern, bulk, c.l., 34c; 2000 to c.l., 35c; central 34.25c and 36c; western, 34.55c and 36.05c; f.o.b. shipping point, freight allowed.

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 gross ton, f.o.b. Niagara Falls, N. Y., freight allowed to destination east of Mississippi River and North of Baltimore and St. Louis, 6-8% carbon $142.50; 3-5% carbon $157.50.

Carbortam: Boron 0.90 to 1.15% net ton to carload, 8c lb. f.a.s. 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 cents 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 each 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, 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 ¼ cent higher.

Simanal: (Approx. 20% each Si, Mn., Al.) Contract, frt. all, not east of 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 SCRA

Following prices are quotations developed by editors of STEEL in the various centers. For complete OPA ceiling price schedule refer to page [illegible] 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	13.81
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. Hvy. Melt.	$21.00
No. 1 Heavy Melt Steel	20.00
No. 1 Comp. Bundles	20.00
Short Shovel Turnings	17.00
Cast Iron Borings	16.00
Machine Shop Turnings	15.00
Low Phos. Plate	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. Hvy. Melt	$19.75
No. 1 Heavy Melt. Steel	18.75
No. 2 Heavy Melt. Steel	18.75
No. 1 Ind. Bundles	18.75
No. 2 Dlr. Bundles	18.75
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	12
Shoveling Turnings	21
Rerolling Rails	21.50-22
Steel Car Axles	21
Steel Rails, 3 ft.	21
Steel Angle Bars	21
Cast Iron Wheels	21
No. 1 Machinery Cast	21
Railroad Malleable	18
Breakable Cast	15
Stove Plate	15
Grate Bars	15
Brake Shoes	15
(Cast grades f.o.b. shipping point, railroad grades f.o.b. tracks)	15
Stove Plate	15

CINCINNATI:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$18
No. 2 Heavy Melt. Steel	18
No. 1 Comp. Bundles	18
No. 2 Comp. Bundles	9.50-10
Machine Turnings	11.50-12
Shoveling Turnings	11.00-11
Cast Iron Borings	10.50-11
Mixed Borings, Turnings	9
No. 1 Cupola Cast	16
Breakable Cast	21.00-22
Low Phosphorus	20.50-21
Scrap Rails	16.00-16
Stove Plate	16

LOS ANGELES:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$14
No. 2 Heavy Melt. Steel	12
No. 1, 2 Deal. Bundles	9
Machine Turnings	9
Mixed Borings Turnings	9
No. 1 Cast	20

SAN FRANCISCO:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$18
No. 2 Heavy Melt. Steel	18
No. 1 Busheling	18
No. 1, No. 2 Bundles	18
No. 3 Bundles	18
Machine Turnings	13
Billet, Forge Crops	18
Bar Crops, Plate	18
Cast Steel	18
Cut Structural, Plate, 1", under	18
Alloy-free Turnings	13
Tin Can Bundles	13
No. 2 Steel Wheels	18
Iron, Steel Axles	18
No. 2 Cast Steel	18
Uncut Frogs, Switches	18
Scrap Rails	18
Locomotive Tires	18

...: Electrolytic or Lake from producers in ... 12.00c, Del. Conn., less carlots 12.12½c, ...: dealers may add ¾c for 5000 lbs. to ...: 1000-4999 lbs. 1c; 500-999 1¼c; 0-499 ...ting, 11.75c, refinery for 20,000 lbs., or ... 12.00c less than 20,000 lbs.

... Ingot: Carlot prices, including 25 cents ...hundred freight allowance; add ¼c for ...than 20 tons; 85-5-5-5 (No. 115) 13.00c; ... (No. 215) 16.50c; 80-10-10 (No. 305) ...; Navy G (No. 225) 16.75c; Navy M ...) 14.75c; No. 1 yellow (No. 405) ...; manganese bronze (No. 420) 12.75c.

... Prime western 8.25c, select 8.35c, brass ... 8.50c, intermediate 8.75c, E. St. Louis, ...carlots. For 20,000 lbs. to carlots add ... 10,000-20,000 0.25c; 2000-10,000 0.40c; ... 2000 0.50c.

...: Common 6.35c, chemical, 6.40c, corrod... 6.45c, E. St. Louis for carloads; add 5 ... for Chicago, Minneapolis-St. Paul, Mil...-Kenosha districts; add 15 points for ...land-Akron-Detroit area, New Jersey ... York state, Texas, Pacific Coast, Rich... Indianapolis-Kokomo; add 20 points for ...ham, Connecticut, Boston-Worcester, ...field, New Hampshire, Rhode Island.

...y Aluminum: 99% plus, ingots 15.00c ...ls 14.00c del.; metallurgical 94% min. ... del. Base 10,000 lbs. and over; add ¼c ...999 lbs.; 1c less through 2000 lbs.

...y Aluminum: All grades 12.50c per lb. ... as follows: Low grade piston alloy (No. ...) 10.50c; No. 12 foundry alloy (No. ...) 10.50c; chemical warfare service (92½% plus) 10.00c; steel deoxidizers ... bars, granulated or shot, Grade 1 ...%) 11.00c, Grade 2 (92-95%) 9.50c to ... Grade 3 (90-92%) 8.50c to 8.75c, Grade ...90%) 7.50c to 8.00c; any other ingot ... over 1% iron, except PM 754 and ... 12.00c. Above prices for 30,000 lb. ...; add ¼c 10,000-30,000 lb.; ½c 1000-... lbs.; 1c less than 1000 lbs. Prices in... freight at carload rate up to 75 cents ...hundred.

...ium: Commercially pure (99.8%) stand...ingots (4-notch, 17 lbs.), 20.50c lb., add ... special shapes and sizes. Alloy ingots, ...ary bomb alloy, 23.40c; 50-50 mag...-aluminum, 23.75c; ASTM B93-41T, ... 2, 3, 4, 12, 13, 14, 17, 23.00c; Nos. 4X, ...X, 17X, 25.00c; ASTM B-107-41T, or ...T, No. 8X, 23.00c; No. 18, 23.50c; No. ... 25.00c. Selected magnesium crystals, ... and muffs, including all packing ..., barrelling, handling, and other ...tion charges, 23.50c. Prices for 100 ... more; for 25-100 lbs., add 10c; for ...than 25 lbs., 20c. Incendiary bomb alloy, ...plant, any quantity; carload freight al... ... other alloys for 500 lbs. or more.

...ces ex-dock, New York in 5-ton lots, ...cent for 2240-11,199 lbs., 1½c 1000-2239, ...-999, 3c under 500. Grade A, 99.8% ...ter (includes Straits), 52.00c; Grade B, ... or higher, not meeting specifications ...rade A, with 0.05 per cent maximum ..., 51.87½c; Grade C, 99.65-99.79% incl. ...; Grade D, 99.50-99.64% incl., 51.50c; ... E, 99-99.49% incl. 51.12½c; Grade F, ...% (for tin content), 51.00c.

...ony: American bulk carlots f.o.b. La... Tex., 99.0% to 99.8% and 99.8% and ... but not meeting specifications below, ...; 99.8% and over (arsenic, 0.05%, max. ...er impurities, 0.1%, max.) 15.00c. On ...ers' sales add ¼c for less than carload ... lb.; ½c for 9999-224 lb.; and 2c for ... and less; on sales by dealers, distribu... and jobbers add ½c, 1c, and 3c, respec...

...: Electrolytic cathodes, 99.5%, f.o.b. ... 35.00c lb.; pig and shot produced from ...lytic cathodes 36.00c; "F" nickel shot ... for additions to cast iron, 34.00c; ... shot 28.00c.

...ry: Open market, spot, New York, nomi... ...$135 per 76-lb. flask.

...: Prime, white, 99%, carlots, 4.00c lb.

...lium-Copper: 3.75-4.25% Be., $17 lb. con... ... Be.

...: Bars, ingots, pencils, pigs, plates, ..., slabs, sticks, and all other "regular" straight or flat forms 90.00c lb., del.; anodes, balls, discs and all other special or patented shapes 95.00c lb. del.

Cobalt: 97-99%, $1.50 lb. for 550 lb. (bbl.); $1.52 lb. for 100 lb. (case); $1.57 lb. under 100 lb.

Indium: 99.9%, $7.50 per troy ounce.

Gold: U. S. Treasury, $35 per ounce.

Silver: Open market, N. Y. 44.75c per ounce.

Platinum: $35 per ounce.

Iridium: $165 per troy ounce.

Palladium: $24 per troy ounce.

Rolled, Drawn, Extruded Products

(Copper and brass product prices based on 12.00c, Conn., for copper. Freight prepaid on 100 lbs. or more.)

Sheet: Copper 20.87c; yellow brass 19.48c; commercial bronze, 90% 21.07c, 95% 21.28c; red brass, 80% 20.15c, 85% 20.36c; phosphor bronze, Grades A and B 5% 36.25c; Everdur, Herculoy, Duronze or equiv. 26.00c; naval brass 24.50c; manganese bronze 28.00c; Muntz metal 22.75c; nickel silver 5% 26.50c.

Rods: Copper, hot-rolled 17.37c, cold-rolled 18.37c; yellow brass 15.01c; commercial bronze 90% 21.32c, 95% 21.53c; red brass 80% 20.46c, 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 lbs. 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	7.875
Commercial bronze			
90%	9.375	9.125	8.625
95%	9.500	9.250	8.750
Red Brass, 85%	9.125	8.875	8.375
Red Brass, 80%	9.125	8.875	8.375
Muntz metal	8.000	7.750	7.250
Nickel Sil, 5%	9.250	9.000	4.625
Phos. br., A, B, 5%	11.000	10.750	9.750
Herculoy, Everdur or equivalent	10.250	10.000	9.250
Naval brass	8.250	8.000	7.500
Mang. bronze	8.250	3.000	7.500

Other than Brass Mill Scrap: Prices apply on material not meeting brass mill specifications and are f.o.b. shipping point; add ¾c for shipment of 60,000 lbs. of one group and ½c for 20,000 lbs. of second group shipped in same car. Typical prices follow:

(Group 1) No. 1 heavy copper and wire, No. 1 tinned copper, copper borings 9.75c; No. 2 copper wire and mixed heavy copper, copper tuyeres 8.75c.

(Group 2) soft red brass and borings, aluminum bronze 9.00c; copper-nickel and borings 9.25c; car boxes, cocks and faucets 7.75c; bell metal 15.50c; babbit-lined brass bushings 13.00c.

(Group 3) zincy bronze borings, Admiralty condenser tubes, brass pipe 7.50c; Muntz metal condenser tubes 7.00c; yellow brass 6.25c; manganese bronze (lead 0.00%-0.40%) 7.25c, (lead 0.41%-1.0%) 6.25c; manganese bronze borings (lead 0.00-0.40%) 6.50c, (lead 0.41-1.00%) 5.50c.

Aluminum Scrap: Prices f.o.b. point of shipment, 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.

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Sheets, Strip . . .

Sheet & Strip Prices, Page 202

Sheets and strip show little effect from cancellations and mills are well filled to the end of the year. So universally are these steel products used in civilian goods that pressure for delivery is as severe as in war months. Producers in many cases are allocating tonnage to give widest distribution and aid in reconversion to peace products.

Pittsburgh — Abnormally heavy influx of new business and failure of war cancellations to develop in anticipated volume are chief factors in the present uncertain delivery situation in sheets and strip. The 5-day work week further accentuates the extended delivery problem on most items. A number of sellers are setting up plans for distribution of steel to their customers on the basis of actual immediate needs, in an effort to assure the most equitable distribution possible during this early reconversion period when new business far exceeds production. One plan contemplates establishing quotas for each sales office. Pressure for deliveries is expected to be particularly heavy for cold-rolled sheets and strip for the automotive industry and galvanized material for much of the consumer items. Because output was held to a minimum during the war period it will be some time before production of enameling sheets will catch up with orders recently placed by refrigerator, stove and other household appliance manufacturers. Bookings on enameling sheets are extended into next year on basis of current production. Additional flat-rolled steel capacity will be available soon in this district, with the installation of a cold-rolling mill at the West Leechburg, Pa., plant of Allegheny Ludlum Steel Corp. for rolling of stainless and silicon strip.

New York — With demand in excess of supply, sheet deliveries are tightening again. Cancellations after the end of the war were not as heavy as many expected, and now that producers once more are in position to quote, backlogs are increasing.

Some leading producers are allocating quotas for fourth quarter to the various district offices, in each of the principal grades, and in certain instances here at least the quotas are not large enough to meet demand. Further, some of these producers have not, in effect, opened books for first quarter, except in certain specialties, such as silicon sheets, in which there have been relatively few cancellations and in which deliveries have fallen heavily into next year since before the end of the war.

Sellers generally endeavor to favor old customers, and are not being guided too much in setting up schedules by the order in which unrated tonnages have been received over past months. At the same time, there is a disposition in various cases to give preference to civilian manufacturers who have granted tonnage under CMP preference over manufacturers who have been forced out of the picture entirely because of requirements for sheets for war and essential civilian production. Certain sellers are not inclined to give manufacturers who have been favored under CMP any more for fourth quarter than they have been getting in the past, but to at least give them that much.

Chicago — Prospects are that [illegible] rolled sheets will remain tight for many months, so universally are they used. Demand is far above ability to produce. In some instances, they are available in December, but most producers are booked to year's end. Galvanized are not available until January, but this is an improvement over a month ago. Some mill sizes, hot-rolled and hot-rolled pickled sheets, can be obtained for October delivery. Hot-rolled pickled strip also is in October, but narrow and wide strip and hot-rolled cannot be promised before December. Drum makers and stamping manufacturers are among consumers of sheets and strip hardest hit by war contract cancellations.

Birmingham — Sheet demand continues heavy in this area and production is at about 75 per cent of capacity, with output held down by lack of labor, which is acute. Agricultural needs for sheet is especially strong. Strip production, mainly cotton ties, has been increased by the new cotton baling season and is moderately heavy, although strip production usually continues through the year on a schedule gaged to fit in between other demands.

Boston — Considerable tonnage of narrow cold strip ordered earlier on unrated basis remains to be definitely scheduled. Although subject to frequent revisions, production programs covering the next few weeks are taking form. New orders are substantial but not overwhelming, with most tentative for November delivery, as in the case of allocations included in the October melt. Reconversion is gaining momentum, notably in household appliances and typewriters. The changeover at International Silver Co. plants, where cancellations reached a million, will be great, with heavy pent-up demand for tableware accumulated here. As in scores of other plants headed toward reconversion, specifications differ materially from war requirements and new buying in sheets reflects this to greater extent than strip thus far. Large cancellations for army footwear also will result in shank steel changes for many civilian shoes. One large fabricator of stainless kitchen utensils in the East will be back in full swing on civilian schedules by midmonth, starting many on stainless made available by cancellations. Fabricators of civilian consumer goods are frequently more concerned over reconversion prices for finished products than steel supply and to some extent the future of buying is influenced by this uncertainty.

Cincinnati — Sheet mills in this district have substantial backlogs, after elimination of the tonnage canceled since V-J Day, and are operating on full schedules. Most expected cancellations are in, but readjustments in rolling schedules are still necessary to spread available tonnage under pressure for early deliveries. Mills are noting closely the progress in reconversion by automotive manufacturers as a key to the outlook for early next year.

Cleveland — Consumers are pressing for early delivery of sheet and strip, chiefly carbon grades. However, in many cases tonnage requested is in excess of the amount that can be efficiently handled at consumers' plants. In this way they hope to receive a larger proportion of available supplies under the rollers' voluntary allocation system.

...would if they limited their requests to minimum requirements.

Sales offices have processed most of the cancellations, although they still are awaiting official word on some orders which producers know should be off the books.

This uncertainty as to which orders are valid continues to confuse scheduling. Some unpickled sheet and strip will available for delivery late this month and early October; pickled, early first quarter and coated material, late first quarter.

Steel Bars . . .

Bar Prices, Page 202

With paper work involved in removing canceled tonnage and remaking rolling schedules nearly completed barmakers now are able to give more definite promises for delivery. Most producers have little open capacity before the end of the year on small and medium sizes. Larger diameters are easier. Alloy bars may be obtained in some instances for November delivery. Cold-drawn bars will be available in November from most producers.

New York — Hit hard by war-end cancellations, bar sellers are now getting their schedules lined up to a point where they again can make fairly definite promises. This is expediting new business, which for the past week or ten days has been expanding appreciably. On small and medium sizes of hot carbon bars some producers are now largely covered for the remainder of the year, with little left for October or even November.

Cost sellers are in easy position on their specifications, with hot-top quality bars in general on about the same level as common commercial steel. Just prior to the end of the war hot-top quality bar deliveries were on an average anywhere from two to three months further expedited than for the other grade.

Despite cutbacks, cold-drawn carbon bars have rebounded more rapidly than hot carbon, as it appears that little if any of this material can be had before November in any size. Bessemer cold-drawn is generally somewhat easier than open-hearth, but with few exceptions not appreciably so.

Boston — Slightly heavier buying of bars for postwar products is associated with increasing revisions in specifications; in some substantially different grades will be required and new orders for early first quarter delivery reflect this trend. Shift of NE steels to higher alloys is interesting, with indications more fabricators will return to former SAE grades long used and established hardening practice.

Chicago — Some barmakers are unwilling to take on new business in carbon grades for the remainder of the year, while others have openings in schedules from November on. A month ago earliest deliveries were December and January, depending upon size, thus cancellation of war contracts has produced notable easement. Another factor which must be considered in appraising the situation is that mills have realigned operating schedules to give more economical operation, this embracing a 40-hour work week. Alloy bars are available for October delivery, but show signs of tightening as a few industries make progress toward conversion and enlarge production of civilian goods. Forge shops are among metalworking plants hardest hit by the war's end.

Pittsburgh — Delivery schedules on most merchant bar sizes fall into October and November, although some mills can promise late September shipment on large rounds. Open-hearth and electric furnace alloys are available in September. Most cancellations are now in, and are considerably less than for some steel products for much of the bar tonnage on mills' books, except for shells, was going into war supporting lines. Influx of new business again is developing rapidly, notably from the railroad, automotive and agricultural implement industries. Cold-drawers have experienced heavy cancellations, but encouraging volume of new business for civilian account has extended delivery schedules into November. Forge shops are operating well below wartime levels. Substantial volume of export tonnage has been booked and based on current inquiries the demand prospects from this source is promising.

Cleveland — Orders for carbon bars have held up surprisingly well while those for alloy have been cut rather sharply, in some instances up to 50 per cent. Alloy bars and rods are readily available; hot-rolled and billets being offered for prompt delivery and cold-rolled early in first quarter.

While much business in the bar market is pending, and has been for many months, awaiting lifting of governmental restrictions, much of this cannot be

translated immediately into firm orders. Chief uncertainty now concerns specifications, especially sizes.

Alloy specifications are still uncertain in many cases with the future of NE steels clouded. Bolt and nut interests, for instance, do not yet know definitely what alloys their customers will specify and, therefore, have been cautious in placing mill orders.

Philadelphia — Bar buying is accelerating despite the fact that some large producers still have difficulty making firm delivery promises. Business has improved to such an extent that some producers have little carbon bar tonnage available before late November and December. However, especially in large sizes, hot carbon bars can still be had in some quarters in October. In hot alloy bars a full range of sizes can be had for shipment in five to six weeks. Cold-drawn carbon bar schedules run generally into late November and December.

Steel Plates . . .

Plate Prices, Page 203

Most severely hit by cancellations of war contracts steel plates have made some recovery and mills are booked in general for about two months. Railroad cars, locomotives and heavy construction are supporting demand. Change to the 40-hour week has lengthened delivery time somewhat.

Pittsburgh — Plate output is being maintained at a fair rate in spite of cancellation of tonnage for shipbuilding and other direct war contracts. However, some improvement is noted in new orders for railroad cars, locomotives and in heavy construction lines. Miscellaneous ship repair work is an important factor in bolstering demand and steel warehouse interests are actively in the market. A fair tonnage is involved in barge construction work in this area, and construction is under way on a steel float 150 feet long and 26 feet wide for RFC, at the Hillman Barge & Construction Co.'s yards near Brownsville, Pa. Delivery schedules on plates are filled through September in most instances.

Chicago — Except for light-gage plates rolled on continuous mills, backlogs for the next two months are comfortable. Platemakers have realigned schedules on the basis of a 40-hour week and are apportioning available ingots to finished products in accordance with loads and economical operating rates. On this basis, new business takes November delivery. In some instances, platemakers have difficulty maintaining economical operations on continuous mills.

Birmingham — Plate demand and production continue active and mills are operating close to 80 per cent of capacity, a figure which would be higher except for labor shortage. Demand is heavy for general use in addition to large requirements for shipbuilding.

Cleveland — Plate supply is the easiest of all steel products, drop in government demand having been registered long before the capitulation of Japan. Shifting rolling facilities which had been placed on plate work have been restored to their usual schedules and the trend has even reversed in some instances with some sheet being rolled on plate mills. However, this switch is not expected to gain wide application since most producers wish to retain their hold on the plate market and some plate mills cannot be converted. October and November delivery is readily available in the district.

Philadelphia — Plate mills are offering late October and November delivery, with shipment on 3/16-inch plate most extended. Delivery schedules in general are being partially sustained by reduced operations. Demand is fairly regular and is supported somewhat by export buying.

Wire . . .

Wire Prices, Page 203

New York — Wire mill schedules include a substantial volume of rated tonnage for the remainder of this month and are being pieced out beyond with former open-end tonnage. Due to limited definite delivery, production departments are not yet able to determine the extent of duplication in orders placed earlier. Such buying was thought to be rather large but recent trends indicate some revision as to volume. Specialty wire continues tight but some wire is available against new orders for fourth quarter, depending on size and grade. Overall backlogs range from four to six months. Bearing plants are getting back to partial production after shakeout in orders and backlogs centered heavily in aircraft cutbacks.

Boston — While still subject to revision wire mill production sched-

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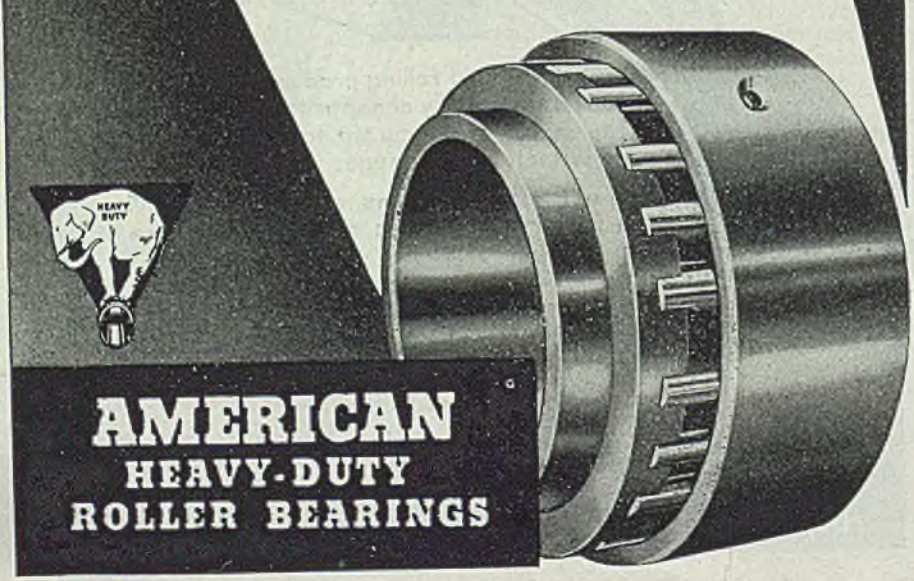

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the rest of this month and next are ...ring, with remaining allotted or... supplemented by civilian volume ...nto cancellation gaps. Orders still ...e fitted into schedules are sufficient ...ll the remainder of fourth quarter ...beyond on some products. New or... now well in excess of cancellations, ...e not filled all gaps but backlogs ...de a much wider range of products ...formerly. Strong demand holds ...re bead wire and some capacity de...ed for urgent war needs may be ...ned without priority for steel. ...e the automobile industry is getting ...eries on other wire, including valve ...ng, some users are pressing for more. ...e stranding operations are down ...ply, but drawing capacity within ...range of sizes is active for other ...rements and additional galvanizing ...pment is also released. Although ...-carbon rods are still tight, more ...wire specialties will eventually be ...ded into fourth quarter schedules ...was predicted earlier.

...icago — Wiremakers report in... ...es for merchant products for post-...fabrication a virtual flood, premised ...ently on the belief that early de... ...y can be made. These products ...e so rapidly that jobbers have no ...rtunity to build inventories. Demand ...rticularly heavy for corn cribs and ...ing materials. For manufacturers' ...substantial increase in demand is ...ved, particularly for high-carbon ...wire. It is judged that canceling ...ar orders is near an end. A let-up ...w business from the electrical and ...truction fields is attributed to re... ...ersion. Exceptions are galvanized ...d and transmission line conductors. ...tories of wire rope are normal, but ...scotty for electrical wire.

...ningham — Wire production is in...sing gradually in this district. De... ...for nails and wire fencing is ex...remely active and production has ...increased to about 85 per cent of ...city.

...ctural Shapes . . .

Structural Shape Prices, Page 203

...icago — End of the war has made ...difference in the structural shape ...tion, due to the fact that WPB had ...the green light to essential indus... ...plant construction before the war ...As a result, shape mills and ...ricators are well booked for the re... ...der of the year. Only in a few in...ces are mill shapes available before ...y. On lighter sections, which go ...machinery and farm implements, ...ess also is heavy. Both phases of ...activity are expected to expand ...in the next few months.

...ttsburgh — Production of structural ...probably will increase through the ...ainder of this year, reflecting the in...ed upturn in construction activity ...g from lifting of WPB building ...rictions. A number of new inquiries ...ve appeared for bridges and ...ellaneous plant expansion projects. ...derable export tonnage also is in the ...s. To meet this renewed demand ...ctural mills are expected to obtain ...e proportionate share of raw steel ...ge than was the case in the clos... ...months of the war. A few sellers ...promising December shipment, ...ss most have openings for late

October and November. Need for structural engineers is acute, and must be remedied soon to meet the anticipated steadily rising volume of construction work.

Philadelphia — Although wide-flange tonnage is available for October, standard shapes are generally quoted for November. Large new building projects are still scattered but there is considerable small construction work, which is contributing substantially to expansion of shape mill backlogs. Bids will be opened early in October by commissioners of the District of Columbia on the substructure of a 3000-foot bridge over Anacostia river. While total shape requirements for the bridge will be 4200 tons, the substructure will require only 50 tons. Steel for the superstructure will not become active for seven to eight months, it is understood, as the bridge will cost about $4,500,000 and only $2,200,000 for the substructure has been appropriated so far.

Reinforcing Bars . . .

Reinforcing Bar Prices, Page 203

Chicago — Industrial building construction during the balance of the year at a level higher than had been anticipated is expected to create strong demand for reinforcing steel. Requirements currently are not heavy according to peacetime standards but small jobs

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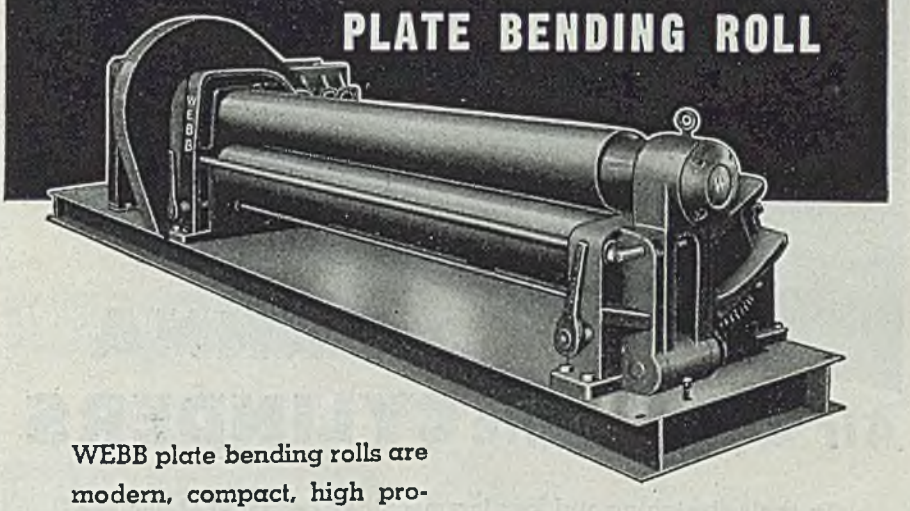

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involving less than a hundred tons each are numerous. Reinforcing suppliers are handicapped by manpower shortage in their engineering and estimating departments, and with steel supply still tight, jobs are not sought after as intensely as in normal times.

Pittsburgh — Reinforcing bar output is not likely to show substantial increase this month, but in October production is scheduled to return to the prewar relationship with merchant bars, which should result in output of nearly three times the current rate. However, despite the indicated sharp increase, backlogs are expected to remain extended into next year in most instances. This will make it necessary to parcel out available production to satisfy essential needs of as many customers as possible. New inquiries are somewhat heavier the past ten days, involving lots from 100 to 200 tons for small plant expansions. Most larger postwar construction is still in the drafting stage.

Pig Iron . . .

Pig Iron Prices, Page 205

Pig iron demand suffers no diminution, except in need for basic by some nonintegrated steelmakers. Foundries seek as much iron as they can get, as inventories are too low for safety with winter approaching. Better labor supply for the latter is expected to increase need for additional iron.

Pittsburgh — A substantial increase in demand for all grades of pig iron for foundry operations is likely for many months, reflecting unusually heavy needs of railroads, farm implements and automotive equipment. Probable gradual easing in the still relatively tight labor situation in foundries should make possible near capacity operations among most foundries before the close of this year, in contrast to 60-70 per cent pace averaged by many throughout the war period. Sharp reduction in steelmaking operations since announcement of Japan's surrender and retrenchment in purchases by some smaller steel producers who had been buying steadily in the open market during the war to supplement their own iron production, have combined to force a marked reduction in overall pig iron consumption. Some interests do not expect postwar demand for basic pig iron to reach wartime levels. However, indicated large increase in foundry pig iron demand will probably offset reduced basic requirements. Sellers state the WPB 30-day inventory limitation held down September specifications from foundries. Many interests are hopeful that this regulation will be lifted soon, for it has prevented maximum efficient operations. Blast furnace interests welcome the current breathing spell for equipment is badly in need of repairs. In this district 13 out of 54 blast furnaces are banked or blown out. More of these units have been banked under steel mill schedules are clarified.

New York — A slightly heavier movement than last month is indicated by current pig iron specifications. Gray iron and malleable foundries in particular have heavy backlogs, with war cancellations more than offset by civilian requirements. Apparently the only important restriction is manpower and this is easing a trifle. Possibly by the middle of fall the labor situation will show material improvement. Consumers are covering principally on a month-to-month basis and this tendency will probably continue at least as long as the 30-day inventory regulation remains in effect. With backlog demand off, the pig iron situation in general in the East is fairly comfortable.

Boston — Pig iron demand for the fourth quarter is expected to be stronger with melt up slightly, depending on how supply. Should remaining controls be lifted substantial increase in buying against winter needs is likely. This 30-day inventory is not a safe margin with larger foundry and basic consumers depending on outside shipments, largely from Buffalo. With the district furnace down and stocks depleted emergency demand cannot be met by the Everett unit as was the case last winter. The Everett cast pipe foundry, down last year, has not bettered 35 per cent capacity since resumption, but this is due to manpower shortages rather than lack of iron, which is now brought in instead of being supplied nearby.

Birmingham — Pig iron demand shows a definite upward trend, which is being met by increased production, 18 furnaces now being in action after interruption in recent weeks.

Buffalo—Marked decreases have been noted in pig iron shipments to foundries in Michigan which are strike-bound. However, there has been no accumulation at furnaces. Production and melt

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ted by lack of labor. Sellers have ed books for fourth quarter.

Cincinnati — September requisitions foundry iron match recent levels. ers are busy and have a backlog, continue to complain that a shortage manpower prevents expansion. Some ments of southern iron are tardy be- of recent conditions at furnaces, no case has a district melter faced shutdown for lack of iron. Supplies by-product foundry coke are easy.

Philadelphia — Demand for foundry is strong, although supply is adequate, as the situation has been generally eased by the drop in demand for However, foundry requirements will expand as labor supply increases. foundries which had been virtually forced to suspend during the war getting back into operation and in general iron foundries see much work Soil pipe producers have particularly heavy backlogs. Steel foundries are being adversely affected by end of the war.

Chicago — Indicative of the strong demand for pig iron, WPB allocations being continued through September. Hope is, however, that it may be possible to return to a free market in the quarter. In this area, the situation is tight. Requirements for iron are heavy, and supply is curtailed as several blast furnaces remain out of production.

ap . . .

Scrap Prices, Page 206

Scrap prices continue in steel and foundry scrap and the situation is firm, melters having an eye to winter needs, in the face of reduced supply. Conditions are reported generally with highest grades most in demand. Difficulty in processing unprepared scrap in yards continues as the labor situation has not been relieved. Such is expected to continue through the year, at least.

New York — Following recent consumer buying at ceiling levels, the brokerage market here on melting steel is firm, having come through this test, the market since the end of the war, it appears certain that this firmness will continue for some time. There is still a shortage of material at yards, which may be fairly acute for at least another few weeks and the tendency in steel production is upward. Meanwhile, all cast grades are strong, with weakness having appeared at any time even immediately following Japan's surrender, and most trade interests see the material easing for some time, as demolition work is getting under way.

Cleveland — Scrap prices are strong, with borings and turnings are in good demand and small supply, but the sales recently made are at ceilings. Consumers are seeking good grades of cupola scrap, which are moving as fast as they appear. Electric furnace specifications are also in demand. Active demand exists for shell scrap made available by contract termination. September is regarded as a transition month and quotations are ceilings will be maintained through the year. Melters are trying to build reserves for winter but cupola scrap is in small supply as they lack labor to process their collections.

Cincinnati — Although brokers and dealers deny there is any considerable softness to the iron and steel scrap market, all interests are proceeding with caution. Several questions await clarification. For example, what effect will the tonnage from contract terminations have Also, can dealers expect an early increase in the amount of production scrap which has fallen off abruptly? A few cancellations and holdups are current. The approach of winter is proving a strengthening influence. Definite trends are expected soon to end the period of watchful waiting.

Buffalo — Recent buying has increased outstanding orders at ceilings to more than 100,000 tons in this area. Dealers feel the market will remain strong for some time. Turnings are in the balance, melters refusing to pay ceilings and dealers will not sell at less.

Pittsburgh — Scrap prices remain firm here despite relatively little new buying. Re-entry of Bethlehem Steel Corp. into the eastern market, paying ceiling prices plus springboard and commission, has strengthened the belief that except for such grades as alloy turnings no sharp reduction in scrap prices is probable. Some weakness has developed in unprepared material, however, with as much as $3 a ton noted. With new buying at a practical standstill, dealers do not want to stock up with material at former price levels. Alloy free scrap, cast iron and heavy melting steel are scarce. About 2000 tons of heavy melting steel on the Baltimore & Ohio list

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were recently allocated by WPB. This same policy was followed on the 8000 tons on Pennsylvania railroad's list a short time ago, indicating this type distribution is still being sought by consumers. However, sharp reduction in steel ingot operations since the end of the war has resulted in a moderate increase in mill scrap inventories.

Philadelphia — Scrap continues firm although there is much less consumer buying than a fortnight ago and brokers are beginning to clean up on many of their orders. One factor in present firmness is continued shortage of help in scrap yards. However, the situation should ease over the next few weeks and as a result consumers are moving cautiously on long-term commitments, especially as it is recognized that much ship scrap will be released some day. Some export demand is noted, with Sweden inquiring for cast scrap, which in view of present shortage here is like demanding the moon. With Spain seeking round tonnages of steel scrap there is little likelihood of much scrap of any description moving to Europe at this time.

Chicago — A purchase of scrap by a large consumer a week ago, and incidentally the first sizable one since the end of the war, was limited to No. 1 and No. 2 heavy melting and No. 1 bundles, and consequently failed to provide a real test of the market. Ceiling prices were paid on the order, which was understood to involve about 25,000 tons. Mills are taking in material specified in old contracts, but inventories are

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shrinking and further mill buying within the next two weeks appears to be a certainty.

Warehouse . . .

Warehouse Prices, Page 204

Pittsburgh — Mill shipments to steel distributors have recorded substantial improvement recently, notably in sheets, strip, pipe and cold-finished bars, although these items still are in relatively tight supply. Distributors also have improved their inventory position through the purchase, in some instances at only $5 a ton above scrap prices, of substantial tonnages of excess steel items forced on the market due to wholesale cancellations of war contracts. Warehouse inventories shortly should be more adequately balanced than in many months. Some distributors have pushed back delivery schedules on a few items due to the sharp reduction in demand, estimated to average about 30 per cent for all products, since the end of the war. However, many small lot orders for reconversion purposes should boost warehouse steel shipments during the early reconversion period. The number of incoming orders currently matches the near record pace registered during June but individual tonnages involved are considerably smaller

Cincinnati — Warehouse sales are holding well sustained, demand for structurals and plates being particularly brisk. Some recent decrease in calls for bars has been noted. Mill shipments are improving although a lack of balance in jobbers' stocks continues.

New York — Moderate rebound in buying for urgent fill-in requirements for reconversion is experienced by many warehouses. Orders are mainly for light flat-rolled products, with some slight recovery in alloys. Scattered renewals for aircraft quality steels have followed general cancellations by that industry although the ratio of renewed volume is slight. Mill replacements have not improved materially in most wanted products. In revising mill order programs distributors are maintaining most of their commitments but are spacing out deliveries in more instances.

Philadelphia — Warehouses in August experienced the slowest month so far this year, but considering the fact that war ended about the middle of the month the decline was relatively light, probably not being more than 10 per cent on an average. Distributors anticipate little change this month but look for an increase as fall gets under way. Galvanized sheets and light structurals are in pressing demand.

Price Is Reduced on Electromelt Manganese

Electro Metallurgical Sales Corp., a unit of Union Carbide & Carbon Corp., New York, announces a reduction of 4 cents per pound, effective Sept. 1, on the minimum 2 per cent iron grade of Electromelt manganese metal. The maximum 2.5 per cent iron grade will be discontinued and all shipments of this brand of manganese metal will now conform to the following specification: Manganese 96 per cent minimum; silicon 1 per

...um, carbon 0.2 per cent maximum ... iron 2 per cent maximum. All users ... this product now will receive the ... or a higher quality material at a ... price.

...ron Ore . . .

Iron Ore Prices, Page 204

Lake Superior iron ore shipments in ...gust fell little below those of the com...rable period last year, according to the ...ke Superior Iron Ore Association, ...eveland. This indicates only a mod...ate slackening in demand, less than had ...en expected to follow end of hostili...es. Probable heavy demand for steel ...ter reconversion is completed and de...e to rebuild inventories higher than ...y were last spring is causing a con...ued movement, with expectation that ...e season's total will be close to 80 mil...n tons.

In the accompanying tabulation the ... credited to Port Arthur docks is from ... Steep Rock mine, which also loaded ...454 tons in August through American ...ks at Superior, as the Port Arthur ...k is not sufficiently completed to ...dle all the mine's output.

Detailed statistics of August shipments ...e as follows, in gross tons:

	Aug., 1945	Aug., 1944
...anaba	604,508	776,934
...uette	478,067	609,084
...land	544,500	742,558
...erior	3,700,849	4,202,218
...ith	2,958,848	3,118,338
...e Harbors	2,345,004	2,776,925
...tals U. S. Ports	10,631,776	12,226,057
...spicoten	65,718	62,196
...Arthur	34,310	.....
...otal Canada	100,028	62,196
...rand total	10,731,804	12,288,253

...rease from August, 1944, 1,556,449 tons.

...For the season to Sept. 1 detailed ship...ts by ports are as follows, in gross ...:

	To Sept. 1, 1945	To Sept. 1, 1944
...anaba	3,175,083	3,663,507
...uette	2,446,297	2,596,985
...land	2,936,317	3,799,031
...erior	16,494,817	17,897,858
...ith	13,607,253	13,727,657
...Harbors	12,120,045	12,587,066
...tal U. S. Ports	50,779,812	54,272,104
...spicoten	300,572	302,051
...Arthur	48,288	.....
...otal Canada	348,860	302,051
...rand total	51,128,672	54,574,155

...rease from 1944, 3,445,483 tons

...anada . . .

...on and steel production in Canada ...ing July showed a decline from the ...ious month and also sharp retrac... from the corresponding period of ... year. War contract cancellations, ... shortage and plant repairs are said ...e responsible for the slowdown. The ...cline in pig iron output in July also ... reflected in bringing production for ... seven months of this year below the ... for the like period of 1944. Produc...n of steel ingots, castings and ferro..., however, continues somewhat ...ead of last year's record. In July one ... furnace was banked, leaving eight ... blast, one banked and five blown out ... the end of the month. Following are comparative production figures in net tons:

	Steel ingots, castings	Pig iron	Ferro-alloys
July, 1945	229,161	150,387	15,750
June, 1945	257,115	159,046	18,473
July, 1944	234,418	166,004	14,508
7 Mos. 1945	1,824,779	1,092,350	114,422
7 Mos. 1944	1,747,001	1,115,527	105,750
7 Mos. 1943	1,749,661	1,019,158	133,201

Steel in Europe . . .

London — (*By Radio*) — Position of the steel plate industry is improving in Great Britain. Rail producers are fully booked for some time. Semifinished steel supply is tight, pending arrivals from overseas. Larger output of pig iron is needed for the light castings trade.

STRUCTURAL SHAPES . . .

STRUCTURAL STEEL PLACED

2200 tons, foundry building, Dubuque, Iowa, for Deere & Co., to Gage Structural Steel Co., Chicago; bids June 20.

2000 tons, passenger car shop expansion, Chicago, for Pullman-Standard Car Mfg. Co., to Hansell-Elcock Co., Chicago; Sumner S. Sollitt & Co., Chicago, contractor; bids Aug. 30.

500 tons, addition for Container Co., Reading, Pa., to Belmont Iron Works, Eddystone, Pa., through L. H. Focht & Son, Reading, Pa.,

★ MallDrills put extra torque into drill bits that speeds heavy production and general maintenance drilling of metal, plastics and wood.

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ARMY-NAVY E

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contractors.

400 tons, warehouse and machine room, St. Mary's Kraft Corp., St. Marys, Ga., to Virginia Bridge Co., Roanoke, Va.

320 tons, factory building, Milwaukee, for Chain Belt Co., to Milwaukee Bridge Co., Milwaukee; Klug & Smith Co., Milwaukee, contractor.

250 tons, TPG span, bridge Z-1510, Yorkshire, Iowa, for Chicago, Milwaukee, St. Paul & Pacific railroad, to American Bridge Co., Pittsburgh; bids June 25.

200 tons, mill buildings, De Ridder, La., for Crosby Naval Stores Inc., to Virginia Bridge Co., Roanoke, Va.

STRUCTURAL STEEL PENDING

3000 tons, administration and laboratory building for Navy, at White Oaks, Md.; bids Sept. 14.

2840 tons, axle building No. 5, Pontiac, Mich., for Pontiac Motor Division, General Motors Corp.; bids Aug. 28.

1000 tons, mill building for Lees Cochran Corp., Glasgo, Va.

500 tons, building at Cranford, N. J., for Johnson & Johnson, New Brunswick, N. J.

450 tons, highway bridge, San Angelo, Tex., for state highway commission.

REINFORCING BARS . . .

REINFORCING BARS PLACED

200 tons, Bernstein apartment building, Cleveland, to Truscon Steel Co., Youngstown.

REINFORCING BARS PENDING

2000 tons, square twisted concrete reinforcing bars, Delaware aqueduct, contract 390, Merriman dam, Lackawack, N. Y.

300 tons, Prudential Insurance Co. of America, Watertown, Mass.

200 tons, Western Auto Co., Baltimore.

150 tons, Sears-Roebuck store, Mansfield, O.

100 tons, boardwalk, Atlantic City, N. J.

PIPE . . .

CAST IRON PIPE PENDING

1200 tons, Everett, Wash., 6 and 8-inch, bids rejected; new bids scheduled soon.

100 tons or more, Hillcrest project, Seattle, 6 and 8-inch, bids scheduled soon.

Unstated, $400,000 water system improvement, Kelso, Wash.; survey authorized.

RAILS, CARS . . .

RAILROAD CARS PLACED

Chesapeake & Ohio, 2190 fifty and seventy-ton hoppers; 1490 fifty-ton to Huntington, W. Va., shop of American Car & Foundry Co., New York; 500 fifty-ton hopper coal cars and 200 seventy-ton hoppers to General American Transportation Corp., East Chicago, Ind.; also ten experimental light-weight 50-ton hopper coal cars to Huntington plant of American Car & Foundry Co.

LOCOMOTIVES PLACED

National Railways of Mexico, 32 4-8-4 steam locomotives, 16 to Baldwin Locomotive Works, Philadelphia, and 16 to American Locomotive Co., New York.

Price Ceilings Set for Contractor Inventory Sales

Suppliers of war goods to the government whose contracts have been terminated, and who elect to retain the contractor inventory, can determine their price ceilings for sales of these inventories as follows: Where price ceilings already are established for the same materials when sold in regular commercial channels, these ceilings will apply to the retained inventory of war goods; where there are no existing ceiling prices, sellers will follow simple formula to arrive at their ceiling prices.

Refractory Product Prices Advanced in Southwest

Manufacturers of refractory products in southern California may increase their present maximum prices by 8.6 per cent, Office of Price Administration announced last week. Jobbers and dealers purchasing these products may add to their established maximum prices an amount not to exceed their dollars-and-cents increased costs resulting from the adjustment granted to manufacturers.

OPA Sets Export Premiums For Relaying Rail

Resellers of relaying rail and used track accessories for export have been authorized by the Office of Price Administration to add the same export premiums to domestic base ceiling prices as are permitted on export sales of new iron and steel products. These premiums range from 6 to 12½ per cent, depending upon the quantity sold; provision is made for extra allowance, d

STEE

Aircraft bolts being tested on a Riehle P2 Precision Universal Hydraulic testing machine. Below—One of National Lock Co.'s nickel steel aircraft bolts.

How strong is an aircraft bolt?

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gives "National Lock" the answer

Bolts for aircraft must be plenty strong to withstand the terrific strains and vibrations to which they are subjected. At National Lock Company, Rockford, Illinois, they have been producing thousands of such bolts for 15 years to exact specifications with utmost precision and accuracy. Careful and exact testing of materials is an important part, uncovering defects before production, checking products before shipment and use.

National Lock Company has found the Riehle axiom true—*"One test is worth a thousand expert opinions"*—as have hundreds of other manufacturers. The extreme sensitivity and accuracy of Riehle Testing Machines are the result of their precision construction and assembly. Combined with the utmost simplicity of operation, their precise performance facilitates faster, more exact testing.

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BRINELL HARDNESS TESTERS • MEASURING INSTRUMENTS

ing upon the terms of sale.

ersons warehousing relaying rails and d track accessories must maintain rate facilities for stocking, recon-ning, shipping and receiving the erial if they charge warehouse prices. ch are higher than those railroad rs may charge. The definition of ring rail in the price regulation, 46, has been broadened to include rail used for any purpose other n scrap or rerolling.

ew Ceiling Prices Set r Reconditioned Drums

ew ceiling prices for all sales of re-itioned, unused steel drums, pails containers have been announced by Office of Price Administration. The ceiling prices are the same as those ed for used drums and other used shipping packages. Dollar-and-ceiling prices have been established damaged new drums and used drums 13 to 65 gallons in size and for pails es from 1 to 12 gallons.

ximum Prices for Cast n Soil Pipe Increased

nufacturers' and jobbers' maximum for cast iron soil pipe and fittings been increased about 4 per cent by Office of Price Administration. ndment 4 to revised price schedule provides for an increase of $3 per the prices of cast iron soil pipe ittings. This increase is author-however, for a period of only nonths during which a detailed will be made to determine the necessary to insure generally fair equitable maximum prices for these cts.

ish Steel Not Slated Early Nationalization

(*Concluded from Page 77*)

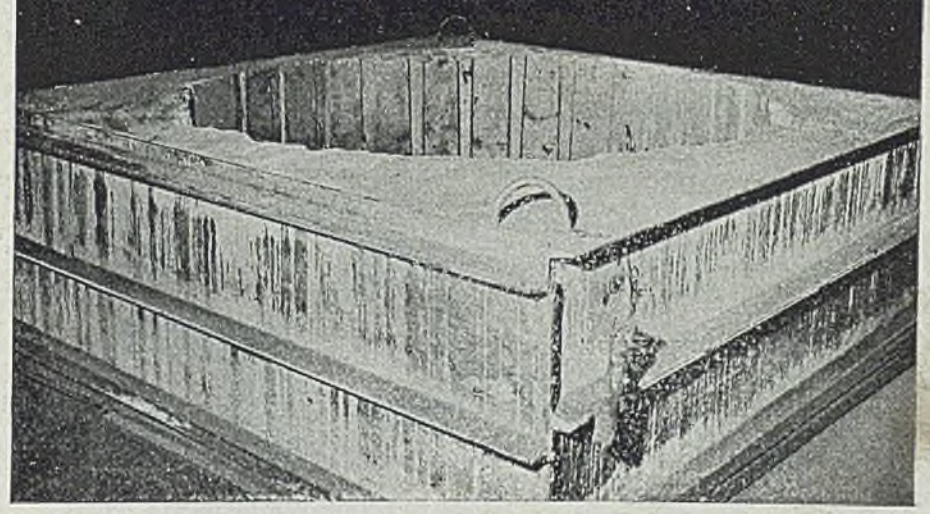
ve continuous employment and a standard of life to the workers de-ng upon the industry, it would be ary to attain a substantially higher of iron and steel, and produce to replace imported products to extent of 2 million tons a year. It ggested that the necessary produc-ould be carried out in one or two letely integrated plants.

w the Labor party is in power, and face squarely all the difficulties lieve the putting into effect of their es in regard to nationalization of a complex industry. Small wonder hesitate before taking the respon-y for such a revolutionary move. industry, on the other hand, has fidence in its capacity to solve its own ems. It is determined to pursue its although handicapped now in re-to the supply of the necessary cap-but it is only too easy to understand that there will be hesitancy in investing fresh capital in an industry that lies under the threat of being taken over by the state, especially when the rate of compensation is unknown. The proposed state planning of investment brings in another element of uncertainty.

From the government's declaration of policy for the coming session of Parliament, there appears to be a breathing space, during which the new party leaders now in power may think over the pros and cons of the situation. The industry is strongly organized to expound its views and discuss the position in a friendly manner with the government. The British Iron & Steel Federation will exert every effort to persuade the government of the industry's confidence that it can manage itself, and, if no basis of agreement can be found, they will use all means at their disposal, mainly through Parliamentary opposition and public opinion, to win their case.

There remains the hopeful possibility of intelligent co-operation between government and industry, with a certain amount of give and take on both sides. Whatever solution is ultimately arrived at, it should be remembered that the consumer has a say in the matter, and should be directly represented in any discussions that may take place at the highest levels, so that his interest may also be protected.

STEEL FOUNDRIES USE REFRACTORY CONCRETE FOR *PERMANENT* MOLDS



Here's a permanent flask or mold ready for your next job. The amount of sand-molding required for big castings is reduced to a minimum. The solid, substantial Refractory Concrete section will take a lot of abuse in ramming and cleaning.

The flask is permanent because it stands up under heat, does not go to pieces, even when there's a breakthrough in the sand mold. The Refractory Concrete, made with LUMNITE and trap-rock, is cast in place and has full service strength in 24 hours without prefiring or baking.

Refractory Concrete is designed to meet the specific requirements of each installation. Thermal and insulating properties depend on the aggregate...crushed firebrick, trap rock, high-temperature insulating materials...used with LUMNITE. Aggregate and LUMNITE are mixed with water and cast in place. Result—jointless refractory sections of the right size and shape to fit the job.

Find out how you can use *adaptable* Refractory Concrete. Ask for booklet, "LUMNITE for Refractory Concrete." Write: The Atlas Lumnite Cement Company (United States Steel Corporation Subsidiary), Chrysler Building, New York 17, N.Y.

LUMNITE FOR REFRACTORY CONCRETE

CONSTRUCTION AND ENTERPRISE

ILLINOIS

CHICAGO—Monaco Metal Foundry Co., 114 West Hubbard St., has plans by H. M. McClure, 53 West Jackson Blvd., for a two-story 50 x 120-foot foundry addition to cost over $40,000.

ELGIN, ILL.—Elgin Softener Corp., manufacturer of water softening and purifying equipment, will build a one-story factory addition to cost about $50,000.

EL PASO, ILL.—City will issue $64,000 bonds for extending municipal water system, including water treatment plant, softener and engine drive unit.

LIBERTYVILLE, ILL.—Scale-Craft Co., manufacturer of railway model equipment, has let contract to Bulley & Andrews, 2040 West Harrison St., Chicago, for a one-story plant 120 x 160 feet.

JERSEYVILLE, ILL.—Baughman Mfg. Co., is building new plant for manufacture of lime spreaders, at cost of $125,000, with capacity of 20 machines daily.

MORRISON, ILL.—Liquid Carbonic Corp., 3100 South Kedzie Ave., Chicago, has let contract to Kaiser-Ducett Co., 80 East Jackson Blvd., Chicago, for a one-story and two-story plant to cost about $500,000.

OTTAWA, ILL.—Inland Rubber Co. plans early erection here of plant to cost about $250,000 for manufacture of tires and tubes. Plans are by Giffels & Vallet, 1000 Marquette Bldg., Detroit.

ST. CHARLES, ILL.—Howell Co., manufacturer of metal furniture, will build a one-story plant addition costing about $75,000. Frank B. Gray, Geneva, Ill., is architect.

MASSACHUSETTS

WORCESTER, MASS.—Crompton & Knowles Loom Works, 93 Grand St., has let contract to E. Whitehead Inc., 97 Union St., for plant additions and alterations costing about $100,000.

CONNECTICUT

BRIDGEPORT, CONN.—Bryant Electric Co., H. E. Seim, president, 1421 State St., plans a three-story plant to cost about $650,000.

HARTFORD, CONN.—Spencer Turbine Co., 486 New Park Ave., has let contract to Louis W. Slocum Inc., 261 North Main street, West Hartford, for a one-story 85 x 135-foot plant addition, to cost about $50,000. R. J. Percival, 12 Haynes St., is architect.

STRATFORD, CONN.—Raybestos Division of Raybestos-Manhattan Inc., East Main St., has plans by L. Asheim, 211 State St., for a three-story factory and office building costing $85,000.

WALLINGFORD, CONN.—American Cyanamid Corp., 30 Rockefeller Plaza, New York, will take bids soon for additions and alterations to chemical plant at cost of about $300,000.

NEW YORK

BUFFALO—Dousing & Hunt Inc., Leon F. Dousing, president, will build an addition to its steel door plant. Plant is busy on post-war stampings and sheet metal products.

NORTH TONAWANDA, N. Y.—Rudolph Wurlitzer Co. plans a $1 million expansion to increase manufacturing floor space more than 250,000 square feet.

TICONDEROGA, N. Y.—International Paper Co., 220 East 42nd St., New York 17, will take bids soon on a boiler plant costing $265,000. Gibbs & Hill Inc., 450 Seventh avenue, New York, is engineer.

OHIO

AKRON—Rogers Tool & Die Co., 590 North Main St., has incorporated with $500 capital and 250 shares no par value to manufacture tools, jigs, dies, saws, pressed parts etc. Saul Groff, 113 South Main St., is agent.

CANTON, O.—Timken Roller Bearing Co., 1835 Dueber Ave., will build a two story plant adjacent to present office building on Dueber Ave., estimated to cost $350,600.

CLEVELAND — Lorence Plating Co., 3134 East 91st St., will build a one-story plant addition 72 x 130 feet, to cost $30,000.

DAYTON, O.—Chrysler Corp. Airtemp Division, General Motors Bldg., Detroit, has plans by Albert Kahn Associated Architects & Engineers Inc., 345 New Center Bldg., Detroit, for a plant to manufacture heating, air conditioning and refrigerating equipment, to cost about $3 million.

ELYRIA, O.—General Motors Corp., Detroit has bought 175 acres on the New York Central tracks near Elyria and will build a manufacturing plant with 400,000 square feet of floor space and an administration building. Hub caps, bumper guards, grilles and similar products will be manufactured.

LOUDONVILLE, O.—Flexible Co., Hugo H. Young, president, will build extension of plant B, Market St., 180 x 200 feet, for building of buses.

MICHIGAN

BRIGHTON, MICH.—Vagabond Coach Mfg. Co., has bought site for a new manufacturing plant.

KALAMAZOO, MICH.—Kalamazoo Stove & Furnace Co. plans to expend $2 million in retooling for postwar production. Arthur L. Black is president.

LANSING, MICH.—Phillips Bros. Screw Products Co. is building a one-story plant addition 40 x 80 feet, on South Logan St.

STEVENSVILLE, MICH.—St. Joe Machines Inc., St. Joseph, Mich., manufacturer of stapling machines, etc., has started erection of a plant here.

INDIANA

FORT WAYNE, IND.—Phelps-Dodge Copper Products Corp., New York, has bought 31 acres and will build a rod, wire and cable plant costing $4,500,000.

MISSISSIPPI

JACKSON, MISS.—Tri-State Brick & Tile Co. plans new plant with modern equipment, including continuous kiln, with capacity of 750,000 brick per month, to cost about $75,000.

TENNESSEE

JACKSON, TENN.—Kirby-Williams Steel Co., John Williams, president, plans a one-story factory to cost about $40,000.

NASHVILLE, TENN.—Precision Parts Corp. is building a one-story machine shop 97 x 150 feet at 402 Cowan St.

NORTH CAROLINA

NEW BERN, N. C.—City will build diesel engine power plant adjoining present steam plant. Burns & McDonnell, Kansas City, Mo.,

MISSOURI

INDEPENDENCE, MO. — Alexander Klein plans one-story factory 40 x 200 feet for manufacture of deep-freeze units.

KANSAS CITY, MO.—Loose-Wiles Biscuit Co., 1100 West Eighth St., Hanford Main, president, has bought 44 acres in Fairfax Industrial District for a $3 million plant, first unit with three work floors 400 x 1400 feet. B. Steenhof is plant manager.

KANSAS CITY, MO. — Nevel Mfg. Co., cases, etc., plans a two-story plant addition 60 x 65 feet, at 1437 Chestnut St.

ST. LOUIS—Emerson Electric Mfg. Co., 1864 Washington St., plans a new factory to cost about $1 million.

ST. LOUIS—Missouri Pacific railroad has let contract to H. B. Deal & Co. Inc., 1210 Olive St., for a one-story 50 x 90-foot machine shop at 3001 Chouteau Ave.

ST. LOUIS—Barry-Wehmiller Machinery Co., 4660 West Florissant Ave., manufacturer of food processing equipment, plans a two-story plant 130 x 260 feet, to cost about $250,000 with equipment. Oscar Janssen, Chemical Bldg., 721 Olive St., St. Louis, is architect.

ST. LOUIS—Acme Chair Co., 3801 Washington Ave., has let contract to Murch-Jarvis Co. Inc., 718 Locust St., for a one-story 80 x 105-foot plant at 3232 Washington Ave. O. R. S. Traber, 718 Locust St., is architect. Cost is estimated at $40,000.

WISCONSIN

BURLINGTON, WIS.—Burlington Mills Inc., manufacturer of insulation, plans one-story plant addition 66 x 106 feet.

HARTFORD, WIS.—Maysteel Products Inc., Mayville, Wis., plans a one-story 60 x 100-foot plant.

KENOSHA, WIS.—Wells Machine Co. let contracts for a one-story factory addition

LA CROSSE, WIS.—Trane Co., manufacturer of heating and air conditioning equipment, has let contract to the Austin Co., 510 North Dearborn St., Chicago, for a one-story plant addition at Bennett and 16th Sts.

MILWAUKEE—S. K. Williams Co., electric plater, will let contracts soon for a one-story plant 58 x 144 feet, at 2328 North 31st.

MILWAUKEE—Peterson Tool & Machine Co. has let contract for a one-story machine shop 60 x 185 and 20 x 30 feet, at 2 West Clybourn street.

MILWAUKEE—Graham Transmissions Inc., manufacturer of variable speed transmissions, will let contracts soon for a two-story addition to its machine shop, 80 x 120 feet at 3760 North Holton St.

MILWAUKEE—Midwest Die Casting Co., 3930 North First St., has let contracts for a one-story plant addition.

MILWAUKEE—Wesley Steel Treating Co. having plans made for a one-story plant addition 33 x 96 feet at 1333 West Pierce.

MILWAUKEE—Weyenberg Shoe Mfg. Co., 234 East Reservoir Ave., has let contract to Walter W. Oeflein Inc., for a three-story plant addition 140 x 202 feet.

MILWAUKEE—Micron Tool & Machine Co., 2030 North 35th St., has let contract for a one-story machine shop addition.

RACINE, WIS.—Dremel Mfg. Co., manufacturer of grinders, plans a one-story plant.

SUPERIOR, WIS.—City plans construction of sewage disposal plant to cost about $500,000. R. E. McKeague is city clerk.

SOUTH MILWAUKEE, WIS.—Midland Co., manufacturer of hardware and metal specialties, has let contracts for a plant addition 128 x 128 feet.

WAUSAU, WIS.—Worth Co., manufacturer of metal parts and fishing tackle, Stevens Point, Wis., plans a one-story factory 200 x 200. A. F. Billmeyer & Son, Wisconsin Rapids, are architects.

MINNESOTA

MINNEAPOLIS—Storm Mfg. Co., 1312 Fifth street, manufacturer of boring machines for automotive maintenance, plans a one-story plant addition.

MINNEAPOLIS, MINN.—American Refrigerator & Machine Inc., 615 North Third, manufacturer of refrigerating equipment, will build a one-story plant at 2700

...ntry Ave. Northeast, 140 x 162 feet.

...OORHEAD, MINN.— City water and light commission will open bids Sept. 18 for a 55,000-lb capacity boiler, 3000-kw generator, stoker and auxiliary equipment for the municipal light and power plant, following approval of $712,000 improvement program. Helmick, Edeskuty & Lutz, Essex building, Minneapolis, are engineers.

...CLOUD, MINN.—J. P. Fox has bought the Midland Hardware Foundry and will reopen it for manufacture of boat anchors and aluminum castings.

...PAUL—National Battery Co., First National Bank Bldg., has bought eight acres at Lexington Ave., and Hewitt St., as site for a new plant. A. H. Daggett is president.

...PAUL—Highway Safety Appliances Inc., 2429 University Ave., manufacturer of anti-skid devices, has bought site for factory, first unit to cost about $125,000.

...PAUL—Atlas Mfg. Co., Eustis and Robbins Sts., manufacturer of sheet metal products, has let contract to E. O. Myrman for a one-story plant addition 60 x 80 feet.

...PAUL—St. Paul Welding & Mfg. Co., 292 Walnut St., manufacturer of welding equipment, has let contract to Lauer Construction Co. for a one-story plant 55 x 60 feet.

...PAUL—Healy-Ruff Co., 2235 University Ave., manufacturer of water level control equipment, radiator hangers, concrete inserts, etc., has let contracts for remodeling and addition to foundry at 85 West Water St.

...PAUL—Seeger Sunbeam Corp., manufacturer of refrigerators, has let contract for a two-story plant 76 x 90 feet.

NEBRASKA

...ATRICE, NEBR.—Store Kraft Mfg. Co., manufacturer of store fixtures and cases, has let contract to Olsen Construction Co., Lincoln, Nebr., for a one-story plant addition 73 x 225 feet, to cost about $100,000.

IOWA

...VENPORT, IOWA—French & Hecht Inc., division of Kelsey-Hayes Wheel Co., 523 East Third St., has let contract to Priester Construction Co., Davenport Bank Bldg., for plant additions and remodeling, to cost about $900,000.

...INNELL, IOWA—Grinnell College will build a foundry at cost of $60,000, to be operated by Lennox Furnace Co., Marshalltown, Iowa, manufacturer of heating products. Lenox plant will absorb most of the foundry output.

...TUMWA, IOWA—Clausing Mfg. Co., manufacturer of lathes and tools plans a one-story plant 120 x 180 feet. Paul Clausing is manager.

...BSTER CITY, IOWA—Charles Closz Co., manufacturer of threshing machine parts, etc., will build a one-story plant 100 x 300 feet.

CALIFORNIA

...EARWATER, CALIF.—Capital Welding Co. has let contract to William J. Moran Co., 3011 South Fremont Ave., Los Angeles, for a plant building 60 x 80 feet at 1201 West Rosecrans Ave., in suburban Los Angeles, including 3-ton crane. Estimated to cost about $9000.

...S ANGELES—Coast Coil Spring Co. has permit for building a machine shop at 1335 East 58th St., 120 x 120 feet, to cost about $36,200.

...S ANGELES—Columbia Iron & Metals Co. will build a storage building 62 x 75 feet at 1705 East Slauson Ave.

...S ANGELES—Paul Wagner is building a machine shop at 2875 Washington boulevard, 117 x 178 feet, to cost $40,000.

...S ANGELES—Roberts Tackless Strip Co., 4705 West Pico boulevard, has let contract to W. B. Whisenand, 357 South Spring St., for a factory building at 123 South Boyle Ave., 50 x 80 feet, to cost about $12,000.

SAN DIEGO, CALIF.—Aircraft Engineering Corp. has been incorporated with $75,000 capital, by G. R. Halterman and associates. Eugene Glenn, 520 Bank of America bldg., San Diego, is representative.

OAKLAND, CALIF.—Diamond Precision Motor Parts has been incorporated with $100,000 capital, represented by Hagar, Crosby & Crosby, Central Bank Bldg., Oakland.

PASADENA, CALIF.—Holly Heating & Mfg. Co., 1000 Fair Oaks Ave., South Pasadena, has plans for a plant at 861 South Arroyo Parkway Boul., 140 x 157 feet, to cost about $52,000. Plans are by R. Howard Annin, 405 South Hill St., Los Angeles.

VAN NUYS, CALIF.—Ed Price has let contract to Owens-Holloway, 14519 Van Owen St., for a machine shop 20 x 60 feet, to cost about $4000.

VERNON, CALIF.—Studebaker Pacific Corp., 4530 Loma Vista, will build a plant addition and improve office building, at cost of $11,000.

VERNON, CALIF.—Truck Bodies Co. is erecting a plant building 51 x 80 feet on East 26th St., at cost of $19,000.

VENICE, CALIF.—Flexible Sewer Rod & Equipment Co., 9059 Venice boulevard, is building a plant addition 50 x 150 feet, to cost about $20,000.

OREGON

EUGENE, OREG.—International Crossarm Co. has bought ten acres for factory to cost about $600,000, with equipment.

SALEM, OREG.—American Can Co. has bought 28 acres for site of can manufacturing plant.

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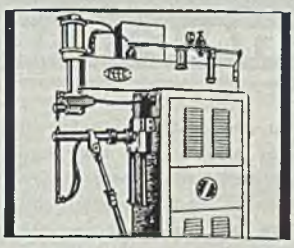

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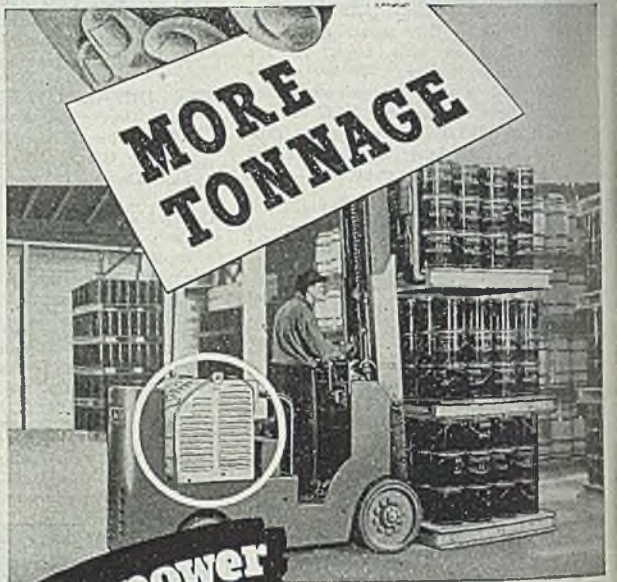

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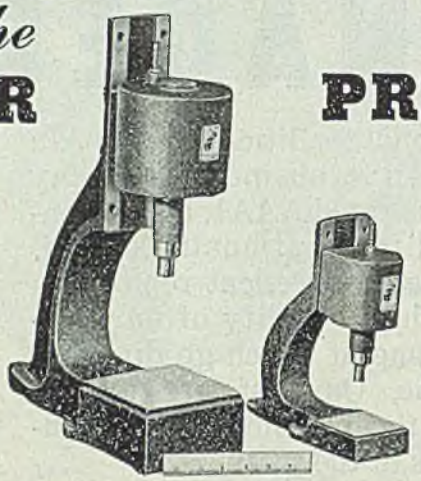

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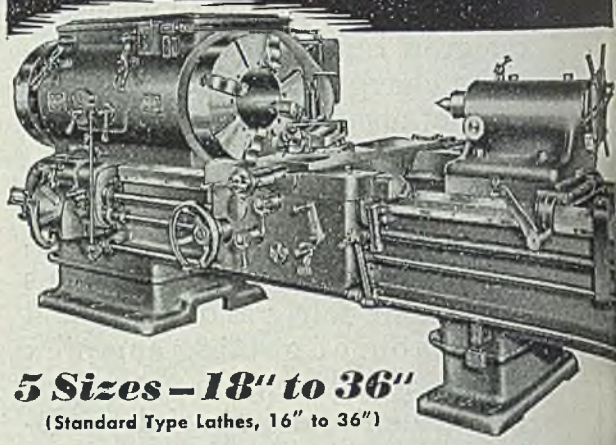

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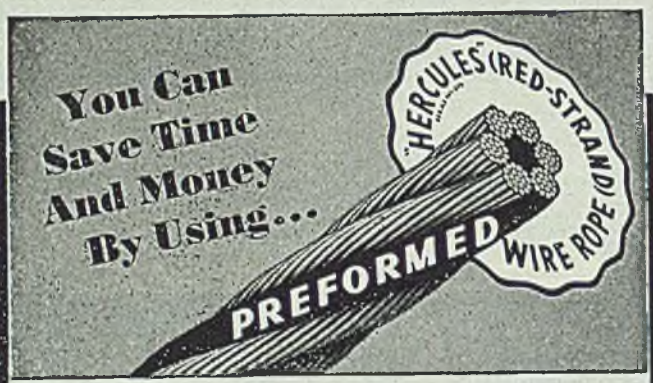

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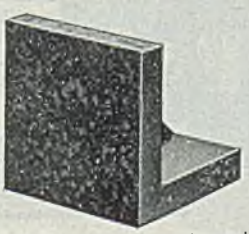

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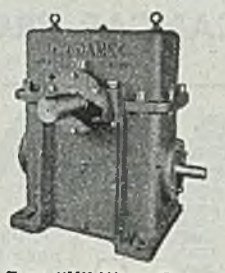

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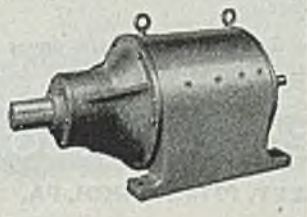

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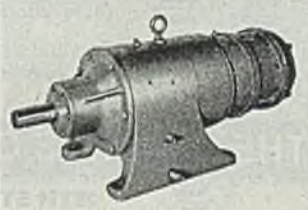

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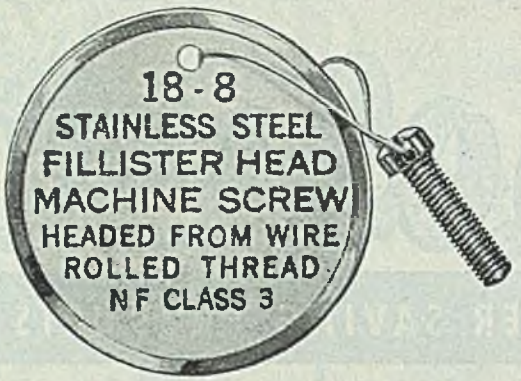

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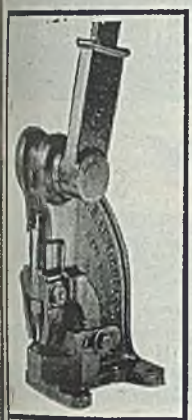

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1/4"x3/16"	1/2"x3/16"	1/2"x7/32"	5/16"x1/4"	21/64"	7/32"
1/4"x3/16"	1/2"x5/32"	1/2"x3/16"	5/16"x9/64"	5/16"	3/16"
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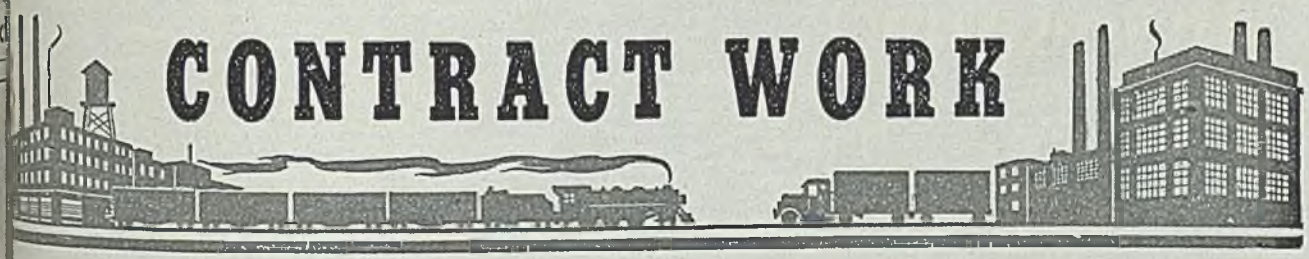

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