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STEEL

The Magazine of Metalworking and Metalproducing

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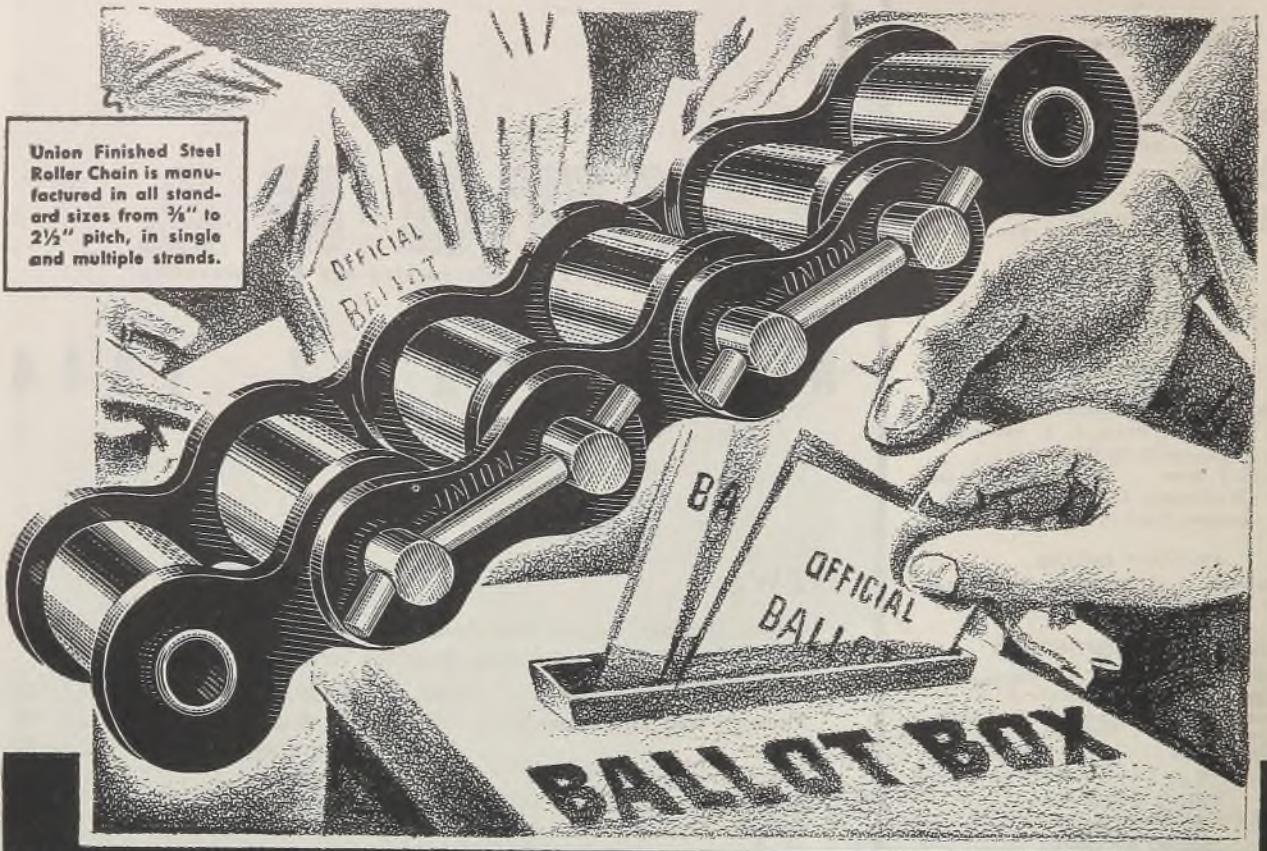
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Industry Is Vulnerable

Scores of corporations are taking action to assure a square deal for returning servicemen. These employers have set up boards to study the case of each returning veteran individually and to assist in placing him in the job to which he is best adapted. In most instances, employers are providing treatment for home-coming soldiers and sailors more liberal than that prescribed by the Selective Service law.

Experience with these plans indicates that the problems attending the rehabilitation and placement of World War II veterans are far more complicated than were those of the first World War. In most plants the ratio of war veterans to the total number of employes will be higher. The variety of ailments arising from service in the present global war is greater than in the case of World War I, which was fought largely in Europe. Aptitudes of men are being affected more markedly by service in the highly mechanized land, sea and air forces in this war than was true in 1917 and 1918.

These factors make it necessary for employers to provide better facilities for determining the individual's qualifications. Some returning men will be capable of handling better jobs than the ones they left. Others will require special help to enable them to fill jobs as good as those they formerly held. A few men never will be able to readjust themselves to a civilian job.

But the factor which makes the World War II problem particularly complicated is the combination of government and union restrictions. No matter how generous the employer may be, he must clear many details through government agencies and unions. One manufacturer had to obtain approval from WLB before he could modify his plan of vacation pay to benefit veterans. Many employers are petitioning unions for permission to give compensating seniority rights to ex-servicemen. The complications in this field are limitless.

Because of these many complications, industrial employers who have not inaugurated plans for assisting veterans should get busy at once. Checks of three industrial groups show that only 16, 25 and 52 per cent, respectively, of companies queried have provided adequate facilities for dealing with returning veterans.

These percentages are lamentably low. A decisive majority—75 per cent or more—of industrial employers should have detailed plans for veterans in operation now. Unless this situation is remedied promptly, industry will be vulnerable to public criticism for failing to do its part in solving this vitally important problem.

DEBATE ON CARTELS: Get set for spirited discussions on private enterprise versus cartels in foreign trade. In Chicago, the Civil Aviation Conference has been working along lines of "equality of opportunity" with accent on private initiative. At the International Business Conference at Rye, N. Y., delegates differed sharply on free enterprise versus cartels. France, Belgium, Great Britain and others favor cartels, while the American delegation—probably remembering experience with

NRA—stood firm against government and cartel controls.

Meanwhile a subcommittee on War Mobilization has submitted a report to the Senate Committee on Military Affairs stating that "industrial monopolists of Germany have worked long and ardently for pan-Germanism" and that "immediately after military victory an international authority should take over the economic controls formerly held by Nazi cartelists." The report is a scathing indictment of

the cartel system as employed by Germany.

Fortunately differences over the organization of foreign trade were not allowed to break out openly at the Rye conference. The delegates voted unanimously to authorize an immediate inter-governmental study of cartels which regulate production, marketing, prices and patent exchanges.

The results of this study, sponsored by 52 nations, will be awaited eagerly by everybody interested in foreign trade. —p. 54

* * *

OFF TO GOOD START: Because of the growing prestige of union labor in national affairs, more than usual interest is being manifested in the annual conventions of the two major union organizations.

Thus far the proceedings of the CIO conclave at Chicago and of the AFL meeting in New Orleans have been characterized by constructive and rather reassuring action and discussion. The executive council of AFL actually held out the olive branch in pleading for a reunion with CIO so that labor can present a solid front to postwar challenges. President Philip Murray of CIO obtained approval for renewing the "no strike pledge" much more easily than he did a year ago. Vice President Wallace, addressing the CIO delegates, spoke realistically when he advocated tax relief for small business organizations in adjusting to postwar conditions.

Of course there is cockiness at both meetings, as was to be expected, but on the whole labor's leaders are getting off to a good start in their roles of greater responsibility. —pp. 48, 49

* * *

HERE'S A RUSH JOB! With Allied armies again on the march toward Berlin, a new drive—sparked by appeals by General Eisenhower and President Roosevelt—is under way to bolster the "critical 10 per cent" of the munitions production program.

The authorities attribute 25 per cent of the lag to a shortage of 100,000 skilled workers, 40 per cent to changes by the military in estimates of requirements, 10 per cent to lack of specialized facilities and 25 per cent to changes in design.

Little can be done about the changes in estimates and in designs. These changes are dictated by the fortunes of war. Relief in the present emergency must be found in solution of the shortage of men and of specialized facilities. This means a better distribution of skilled workers and of the critical machines and the maximum employment of both on jobs that count. —p. 43

HITS "BALKANIZING": Senator Pat McCarran's efforts to "decentralize" industry by means of political discrimination have provoked protests from many industrial sections in the north-eastern part of the nation. Some eastern newspapers have been quite outspoken in their condemnation of the motives of the Nevada Senator's "Committee to Investigate the Centralization of Heavy Industry in the United States."

However well founded these attacks may be, it has remained for a Californian to make the best case against McCarran's arguments. W. C. Mullen-dore, president of the Los Angeles Chamber of Commerce, flatly opposes McCarran's proposal to "freeze" new war plants in the industrial east on the ground that it would "Balkanize" the United States. He questions the notion that the economic progress of any area can be or should be promoted by governmental limitations on production and employment in other areas. He denies that present transportation rates discriminate against the West and the South.

"What western industry wants," says Mr. Mullen-dore, "is a return to free markets and free competition at the earliest possible moment after the war." —p. 65

* * *

LEAD PLATED STEEL: Sulfamic acid is a strong, inorganic acid; a white solid that is non-volatile, non-hygroscopic, odorless and easily handled. For 66 years prior to 1938 this acid had been virtually a laboratory curiosity, inasmuch as it had not been put to use commercially.

However in that year chemists at the Du Pont experimental station evolved a practical, economical process for manufacturing sulfamic acid. The salts of this acid have exceptionally high water solubility and high stability—properties that are important from the standpoint of lead electroplating. Lead sulfamate is one of the most soluble of inorganic lead compounds.

Thus out of the commercial development of sulfamic acid has come the sulfamate lead plating process. It provides an effective, low-cost protective coating for steel which is finding many applications as a substitute for more critical coating materials during the war and will be available for general use in peacetime. —p. 78

E. L. Shaner

EDITOR-IN-CHIEF



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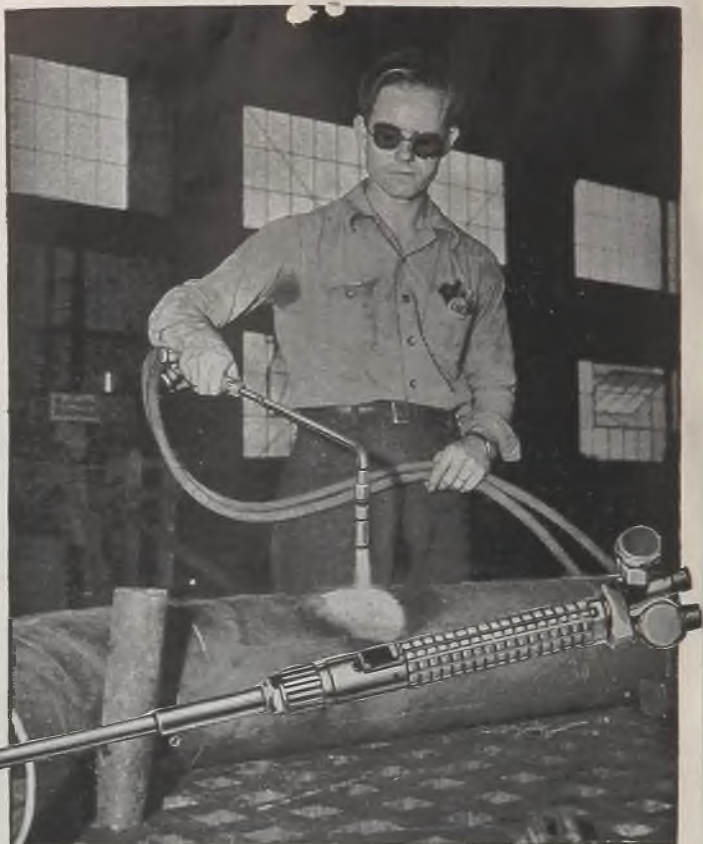
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Induction of men into armed services continues. Casualty replacements not expected to cut materially into present labor force. NEA photo



Labor Shortage Delays War Output

Lack of skilled workers accounts for quarter of lag in production of most critically needed munitions items. Heavy ammunition, artillery, foundries and forge shops most affected. Lifting of draft age unlikely to drain many men from essential industries

A MANPOWER shortage of 100,000 skilled workmen is a major contributing factor in the lagging "critical 10 per cent" of the United States munitions program. However, the lack of skilled workers accounts for only 25 per cent of the lag. Forty per cent is due to the military's changing estimates of the volume of requirements; 10 per cent is due to the lack of specialized facilities; 25 per cent is due to changes of design.

Drafting of men from 26 to 30 years of age will be intensified as military requirements necessitate, but this is unlikely to drain many essential men.

In the face of this relatively small manpower shortage, Washington officials apparently have no definite program to remedy the situation. Beset by the continuing problem of military versus produc-

tion needs, wage restrictions, a lack of labor "effectiveness," and the workers' interest in getting back to assured peacetime employment, manpower officials are at a loss in finding a solution to their problem.

The present approach is much the same as it has been in past months, without signal success in a complete solution. This approach includes the following steps:

1. Transfer of men from less critical to more critical jobs within the same plant.
2. Recruiting workers from less critical areas to the prime critical areas.
3. Priority referral system, giving highest referral to the most essential industries.
4. Placing employment ceilings in non-essential activities.

5. Importing foreign workers.

War Production Board, War Manpower Commission and military officials are attempting a "rifle" approach to the shortage in critical munitions items—attacking the specific delaying factors in specific factories. What the success of this approach will be remains to be seen.

A summary of the manpower situation as it appears in the major war production centers, as compiled by STEEL's editors, follows:

125,000 More Workers Needed in Midwest

CHICAGO

Available labor supply in the Illinois, Indiana and Wisconsin region is falling

far short of manpower demands of essential industries. According to William H. Spencer, regional manpower director, approximately 125,000 workers were needed Nov. 1 after local labor supplies were exhausted.

Demands of nonseasonal establishments for workers have continued to expand, but at a diminished rate, he said. As of Sept. 1, essential labor demands were 4 per cent higher than on July 1, when demand was 14 per cent higher than on May 1. Translated into numbers of workers, the nonseasonal demand of the 64 labor market areas in the region was nearly 140,000 on Sept. 1, compared with 135,000 on July 1 and 110,000 on May 1.

To some extent, Mr. Spencer explains, the increased manpower requirements represent higher war production schedules, true of several ordnance plants in the region that are producing heavy artillery ammunition and dry cell batteries.

To a larger extent the increased demand is a reflection of a decreasing labor force, cut by the loss of summer workers, against constant employment needs. He predicted that the situation would be eased slightly after November unless additional war production contracts placed within the stringent areas carry substantial labor requirements.

One of the worst problems of WMC is to hold workers on the job. Quits, including induction into the armed services, are running at a heavy rate, and

adequate replacements are lacking. According to latest information of Selective Service, drafting of men is to be increased shortly. WMC feels that part of its problem could be solved if workers can be prevailed upon to remain on their jobs—this would reduce the number of new workers to be found.

It was stated that one large aircraft plant here would not need a single new worker in three months if the number of employes who quit each month could be persuaded to stay.

Cleveland Manpower Needs Less Critical Than Year Ago

CLEVELAND

Manpower needs in this district for such lagging war programs as radio and radar equipment, bearings, machine tools, heavy trucks and ammunition are still critical but not to the degree of six months ago.

United States Employment office has orders for 4000 workers from 65 plants on critical war programs, in contrast with 7500 wanted six months ago. There have been a few instances of companies seeking relaxation from the 48-hour week.

Employment in Cleveland war plants—now totaling about 325,000—have been reduced on an average of 1000 persons a month for the past year. Many of those who have lost their war jobs because of contract adjustments have quit the labor force entirely, while the balance have sought work in other cities, were drafted, or have obtained postwar jobs.

Despite the reduction of the working force in war plants, the overall output of munitions in this district has held relatively stable.

Recent decision of Selective Service boards to step up the drafting of those in the 26 to 30 years age group is not expected to materially disrupt war production schedules here. Those in essential work will still be able to obtain deferments.

War veterans seeking employment have been steadily increasing in recent months, but so far have been only a relatively small factor in aiding WMC officials to meet war employment requirements. Local USES office placed 674 veterans during October, the largest number recorded to date. Most took jobs in essential service industries, or other civilian goods lines.

Fewer than 100 men in this district

Strikes, mainly for minor grievances, are a factor in retarding war production of the "critical 10 per cent." Shown below are pickets at a recent strike at the Wright Aeronautical Corp., Paterson, N. J., producing B-29 engines, when 1800 supervisory workers walked out, causing 32,000 other workers to be laid off.

NEA photo



have been transferred to civilian goods production under the War Production Board's spot authorization plan.

Pittsburgh Shell Plants Call for 8000 Employees

PITTSBURGH

Probably as many conflicting opinions as to the manpower situation exists here as there are employers and employing agencies. According to the War Manpower Commission, things are in a bad way, and they have turned to such publicity-getting schemes as placing girls with handbills on downtown streets, who personally solicit workers for war plants. This view is backed up in part, at least, by local offices of War Production Board, Pittsburgh Ordnance District, and the Inspector of Naval Materiel.

Col. Robert C. Downie, district ordnance chief, stated last week that the shell program here was falling behind schedule, and cited the combined need of shell plants here for 7890 workers to bring them to full strength. Particularly he singled out shell lines at Jones & Laughlin Steel Corp., McKeesport, Pa., needing 80 men and 60 women; United Engineering & Foundry Co., New Castle, Pa., 724 men and 453 women; National Tube Co., McKeesport, Pa., 350 men, 100 women; Treadwell Engineering Co., Midland, Pa., 50 men; Bethlehem Steel Corp., Johnstown, Pa., 550 men, 200 women; Pullman Standard Car Mfg. Co., Butler, Pa., 100 men; Oliver Iron & Steel Corp., West Pittsburgh, Pa., 300 men and 100 women; and Pressed Steel Car Co., McKees Rocks, Pa., 87 men and 40 women.

Philadelphia Foundries, Shipyards Need Help

PHILADELPHIA

A shortage of 14,000 workers prevails in the Philadelphia war manpower area, comprising Bucks, Montgomery, Philadelphia and Chester counties. Of this amount 70 per cent represent common labor. Following its designation as a critical manpower district Sept. 1 the trend held for a few weeks, but now the stringency is more pronounced, due primarily to the fact that many employees are leaving their wartime jobs in an effort to set themselves up in peacetime occupations.

Greatest scarcity of help is noted in the foundry industry, with shortages at the shipyards following next in order. It is the requirements of these two industries, it is pointed out, that is accounting for the special need for common labor. One large district shipyard, engaged solely in naval construction, is inquiring for 3000 workers, promising at least three years work. One large yard engaged in merchant ship construction is reported to have recently obtained a new tanker contract which should at least sustain needs at that yard for some time to come.



Personnel workers at Hudson Motor Car Co. discuss problems of rehabilitating returning servicemen. At right is Maj. Otto Rowoldt, who served in both World War I and World War II; at left is Martin Brehem, who joined Hudson after helping rehabilitate thousands of veterans in Walter Reed hospital, Washington. NEA photo

Coal, Ore Miners Needed in the South

BIRMINGHAM, ALA.

This area is in group 3 WMC classification but employers here are struggling increasingly to maintain that status. The district is still short 2000 coal miners and 1500 ore miners with a gradual tightening in other classifications reported. J. A. Downey Jr., WMC area director, attributes much of the trouble to "job hopping," and says the district is on the verge of being placed in class No. 2. There is little indication the military draft here will go above the 26 year age limit at this time as quotas are being fairly well met in the younger age group.

West Coast Out-Migration Estimated at 20,000 Monthly

SAN FRANCISCO

Manpower shortages continue to be the biggest single problem of San Francisco Bay area industries. The downward trend in the labor supply, which has continued unabated for months, affects virtually every war plant in this region. This scarcity, moreover, steadily is being felt more acutely as tempo of the Pacific war is stepped up.

As a result of the out-migration of war workers to their prewar homes in other sections, many industrialists here foresee a manpower scarcity in coming months which will tax to the utmost their ability to maintain war production schedules. This out-migration has been estimated by reliable surveys to be run-

ning at the rate of 20,000 persons a month in the seven western states, with heaviest losses being felt in San Francisco-Oakland, Los Angeles, San Diego, Seattle and Portland.

Among the problems facing many a war plant is the seeming ease with which workers can transfer either to other essential or to non-essential jobs as the result of loopholes in the War Manpower Commission regulations.

30% of New England Feels Labor Shortage

BOSTON

While manpower shortage stands out in the foundry industry, there are other fields where production officials state output of critical war equipment is behind schedule because of lack of labor. Shipyards are loudly calling for labor, notably welders, despite downward revised schedules in some instances. Thousands have left shipyards; one Maine yard has close to 10,000 off from peak employment. Where these workers have gone is a mystery; few have entered the foundries despite frantic appeals. Selective Service has taken some, but far from the total; many are thought to have gone back to farming areas, paid off mortgages and still have money in their pockets. Another factor may be the growing disappearance of overtime pay.

There are in New England approximately 525 companies making critical war items and 156, at last reports, were behind schedule because of lack of labor. This is the major factor also in the lag behind heavy quotas for signal, assault and communications wire for the services.

NFA Discusses Industrial Relations

Forty-seventh annual meeting at Chicago considers such problems as manpower shortages, wage policies, employe training, management's function. Menck new president

NOW that the pattern of government for the next four years can be appraised, the National Founders Association at its forty-seventh annual meeting at the Stevens hotel, Chicago, Nov. 16-17, devoted considerable attention to the industrial relations problems with which its members must deal in the months ahead. Among topics, under the general theme "For Industry's Future," were manpower shortages, wage policies, employe training, and prerogatives of management.

This was the first time in 35 years the annual meeting had been held outside New York city, the shift having been made to minimize travel and promote a heavier attendance of members in the midwest area. Registration was approximately 175 members and guests.

D. C. Bakewell, vice president, Blaw-Knox Co., Pittsburgh, and president of the association, said "industrial relations is the NFA function and the fundamental element is essentially one of manpower."

President Bakewell announced that after long and faithful service to the association, A. E. McClintock, commissioner, and J. M. Taylor, secretary-treasurer, both in Chicago, had resigned as of Jan. 1, 1945. L. E. Roark, for 20 years manager of the Manufacturers Association of Peoria, Ill., and also National Metal Trades Association representative in that district, will take over the duties of both.

Herman Menck, vice president and works manager, Harnischfeger Corp., Milwaukee, was elected president of the association, and I. R. Wagner, vice president and general manager, Electric Steel Castings Co., Indianapolis, vice president. Filling these posts was complicated by the fact that F. H. Clausen, president, Van Brunt Mfg. Co., Horicon, Wis., who was vice president and would have advanced to president, died Oct. 20.

Past presidents of the association elected to council included Thomas S. Hammond, Whiting Corp., Harvey, Ill.; S. Wells Utley, Detroit Steel Casting Co., Detroit; Thomas W. Pangborn, Pangborn Corp., Hagerstown, Md.; Franklin R. Hoadley, Atwood Machine Co., Stonington, Conn.; W. D. Hamerstadt, Rockwood Mfg. Co., Indianapolis; and Retiring President Bakewell.

At the opening session, C. Wayland Brooks, United States senator from Illi-



HERMAN MENCK



I. R. WAGNER

At the recent Chicago meeting of the National Founders Association, Mr. Menck was elected president of the association and Mr. Wagner vice president

nois, spoke on "Strengthening Our American Ideals." He pointed to the task that faces business and industry if our form of government is to be preserved, and appealed to business leaders to visualize that they are leaders not only in the plant—in the foundry—but that they must assume leadership of thought in the community. The problems ahead are the most severe in the history of the nation, he said, and he stressed the fact that we cannot take the cream of manhood, train them to kill, and then move them, after the war, back to an even life of tranquility without great difficulty.

Discusses Pattern of Strikes

Nicholas Kelley, Rathbone, Perry, Kelley & Dye, and vice president, Chrysler Corp., New York, discussed the pattern of strikes since the time of the National Industrial Recovery act, particularly in the automotive industry. He pointed out that the act gave labor the right to bargain with representatives of its own choosing. Then the pattern of grievances began to develop. Organizers wanted help, preferably the help of government. In many cases it would seem this help was secured by threatening to do things that would be embarrassing to the government.

The many difficulties of management in living up to contracts were outlined by Mr. Kelley. He discussed recent strikes and indicated how these were used to get action from the War Labor Board. In conclusion he stated that the term "labor relations" is used rather loosely, and indicated that attention should be given to the standards by which management measures whether its labor relations are good or bad.

Discussing "Preparation of Labor

Board Cases," Clark M. Robertson, general counsel, J. I. Case Co., Racine, Wis., called upon management for "united action" to check a tendency of WLB to usurp "functions and control necessary in operation of business." After reviewing the history of the board, the speaker warned that its hearings are conducted informally and not according to the laws of evidence. Therein, he declared, lies a danger.

When a company is involved in a hearing before the board, legal counsel is desirable, but in any event its representative must be well versed. Labor, Mr. Robertson asserted, has come to believe it can gain its ends better by WLB orders than by processes of collective bargaining. "Remarkable inroads have been made by unions, either through surrender by managements, or by the acceptance of directive orders by which the functions of management have been turned over in one degree or another to the union without a corresponding assumption of responsibility."

He warned against the "so-called mutual consent" provisions, and compulsory arbitration, "sometimes innocent in appearance but deadly in action." The veto provisions frequently are not mutual consent provisions at all, but simply grants to unions of veto power over the exercise of a managerial function.

"Collective bargaining should only include in its scope matters which are properly the subject of collective negotiations." Mr. Robertson contended also that submission of a dispute to some third party by WLB is an "improper delegation of authority under the law, and that the order itself was unconstitutional. It is difficult to see, even under war conditions, that the board can designate some

third party to settle disputes, the settlement of which is vested under law in the board itself."

In discussing "Where Our Wage Policies Are Heading," Phil Hanna, business editor, *Chicago Daily News*, declared that labor policy needs to be changed to make it easier for employers to hire and workers to take jobs. The most pressing future need is more production in bushels and tons, for with shortages of goods workers want goods more than money.

In attempting to set forth what would be the "proper government labor policy," Gilbert H. Montague, counsellor-at-law, New York, declared that WLB has become a "strongly pro-labor pressure agency," exerting its force to induce employers to yield in labor disputes and thereby prevent workers from instigating strikes or boycotts that would interfere with the war effort.

Major portion of the concluding session was devoted to a panel discussion

on "The Foundry—Today and Tomorrow." The panel consisted of Herman Menck, Harnischfeger Corp., Milwaukee, chairman; M. W. Manz, Ohio Brass Co., Mansfield, O.; R. J. Redmond, Buckeye Foundry Co., Cincinnati; W. D. Hamerstadt, Rockwood Mfg. Co., Indianapolis; H. Garnsey Jr., Gould Pumps Inc., Seneca Falls, N. Y.; Gottfrid Olson, National Founders Association, Chicago; and Col. Robert I. Randolph, Chicago Ordnance District.

Colonel Randolph's appearance with the panel was to discuss contract termination procedure and to give a picture of the situation as it now exists. Consensus of the panel was that for the next four years government policy will pursue about the same path as in the immediate past with some further encroachment on management's prerogatives; OPA and WPB regulations are likely to continue for some time in postwar, and little tax relief can be expected immediately.

Regarding installation of new foundry

equipment, it was stated that this should pay for itself in three years or less, otherwise should not be put in.

Possibilities of continued production of steel castings after the war by the converter process were discussed briefly by A. W. Gregg, foundry engineer, Whiting Corp., Harvey, Ill. Undoubtedly, for some time to come, he said, the country will have excess capacity for steel castings, and the situation will boil down to a matter of economics.

Manpower was a topic which received considerable attention from the panel. A few plants which have taken on West Indian labor have found these men good workers and results have been satisfactory. Other foundries, however, have found it economically infeasible to acquire Jamaican help because of the necessity of providing barracks, overcoming union opposition and other red tape.

As to how men can be held in the foundry industry, the panel's advice was limited. Although good housekeeping helps, little can be done to make working conditions more attractive. Higher wages would provide incentive, but this is subject to government regulation.

In summing up the panel's deliberations, Mr. Menck declared the organization in the year ahead, would work for the return of management's prerogatives to management, return of free enterprise, and a minimum of government in business.

Present, Past and Pending

■ STRUTHERS IRON & STEEL SHUTS DOWN BLAST FURNACES

STRUTHERS, O.—Struthers Iron & Steel Co. has shut down its blast furnace, last merchant furnace in this district, after using all raw materials. William C. Holzworth, president, said there are no prospects of reopening now, explaining current OPA prices, overtime rates, difficulties of getting coke and other factors make it impossible to continue operations.

■ RUSTLESS IRON & STEEL OPENS NEW HAMMER SHOP

BALTIMORE—Operations have been started in a new \$500,000 hammer shop of the Rustless Iron & Steel Corp. here. A 12,000-pound air hammer supplements the work of the rolling mills and makes possible the hot working of the higher alloy stainless steels which are not readily rolled. Another 5000-pound hammer, now located in the company's South plant, will be moved to the new hammer shop.

■ WESTERN CARTRIDGE AND OLIN CORP. PLAN MERGER

EAST ALTON, ILL.—Western Cartridge Co. and the Olin Corp., both of this city, have signed an agreement of merger and will be consolidated under the name of Olin Industries Inc.

■ CLAIMS NEW STRETCHING PROCESS IMPROVES STEEL

PITTSBURGH—United Engineering & Foundry Co. has developed in co-operation with the Republic Steel Corp. at the latter's Niles, O., plant a rolling mill unit which uses a stretching process to obtain high quality strip steel of desired temper, hardness and ductility. The mill handles up to 3000 feet of strip per minute.

■ MACHINE TOOL INDUSTRY SWAMPED WITH RUSSIAN ORDERS

NEW YORK—A flood of orders from Russia during the past few weeks threatens to delay the machine tool industry in its role of helping automobile manufacturers prepare for reconversion, according to reports in financial circles here. The government has promised to lend-lease \$120 million of machine tools to Russia in the fiscal year ending June 30, 1945.

■ TITAN METAL PLACES NEW ROD MILL IN OPERATION

BELLEFONTE, PA.—Titan Metal Mfg. Co. has placed its new brass rod mill here in operation, doubling its former production capacity for that product. The mill was financed by Defense Plant Corp. as part of a \$1,500,000 expansion program.

■ DONALD NELSON GIVEN PRESIDENTIAL CABINET RATING

WASHINGTON—Donald M. Nelson has been designated "personal representative" of President Roosevelt, with rank at the cabinet level, and will occupy offices in the White House. He is now in Chungking helping to create a Chinese WPB.

■ FOY RESIGNS DIRECTORSHIP OF WPB STEEL DIVISION

WASHINGTON—Norman W. Foy has tendered his resignation as director of the Steel Division, War Production Board, effective Nov. 30, to J. A. Krug, WPB chairman.

Blast Furnace Men Meet At Chicago Dec. 8

First regular meeting of the 1944-45 season Blast Furnace and Coke Oven Association of the Chicago district will be held Dec. 8 at the Del Prado hotel, Chicago. Program for the blast furnace session has been divided into three topics: Maintenance, raw materials and their handling, and furnace operating. The coke plant session is separated into two groups: Maintenance and operating problems.

Nonferrous Founders Show Interest in Cost Methods

Keen interest of nonferrous founders in the modern methods of cost accumulation factors was convincingly expressed when an entire afternoon was devoted to the subject at the recent board of directors meeting of the Non-Ferrous Founders' Society at Columbus, O.

L. M. Nesselbush, Falcon Bronze Co., Youngstown, O., director of the society and chairman of the cost committee, presented for discussion the preliminary accounting manual being prepared for the membership. The purpose of the manual is to "provide the society members with what the committee has found to be the minimum requirement for general accounting principles which must be followed and cost finding methods to be employed."



FRED M. VINSON "I will use special vigilance"

BLS Cost of Living Index Is Upheld by Stabilization Chiefs

Hold-the-line policy on wages indicated in statements by presidential advisers. Unions' contention of 44 per cent advance challenged. Davis says only 3½ to 4½ points need be added to Labor Department's figures

WHAT action the President may take in holding or modifying the Little Steel wage formula remained a mystery last week despite reports by two advisers indicating that advances in living costs justified a continuance of the "hold-the-line" policy.

War Labor Board Chairman William H. Davis sent to the President a report by a five-member special committee upholding in general terms the conservative Bureau of Labor Statistics index as a measure of the advance in wartime living costs. While the Davis report suggested that 3½ to 4½ percentage points might be added to the bureau's index to compensate for certain hidden advances, it sharply challenged the contention of union labor leaders that living costs have advanced 44 per cent. The BLS index shows an advance of 25.5 per cent, while the Davis report suggests this might be raised to 29 to 30 per cent.

Fred M. Vinson, director of the Office of Economic Stabilization, in a statement supporting the conclusions of the Davis committee called for extra vigilance in holding the line against inflation, and declared that "wherever our present price and production controls are too lax—as in the case of textiles and clothing—we must tighten them."

Mr. Vinson's statement implied that emphasis should be placed on continued stiff resistance to any elements contributing to a further widening of the inflationary gap—wages as well as prices.

The economic stabilizer said the minor differences in the Davis report and the BLS index relate almost entirely to matters not sufficiently precise to permit of accurate measurement by an official index.

The general conclusion of the Davis committee's report that only 3½ to 4½

percentage points need be added to the BLS index to arrive at a fairly accurate reflection of wage earners' increased wartime living costs and Mr. Vinson's endorsement of the committee's finding were interpreted in many quarters as strengthening the administration's hand if it decides to refuse union demands for abolition of the Little Steel formula.

Other observers, however, were unable to understand how the President could repay his political debt to organized labor unless some wage concessions were granted.

The reports in any event are likely to play an important part in the efforts of the Congress of Industrial Organizations and the American Federation of Labor to breach the wage formula, which limits wage increases to 15 per cent over January, 1941, the base period. Chief

test case in the unions' effort to destroy the formula is the demand of the CIO-United Steelworkers for a straight 17-cent hourly increase, with other concessions estimated to cost the industry an equal amount. This case has been before the WLB for nearly a year and the full membership of the board now is at work on a factual report to the President. It is understood the public members of the board already have completed a draft of such a report.

Members of the Davis committee reporting on the accuracy of the BLS index included: Public members Horace B. Horton and George K. Batt; CIO Member R. J. Thomas; and AFL Member George Meany. The public members in a separate report said they agreed in the main with the Davis report. Both union members dissented.

WLB Delay Irritates Murray

CIO president calls for renewal of no-strike pledge at annual convention in Chicago. Says continuance calls for changes in either labor board's personnel or policies

CHICAGO
IRRITATION over the War Labor Board's delay in settling the steel wage case which has been pending for almost a year was sounded at the Congress of Industrial Organizations' annual convention here last week by Philip Murray.

Mr. Murray, in making a plea for continuance of the no-strike pledge, demanded in turn that the WLB drastically change its policy or its personnel.

"For the duration of the war there is no question but that labor must continue

its no-strike pledge," said Mr. Murray. "This is a responsibility which labor has to the nation and to itself.

"For this reason, it is imperative that there be a National War Labor Board to handle not some, but all disputes that may arise between labor and management and which cannot be resolved by collective bargaining."

The 600 delegates to the convention unanimously reaffirmed their no strike pledge for the duration of the war after
(Please turn to Page 150)

"Come Home," AFL Beckons CIO

Executive council criticizes destructive policy of rival union, tempers criticism with plea for reunion that labor may present solid front for the postwar world

NEW ORLEANS

DEPLORING the widening split with the Congress of Industrial Organizations, the American Federation of Labor in annual convention here beckoned anew for its one time member and present rival to return to the fold and permit

organized labor to present a united front to the postwar world.

The AFL leadership as represented by the executive council tempered criticism of what it termed CIO raiding policies with an expression of hope that the gap between the two unions might be erased.

"It is the opinion of the executive council that the leaders of the CIO who are responsible for the division within the ranks of labor should face the facts, abandon the destructive policy they have followed for years, and unite with the American Federation of Labor in a sincere and constructive effort to establish unity, co-operation and solidarity within the ranks of labor."

Secretary-Treasurer George Meany reported AFL membership now stands at 6,818,400.

Addressing the convention Paul V. McNutt, chairman, War Manpower Commission, warned labor, industry and government against fumbling the ball on the 10-yard line with the war's end in prospect. He said the answer of attracting workers back into low wage war industries lies in a revitalized sense of responsibility to the American people. He derided those who "already have hitched up the victory bandwagon and gone for premature hayrides," and discouraged overoptimistic thinking by saying that after victory in Europe we will still be only halfway to winning the war.

Three WLB Members To Stay On Board Until V-E Day

Three public members of the WLB, who had proffered their resignations to the President, have been persuaded to stay on the job until the defeat of Germany. Mr. Roosevelt rejected the resignations of Mr. Davis, chairman of the board, Dr. George W. Taylor, vice chairman, and Dr. Frank P. Graham. All had expressed their desire to return to their former employment—Mr. Davis as a patent attorney, Dr. Graham to his post as president of the University of North Carolina, and Dr. Taylor to the professorship of economics at the University of Pennsylvania.

Two Members of Surplus Property Board Nominated

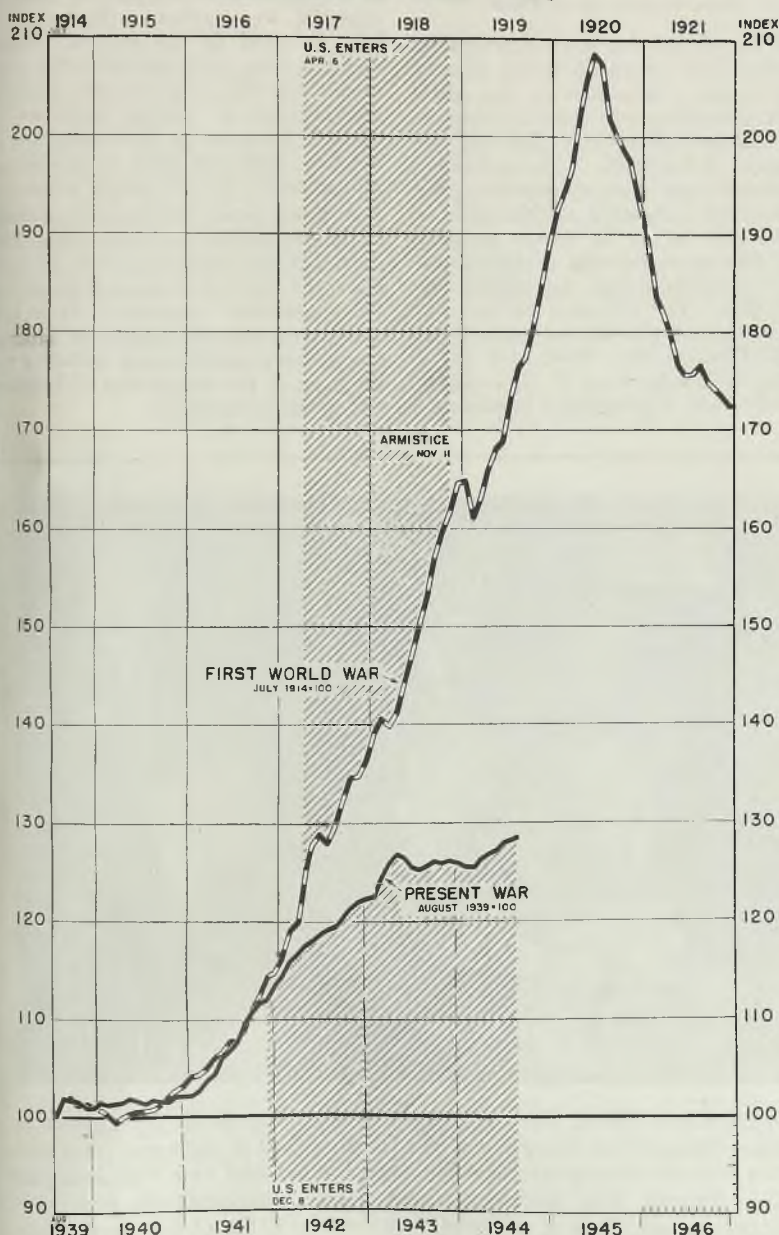
Robert A Hurley, former Connecticut governor, and Lieut. Col. Edward Heller of San Francisco have been nominated by President Roosevelt as members of the Surplus Property Board, established under the Surplus Property Disposal act. It is expected that nomination of the third member, Sen. Guy M. Gillette of Iowa, will be postponed until after Jan. 3, 1945, when his present term as senator expires. It will be the board's duty to direct the disposition of property and goods declared surplus by the War and Navy Departments and other agencies.

Chicago Work Stoppages Disrupt Steel Production

CHICAGO

Chicago strikes continued to beset steel production last week. Three work stoppages (Please turn to Page 150)

COST OF LIVING IN FIRST WORLD WAR AND IN PRESENT WAR
AVERAGE FOR LARGE CITIES



UNITED STATES DEPARTMENT OF LABOR
BUREAU OF LABOR STATISTICS

47

Dispose of Over 50 Per Cent of Listed Surplus Aircraft Materials

Metals Reserve Co. distribution agencies have issued shipping instructions on approximately \$10 million worth of materials. Progress of disposal plan outlined, and thinking on subject co-ordinated at Chicago meeting

CHICAGO

LATEST tabulation of surplus aircraft materials reported to the Metals Reserve Co. in its co-operative plan for resale of these materials, working with designated agents, the Army Air Forces and the Navy Bureau of Aeronautics, shows a total of \$22,500,000 on 591 surplus inventories from plants of 265 prime and subcontractors. Of this total, approximately \$4,250,000 has been "deleted" because of changing contractual requirements, errors in inventories, re-use by other contractors.

Of the balance, the MRC distribution agencies have issued shipping instructions on approximately \$10,000,000 worth, of which over \$1,000,000 worth has already been invoiced. This leaves a balance of around \$8,000,000 listed for sale, indicating a disposition of well over 50 per cent of the listings. Agency contracts with MRC now total 78, of which only 25 as yet have reported sales.

These facts were highlights of a meeting here, Nov. 20, sponsored by the MRC and military procurement agencies under the general direction of Lieut. Col. A. E. R. Peterka, head of the property disposal unit of the Air Technical Service Command at Wright Field, O. Over 150 were in attendance, including representatives of many of the distribution agencies, the MRC, aircraft contractors and the service groups.

Principal purpose of the meeting was to outline progress of the surplus disposal plan, and to co-ordinate the thinking of the above four groups, all of whom have the same principal objective despite a varying approach to the question.

Included on the list of surplus materials are four broad categories of materials and parts—steel, aluminum, copper and aircraft hardware including certain basic components. Inventories submitted by contractors thus far cover 763,000,000 pieces of aircraft hardware and components, 16,000,000 pounds of aluminum, 1,000,000 pounds of copper and 50,000,000 pounds of steel. Recent WPB ruling permits resale of the material under PR-13 or on an ex-allotment basis.

Distribution agencies covered in the 78 MRC contracts are held to a minimum of regulation, the effort being made to depend on their good business judgment, rather than saddling them with a multitude of regulations and directives. Distributors are allowed specified commissions—around 30 per cent—on resales, the MRC taking title to surplus material when it has been accepted by the dis-

tributor. Prices applying to sale of such material are held between a floor set by the lowest established price of any reputable supplier, and the OPA ceiling. Freight costs in excess of those which would apply in regular mill sales of material are absorbed by the MRC, within reasonable limits.

Reviews Details of Plan

Details of the plan were reviewed by Murray Cook, president of the Murray Cook Corp., a subsidiary of the MRC which is handling relations with distribution agencies; and by D. C. Schieck, vice president of the MRC. Colonel Peterka introduced various representatives of the services and announced establishment of special units in the six aircraft procurement districts to expedite problems arising in connection with the surplus disposal plan. The following officers will have charge of this district work: Capt. E. M. Flues in New York; Maj. G. A. Russell in Atlanta; Capt. P. G. Lewis in Detroit; Capt. J. M. Sturges in Chicago;

Capt. A. T. Carrow in Wichita, Kans.; and Lieut. E. E. Haines in Los Angeles.

In panel discussions centered on problems in specific fields, the matter of pricing came in for considerable discussion, some distribution agencies feeling that if surplus were to be moved expeditiously it may be necessary to develop some formula for underpricing. Another problem is how to induce prime contractors to screen their purchase requirements for new material against available surplus stocks. Both of these angles are now being given further attention.

Distributor complaints over the difficulties of obtaining well-rounded inventories from surpluses brought forth the admonition that obviously this would be impossible, but nevertheless these established distributors are best qualified to handle surplus disposition if it is to be kept on a business-like basis. The matter of storage of surpluses pending their acceptance by contractors who may be buying ahead for six months' requirements is being analyzed and within a few months the RFC may announce plans for establishment of "storage reservoirs" to alleviate demands on distributors who do not have sufficient space to handle surplus materials for any length of time.

At the moment, the principal objective of the surplus plan is to move these materials back into production with all possible speed while they can still be used in war production programs. At a later date as the aircraft production program tapers, more consideration doubtless will be given to the distribution of surpluses into civilian channels.



OPEN BOND DRIVE: Sixth War Bond drive is opened at the Capitol by Henry Morgenthau, Secretary of the Treasury. Left to right are, front row: Vice President Henry Wallace; Mr. Morgenthau; and Vice President-elect Harry Truman. Rear row: Rep. Joseph Martin, Massachusetts; Edward F. Bartell, commissioner of accounts; Rep. George L. Doughton, North Carolina; and Sen. Walter F. George, Georgia. NEA photo

Chemical Foundation Denies Any Part in Alleged Price Fixing

Points out that licenses granted over 90 steel companies expired with patents in 1937 and the Foundation since has had no knowledge of the actions of any steel producers. Says its action on minimum prices was legal

DECLARING the implications inherent in the use of the term "co-conspirator" with reference to the Chemical Foundation Inc., in the recent indictment by the federal grand jury in Trenton, N. J., of eighteen steel companies and six of their officers are both unjust and unwarranted, the Foundation last week issued a statement making clear its position in the matter.

"The Chemical Foundation," reads the statement, "licensed over ninety steel companies to use its patents on stainless steel. These patents were available to all American companies on a non-exclusive and equal basis. All of these licenses expired with the patents themselves in May of 1937. Since that time, the Chemical Foundation has had no knowledge of, and certainly no control over, the actions of any steel companies in the United States or elsewhere. Therefore, it is not

possible that the Chemical Foundation had any part in any alleged conspiracy which might be the subject of a present indictment in the federal court.

"During the period from July 1, 1934, to May 4, 1937, the Chemical Foundation did establish minimum prices on those types of steel covered by its patents. Its action in so doing was legal in every sense and in complete accord with the decisions of the United States Supreme Court. Various individuals in the Department of Justice and in the Antitrust division of that department, including a former head of that division, have conceded that the action of the Chemical Foundation in fixing minimum prices was entirely in accordance with the law, particularly as the same was enunciated in the General Electric case.

The prices fixed by the Chemical Foundation were based on actual costs

of production and represented what was believed to be a fair price to the public which would at the same time give a fair return to the producer. This belief is confirmed by the fact that in establishing prices, the Office of Price Administration in its release No. 636 of Sept. 2, 1942, stated that it adopted for certain types of high alloy steel castings the base schedules used by the Chemical Foundation as the basis for minimum prices under its licensing agreements. The OPA also adopted price differentials established by the Chemical Foundation where the producer himself had no such established price differential."

Incidentally, in the same release, it is pointed out that the alloy steel casting industry did not develop in the United States until after the first World War. It was stated that, "although the Chemical Foundation did not control all of the formulas, nevertheless, it did have sufficient control to be the guiding factor in the development of the high alloy casting industry in the United States."

The implication that the Chemical Foundation was used by anyone for any illegal purpose is absolutely without foundation in fact, the issued statement declares.

Says Germans Hold Steel Trade in South America

German steel interests have been successful throughout the war in preserving German supremacy in the steadily expanding South American market, Chairman Harley M. Kilgore, of the Senate Subcommittee on War Mobilization, charged recently.

Presenting to the returning Senate his subcommittee's findings on cartel operations with enemy countries, he reported that European steel firms—Nazi-dominated at the outset, or taken over in their various occupations—procured steel in the United States through their New York agents, when European shipments were halted in 1939. This American steel, said Senator Kilgore, was shipped to German distributors in South America.

"Their customers thus continued to look to the European-controlled firms in Latin America for steel, rather than to the local branch offices of the United States companies that actually manufactured it," he charged.

German steel firms, he continued, succeeded in building up huge inventories in South America and replenishing stocks, so that their engineering firms in South America, with supplies of American steel at their disposal, have continued bidding successfully on construction jobs in competition with other firms buying American steel.

This, said the senator, has caused some of our leading producers considerable concern. The German steel trust, said the report, has operated all over the world, through concealed ownership of agencies conducting its bidding.

POSTWAR PRELIMINARIES

GERMAN CARTELS—Nazi industry must be reorganized to eliminate aggressive power, Senate subcommittee declares. Says cartels must be destroyed. See page 54.

BRAZIL—South America's most populous country will attain near-self-sufficiency in steel soon after the war. Imports will diminish. See page 56.

VETERANS' REINSTATEMENT—Automakers advance plans for determining seniority rating of returning servicemen. See page 59.

WEST COAST—Los Angeles spokesmen say western states do not want "freezing" of government-owned war plants and facilities. Oppose "Balkanizing" of United States. See page 65.

AIRCRAFT—Electric-driven transoceanic air liners envisioned at meeting of American Institute of Electrical Engineers. See page 68.

DEEP DRAWING—Improved die designs and drawing lubricants now permit making 5½-inch deep draw in single operation instead of two formerly required. See page 74.

LEAD PLATING—After this war, lead plating may find broader fields for service and reverse the downtrend noted after World War I. One good reason is commercial production of sulfamic acid which, used in conjunction with electro-deposition process, affords low-cost, protective coating for steel. See page 78.

LABORATORY AIDS—Improved carbon and sulphur determinators now available for rapid and accurate analysis of steel, iron, nonferrous metals and coal should be as valuable tools for peace as war. See page 93.

LIQUID HONING—Peening effect of abrasive emulsion improves physical properties and fatigue life of metal parts. Tool life increased 200 per cent and other benefits are anticipated. See page 100.

Postwar House Building Boom Is Held Dependent on Lower Costs

National Housing Agency points out high construction cost has discouraged house building in past and may cause many potential postwar builders to stay out of market. Report lists five reasons for high costs

NATIONAL Housing Agency in a report covering an investigation of the cost factors involved in building construction infers indirectly that the way is wide open for a lowering of housing costs through the introduction of new materials and methods.

Main conclusions of the report are:

While current estimates indicate a need for more than 1,000,000 dwellings a year after the war, there is a question whether this need for houses can be translated into houses actually built. Recent surveys have indicated that a very large number of families desire to build or purchase new homes more than any other thing after the war, and many of them have accumulated savings for home purchase. But a sizable part of this potential demand is likely to vanish unless building costs are reduced.

"A part of the failure of increases in the housing supply to meet the need of the population, even before the war, may be attributed to the depression," says the report. "Even before the depression, however, the number of new houses built each year was not enough to prevent the accumulation of a large number of substandard houses throughout the country. In fact, the housing census taken in 1940 revealed that the number of substandard dwellings is so great that even if 1,000,000 dwellings were built each year for 15 years after the war it would not eliminate all of them and at the same time provide for the normal increase in new families.

Building Costs May Be Higher

"Apparently something more than the depression or the war is responsible for the fact that for many years the general condition of the housing supply in this country has been declining.

"A large part of the difficulty may be traced directly to the high costs of building and the failure of building methods to keep pace with rapid technological advances in other industries."

Despite the serious consequences of high building costs in the past, says the report, some estimates indicate that in the immediate postwar years building costs may run even higher than before the war. If there were a similar rise in the general price level, this would mean that building costs would be at about their relative prewar levels in relation to prices of other commodities. However, if it is expected that more than 1,000,000 houses a year will be built in the postwar period, and if no substantial improvements are made in building techniques,

the costs of building might rise more than the general price level because of the unprecedented demand for houses.

"Under present methods of production and distribution, the building industry is not geared to produce housing in such volume without increased costs and prices."

High cost of building, in relation to family income, the report goes on, has been a contributing cause of the large volume of costly foreclosures at fairly regular intervals, and it is only because of the low prices on foreclosed houses that many people with lower incomes have been able to afford to live in them.

"It has been suggested," the report says, "that with a high level of national income, and with correspondingly high average family incomes, housing activity can be maintained at high levels without regard to the cost of building. However, no one has yet discovered a way to stimulate individuals and organizations to invest funds in building at high levels in sufficient volume to achieve anything approaching this level of activity."

The report lists the following reasons for high building costs:

1—Technological backwardness; essentially the same materials and assembly methods are used in house construction today as were employed 100 years ago.

2—The average house is made up of as many as 14 individual layers ranging from the finish coat on the outside to the finish coat on the inside. Costly handling and merchandising and distribution methods, and a great deal of labor duplication and waste result.

3—There has been a trend over many years for prices on building materials to rise higher than prices on other commodities.

Rapid Rise in Wage Rates

4—Wage rates of building workers have risen more rapidly and higher than in many other types of work. In 1940 union wage rates in the building trades were 42.4 per cent higher than in 1921 and 9 per cent higher than in 1929. In comparison, the cost of living for wage earners and lower-salaried workers in large cities dropped 18.5 per cent between 1921 and 1940, and was 17.9 per cent lower in 1940 than the cost of living in 1929.

5—Restrictive practices; these take the form of restrictions in building codes which discourage introduction of new materials and methods, restrictions in labor practices which discourage introduction of labor-saving methods and machinery, and restrictions by dealers and manufacturers which require wasteful methods of distribution.



YOUNGEST SENATOR: A former Army Air Corps officer, Capt. William E. Jenner of Marengo, Ind., and a former elevator operator in the House of Representatives, is sworn in as the youngest member of the Senate. He was named to fill the unexpired term of the late Senator Van Nuys. Photo shows, left to right: Sen. Raymond E. Willis; Senator Jenner; Vice President Henry Wallace. NEA photo



After the Ticker Tape . . . what?

The whistles will blow, the bells will toll—we'll shower them with ticker tape and tears of joy—then what?

Then the victory they've won and all the things they've fought for will be in our hands to hold . . . We have all the weapons we could want: Productive capacity, technical skills, buying power, and need. How, then, could we possibly fail?

Only by lack of planning now for total peace.

And in this critical hour of preparedness for peace, the engineers of the basic machine tool producers again have a strategic part to play.

They helped the men of government and of industry to plan the most desperate and gigantic production program of all time . . . and they can help those same men now to solve our post-war problems of reconversion.

One of these is a Bryant man. We offer his services to you.



BRYANT CHUCKING GRINDER COMPANY

SPRINGFIELD
VERMONT, U.S.A.

German Cartel System Must Be Destroyed, Says Senate Committee

In report on American postwar foreign trade policies, group says Nazi industry must be reorganized so as to eliminate its aggressive power. Dismantling of munitions and indirect munitions industries held required

IN REPORTING to the Senate Committee on Military Affairs a recommended program of policies to guide our foreign trade activities after the war, the Subcommittee on War Mobilization holds that the "industrial monopolists of Germany have worked long and ardently for pan-Germanism and that immediately after military victory an international authority should take over the economic controls formerly held by Nazi cartelists.

"Germany's industry," the report declares, "must be reorganized so as to eliminate its aggressive power. The subcommittee believes that those who have urged that all German industry, other than direct armament manufacture, be left intact, have overlooked the fact that for more than 30 years all German industry has been closely integrated as a munitions economy. A real disarmament program requires not only the dismantling of all direct munitions industries but also the dismantling and removal to the devastated areas of Europe of the primary indirect munitions industries, including metallurgical and chemical industries.

Cartel System Part of Conspiracy

German industrialists, the report says, used the cartel system as part of a conspiracy for world dominion; using commercial relations as a weapon, they re-armed their own country and disarmed their prospective victims. Leading American firms, fearing that competitive imports and new techniques from abroad would disturb their control of industries in the United States, "entered into a truce with the foreign cartelists. They gave up foreign markets in exchange for protection. Using their cartel affiliates or subsidiaries, German industrialists built up a network which impaired the production of other nations, obtained sources of foreign exchange for Germany, gathered economic intelligence and spread Nazi propaganda.

Another reason why our participation in cartels must go, says the report, is that cartel economics mean scarcity economics. This philosophy would be a handicap in the postwar era when the nations of the world will be hungry for American goods. If we are to have full employment after the war, says the report, we not only will have to raise our standard of living by 50 per cent over the prewar level, but our export goal must be "several times the prewar figure."

The subcommittee recommends creation of a joint legislative-executive commission as a first step to facilitate United States participation in the international

organization that will be concerned with world trade after the war. Because Congress eventually must sanction any international agreements to insure full United States participation, it is desirable that a special liaison group be organized; it would be composed of representatives of both the legislative and the executive and would study and compile relevant facts and formulate policies. "Representatives of industry, labor and agriculture should be invited to participate in the deliberations of the joint commission, so that the best developed and most fully supported proposals can be given immediate and thorough consideration."

Through the joint international organization, the subcommittee recommends, "the nations should inventory their industrial, human, and natural resources to see how they can most effectively exchange their special products so as to secure for each full production, full employment and a rising standard of living. In determining desirable goals of world exports and imports, one of the chief considerations should be the reconstruction of war-devastated areas . . .

"Because of our advanced industrial position, American co-operation in world reconstruction and industrial development is critical. We should recognize as de-

sirable the possibility of an even more rapid increase in United States exports than imports in the initial postwar years. This would serve to develop markets for the high-powered United States industrial machine, and would also establish firmly the bonds of friendship and co-operation with other nations. After the first major period of reconstruction and development (approximately 10 years) is over, we should establish a balance of imports with exports."

New methods are needed, says the subcommittee, for the interchange of technical and scientific information.

"Within the framework of the international economic organization," it recommends, "there should be set up a special section where representatives of the nations would meet and work out agreements assuring the most useful and rapid scientific exchange. This country should have a scientific agency to represent us in such an international body."

Patent Law Needs Revision

In some respects, says the report, the American patent system has played into the hands of the Germans. Our patent law well should be revised, it says, "so as to require that any discovery originated abroad be licensed to any American producer who wishes to use it on a nonexclusive basis for payment of a reasonable royalty. For this purpose foreign-originated patents could be registered with a designated federal agency which would determine the amount of reasonable royalty after representations by the foreign inventor and the prospective domestic licensee. By international agreement the United States could arrange that this same agency represent American inventors abroad in securing foreign patents and collecting for them reasonable royalties."



KRUPP BEFORE BOMBINGS: Just before American and British bombers started dropping heavy loads of explosives on the Krupp armament works at Essen, Germany, this photo shows the docks and blast furnaces at the leading Nazi munitions plant. NEA photo

PRIORITIES-ALLOCATIONS-PRICES

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

INSTRUCTIONS

ALUMINUM FOIL: Persons who are eligible to use the AA-1 preference rating according to terms of CMP regulation No. 5 for their MRO (maintenance, repair and operating supplies) may use the MRO symbol and their rating to get aluminum foil for their own use for wrapping purposes, regardless of how it is charged on the person's books.

CMP REGULATIONS

COPPER TUBING: Distributors of all petroleum equipment, except that for the refining industry, may obtain copper tubing to sell repairmen for use in repairing this equipment under terms of CMP regulation 9A. The amended order, which previously applied only to distributors of automotive, heating and refrigeration equipment, now provides that distributors of petroleum equipment who were in business on Aug. 1, 1943, and sold copper tubing for petroleum repair purposes in 1941, may buy copper tubing for this purpose. (CMP 9A)

L ORDERS

GALVANIZED WARE: Ash sifters, diaper cans, liquid and dry measures, utility baskets and watering pots have been added to the list of galvanized ware articles that may be made under order L-30-a. Size restrictions on the permitted items as well as restrictions on the gages of steel used to make them have been eliminated from the order. Manufacturers who have no iron and steel quotas for the production of the permitted articles may apply by filing a letter with WPB. The letter should state what articles the manufacturer wishes to make and what facilities he has for the purpose. (L-30-a)

ENAMELED WARE: Restrictions on types and sizes of enameled ware have been removed from order L-30-b, but overall production will not be increased since additional steel is not being made available for enameled ware. The order continues to restrict the use of iron and steel for civilian enameled ware production to 70 per cent of usage in the year ended June 30, 1941. Output of roasters for civilians is now included in the general civilian quota.

The iron and steel quota for enameled ware to fill preferred orders continues at 55 per cent of base period usage. Manufacturers who wish to obtain a quota for the use of iron and steel in the production of enameled ware should file letters of application with the WPB, stating what type of articles he wishes to make and what facilities he has for the purpose. (L-30-b)

COOKING UTENSILS: Restrictions on specifications for miscellaneous cooking utensils and other articles permitted to be made under order L-30-d as well as restrictions on the types of iron and steel that may be used to make the permitted articles have been removed. Since quarterly iron and steel quotas for the permitted items have not been changed, overall production will not be increased. The use of aluminum for household articles is controlled by order L-30-e. Order L-30-d does not restrict the manufacture of cooking utensils containing less than 20 per cent iron and steel by weight. Spring-type clothespins, curtain rods, fixtures, and drapery attachments and pot scourers have been removed from the list of items prohibited by L-30-d.

Restriction on the distribution of miscellaneous cooking utensils and other articles have been deleted from the order. Manufacturers who wish to make items prohibited by the order, or to exceed their quotas, may apply to WPB field offices for permission in accordance

with the terms of priorities regulation No. 25. (L-30-d)

ALUMINUM COOKING UTENSILS: Manufacturers of aluminum cooking utensils, kitchenware and household articles may obtain prime allotments of aluminum under CMP to fill preferred orders, but they will continue to obtain deferred (Z-1) allotments for civilian orders. Preferred orders are those placed by the Army, Navy, Veterans Administration, Maritime Commission, and War Shipping Administration. Manufacturers may file CMP-4-b applications with WPB for firm allotments of aluminum for preferred orders only. Manufacturers who wish to make aluminum pressure canners may request permission in accordance with the terms

INDEX OF ORDER REVISIONS

Subject	Designations
Cooking Utensils	L-30-d
Cooking Utensils, Aluminum	L-30-e
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Office Supplies	L-73
Transportation Systems	P-142
Tubing, Copper	CMP 9A
Utilities	U-1, 1-d, 1-f

Price Regulations

"Blitz" Cans, "Jerricans" S.O. 94
Consumers' Goods GMPR, No. 188

of L-30-e and priorities regulation No. 25, as well as under direction 1 to order L-30-d. (L-30-e)

OFFICE SUPPLIES: Use of iron and steel to make pencil sharpeners and file fasteners is now permitted, subject to quota restrictions of order L-73. In making permitted office supplies for nonmilitary purposes, each manufacturer may use iron and steel at the quarterly rate of 12½ per cent of the amount of all metals consumed for the same items in 1940. Unrestricted use of iron and steel is permitted for the manufacture of listed office supplies in fulfillment of orders on hand from the Army, Navy, Aircraft Resources Control Office, Veterans' Administration, Maritime Commission and War Shipping Administration.

Use of iron and steel for the production of a few miscellaneous items, such as pins, rulers, yardsticks, adhesive and gummed tape dispensers is no longer controlled by the order. Manufacturers who have no iron and steel quota for this purpose may apply for one by letter to the WPB, specifying the types of office supplies the manufacturer wishes to make and what facilities he has for the purpose. Manufacturers who wish to use more iron and steel in the manufacture of office supplies than is permitted by the order may apply for permission in accordance with provisions of priorities regulation No. 25. (L-73)

HEATING EQUIPMENT: Schedule I of order L-107, which had limited the types and sizes of extended surface heating equipment that may be produced and had required other simplification restrictions, has been revoked. The order itself, however, which requires a rating of AA-5 or better and a specific delivery date before delivery can be made, still remains in effect. (L-107)

METAL DOORS: Provisions controlling the manufacture and sale of metal doors, door

frames and shutters have been removed through revocation of order L-142. An estimated 41,000 tons of carbon steel or an equivalent amount of aluminum will be used for metal doors, frames and shutters in 1945, as compared with 30,000 tons of steel allotted to the industry in 1944. (L-142)

P ORDERS

TRANSPORTATION SYSTEMS: Transportation system operators may no longer use the blanket authorization provided under P-142, the railroad maintenance and repair order, to purchase certain repair parts for diesel electric locomotives of 660 horsepower, or larger. To obtain diesel engines, complete truck assemblies, propulsion motors, and generators for repair or reconstruction, operators must apply for a rating on form WPB-541. (P-142)

U ORDERS

UTILITIES: Restrictions on purchases by power, gas and water utilities of surplus war materials, contained in order U-1, have been removed. These restrictions were lifted in order to facilitate the redistribution of these materials to ultimate users.

Utilities orders U-1-d and U-1-f and housing utilities standards appended to the latter order have been amended to permit a more general use of copper tubing for underground water and gas service lines. Restrictions on the length of extensions of gas, water and central steam heating service also have been removed. (U-1, 1-d, 1-f)

PRICE REGULATIONS

CONSUMERS' GOODS: The following 12 items have been exempted from price control: Toys and games sold to consumers for 10 cents and less; ceramic decorative tiles for use as table ornaments; costume jewelry made from seeds, pods, nuts or other natural vegetable products, except wood; canoes; hand painted pictures; advertising thermometers; custom made picture frames when no more than four frames are made to the same specifications for any one customer; Christmas decorations when made of natural vegetable products, such as cones, berries, pods, leaves, etc.; shaving equipment made of precious metals (not including shaving equipment plated with precious metals); hand-decorated bottles; ventilated outdoor window shelters; cartridge case trimmers for use in hand loading ammunition. (GMPR, No. 188)

BLITZ CANS, JERRICANS: Specific dollar-and-cent ceiling prices have been established for "Blitz" cans and "Jerricans," five-gallon steel containers of special design used by the armed forces to transport water or gasoline into combat areas. Maximum prices are: At retail, \$2.10 per can for reconditioned cans or those cans having a serviceability equal to that of new cans and \$1.50 for those cans which do not have the serviceability of new cans. For sales of cans having the serviceability of new cans by jobbers, wholesalers or reconditioners, in carload lots, a maximum price of \$1.25 each has been established. For sales in less-than-carload lots, the ceiling is \$1.35 each. (Supplementary order No. 94)

Appointments-Resignations

James D. Sloan has left the purchasing department of the WPB Steel Division and returned to his position with the Youngstown Sheet and Tube Company. He has been with the Steel Division since February, 1942.

Carroll Burton, previously director of the Metals and Minerals Division, OCR, has been named director of the OCR Staff Bureau, to replace George R. Taylor who is returning to Amherst college, Amherst, Mass.

Brazil Less Dependent On Steel Imports

Second largest nation in western hemisphere to purchase steel from foreign producers on diminishing scale after the war because of wartime expansion in the country's own producing facilities. Industrialization makes great strides during war

LATEST information about economic developments in Brazil indicate that second most populous country in the western hemisphere will purchase steel products from foreign countries on a diminishing scale after the war.

While industrialization has made great strides in that country during the war, and there should be a permanent big market there for industrial equipment, steel requirements of new and expanded manufacturing facilities there are, and for some years will be, small.

Brazilian iron and steel production has been expanded during the war, with the result that that country will produce most of the steel needed to keep its industries going.

Brazil's 1943 production was as follows:

	Metric tons (2204 lbs.)
Pig iron	247,680
Billets and ingots	184,325
Finished steel products:	
Concrete reinforcing bars	82,565
Wire and light rods	32,615
Light shapes:	
Squares	12,476
Flats	22,323
Angles	1,091
Other shapes	856
Strip	2,004
Rails and accessories	1,128
Total finished steel	155,058

This 1943 production was the largest in Brazil's history, and represented a steady expansion since 1934 in which year the output was 58,559 metric tons of pig iron, 61,675 of billets and ingots and 48,699 of finished steel products. Thus iron and steelmaking capacity in Brazil increased three to four-fold in the 10-year period 1934-1943.

Current estimates are that 1944 pig iron production should be somewhat larger than in 1943. In 1943 Brazil had 25 blast furnaces, all using charcoal, with annual capacity for producing 346,750 tons of pig iron. Difference between this capacity figure and the actual 1943 production of 247,680 metric tons to a large extent resulted from depleted stocks of charcoal and the difficulty of producing and transporting this fuel during the rainy season. Brazil has five new charcoal blast furnaces that were

At right is the Piritininga factory at Sao Paula, Brazil, showing the manufacture of hand wringers for working raw rubber



scheduled to be lighted in the latter part of 1944; these had additional capacity of 103,000 metric tons annually. Latest information does not indicate whether enough charcoal was made available to operate these furnaces.

The Brazilian finished steel production schedule that was set up early this year called for an increase of some 20,000 metric tons in 1944 over 1943, or a total of about 175,000 metric tons. It was anticipated that Brazilian output of pig iron, cast iron pipe, concrete reinforcing bars, and of certain types of wire products, would be sufficient in 1944 to meet all domestic needs, with an exportable surplus of pig iron and cast iron pipe.

At the same time, there was considerable uncertainty as to the amount of the deficient finished steel products the country would have to import during 1944. It was estimated during the year that all possible Brazilian needs added together, not counting long-range pro-

grams, would require maximum finished steel imports of some 540,000 metric tons. Actually, because of war conditions, the Brazilian authorities settled for about one-fifth of that amount.

In other words, Brazil has been able to get along in 1944 with a program calling for importation of some 35 per cent of her finished steel requirements. Undoubtedly some unfilled steel demand is accumulating in Brazil during the war and will call for a fair amount of buying after the emergency condition eases. However, these prospects must be discounted by the fact that expansion programs in the Brazilian steel industry have not yet made themselves felt.

The present largest Brazilian producer, the Cia. Siderurgica Belgo-Mineira, has ordered facilities with capacity for producing 24,000 tons of black or galvanized pipe annually. It is increasing its capacity for producing drawn products, including nail wire, black annealed wire,



Section of the new city of Santa Cecilia which is being built to house workers at Brazil's Volta Redonda steel plant is shown above. NEA photo

of wire rods, 60,000 tons of plates, 20,000 tons of billets and 50,000 tons of tin plate annually, also a large tonnage of strip steel. Present indications are that the plant will be in only partial operation before the end of 1945.

Informed opinion is that, unless there is a further great spurt in the development of steel consuming industries in Brazil, that country's steel imports after Dec. 31, 1945, will tend to approach the vanishing point.

The only exception, as seen at this time, may be in alloy steels. Present production plans call for plain carbon steel products only. There has been talk about installing some electric furnaces in Brazil to produce alloy steel, but so far this has been only conversation. Alloy steel requirements of Brazil are small, coming at present to about 2800 tons annually. Silicon sheets for the electrical manufacturing industry comprise about 1800 tons, the remainder consisting largely of tool steel.

Most observers see little reason why Brazil ever again should be dependent upon foreign sources for any considerable percentage of her steel requirements. The outstanding feature of the Volta Redonda plant is that it is the first in Brazil to be based on coal. One of the world's best-endowed countries as far as iron ore is concerned, and able to utilize available coal for metallurgical purposes, there is every reason to assume that it will be only a matter of time before Brazil takes the lead in supplying finished steel to the entire

South American continent.

In 1943, prices charged in Brazil on imported steel products were anywhere from 100 to 1000 per cent above mill prices in the United States from which Brazil has been obtaining nearly all of her imported steel. Then the Brazilian authorities set price ceilings, limiting importers to approximately 100 per cent profit margin. Since then prices have been lowered somewhat further. Present Brazilian ceiling prices on imported steel products, c.i.f. and duty paid, as published by the Servico de Licenciamento dos Despachos de Products Importados, are as follows:

	(See *)	(See †)
Angle bars, ½, ⅝ and ¾-inch	4.50	10.22
Steel beams	4.00	9.08
Spring steel bars	6.10	13.85
Steel plates and sheets, ⅜ to 1-inch	4.10	9.31
Galvanized steel sheets, 12 to 17 USG	5.00	11.35
Silicon steel sheets, 20 USG	6.00	13.62
Boiler tubes	7.00	15.89
Black steel pipe	7.00	15.89
Polished steel wire, 4 BWG	4.20	9.53
Galvanized wire, 8 BWG	5.60	12.71
Barbed wire	5.00	11.35

Prices of domestically made steel products in Brazil have been higher than the ceiling prices on similar imported products. By arrangement with the Brazilian government, however, the mills have effected successive small reductions during 1944, and their prices early in 1945 are expected to be on the same level as the prices on imports.

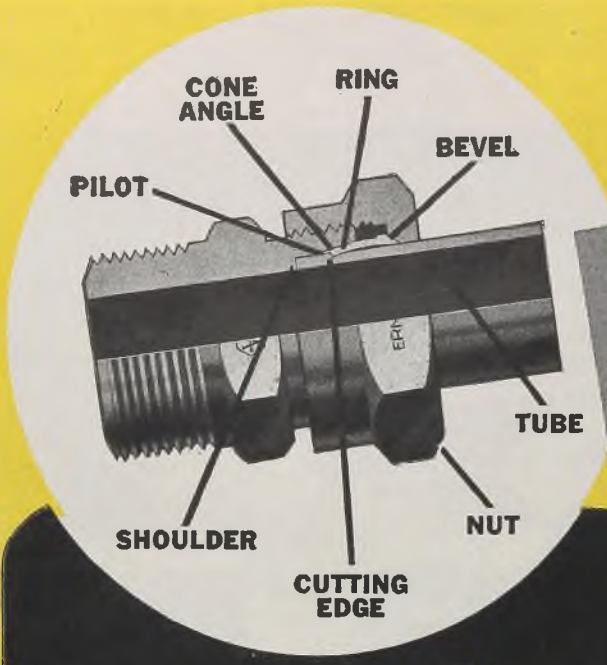
*Cruzzeiros per kilogram (1 cruzeiro is worth about \$0.05 U. S.)
†Equivalent in dollars per 100 pounds.



galvanized barbed wire, oval wire and other forms of wire from 30,000 to 52,000 tons annually. The company has encountered wartime delays in getting the necessary equipment but hopes that an easier situation may make it possible to get this equipment delivered, installed and operating late in 1945.

Delays also are being encountered in obtaining and installing equipment at Brazil's largest-to-be iron and steel plant, the Siderurgica Nacional, at Volta Redonda in the state of Minas Gerais. The plate mill and the rail mill have arrived but the blooming mill is still to come. Production of coke will begin in January or February. Production of pig iron will begin soon thereafter, and the iron will be stockpiled until the open-hearth furnaces are lighted in June or July.


The Volta Redonda plant is slated to have capacity for producing 90,000 metric tons of rails and accessories, 25,000 tons of structural shapes, 50,000 tons



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Hunting season taking annual toll of Detroit area production as absenteeism mounts. War bond redemption rises, as some workers fear possession would eliminate them from roll of make-work plans

DETROIT HUNTING season is now in full bloom and Michigan plant absenteeism has soared even beyond the level of last year when it was bad enough. One large Muskegon employer reports absenteeism last week running close to 25 per cent, while the Cadillac Malleable Iron Co., Cadillac, closed down tight after 120 men decided to take four days off for deer hunting. Protests of army ordnance officials against any suspension of operations were of no avail, and the company's proposal of a two-day holiday was over-ruled in favor of a four-day sojourn in the woods. Dozens of other industrial companies are reporting similar experiences, causing considerable difficulty for supervision in filling in the depleted ranks of working forces at these plants.

While there may be more participants this year than in the past, the exodus of hunters from Michigan plants is nothing new. Stern representations from Washington officials, both government and military, over the dire necessity of maintaining and increasing certain critical phases of war production have had scant effect on employes. Perhaps a brief respite from the steady grind of plant work may bring back some working people refreshed and with renewed vigor for the job ahead. That is about the only consoling factor discernible in the situation.

Another disturbing development noted recently in some industrial areas here is the high rate of war bond redemption among plant employes. Again in Muskegon, it is reported over \$400,000 worth of bonds have been cashed in the past month, and large numbers of these by colored workers. Inquiries as to why the bonds were being cashed developed the strange rumor circulating around plants to the effect that anyone owning bonds would be ineligible for jobs on public works programs or for relief should the day arrive when the dole would have to be reinstated because of the lack of jobs in industry. Why anyone should start such wild rumors is mystifying.

Cash received for these redeemed bonds is not necessarily being spent, for there are indications that currency hoarding is rising to tremendous proportions. Banks generally say their safety deposit boxes are rented out 100 per cent, and bills of large denomination—\$50 and \$100—disappear from circulation almost as fast as they are printed. There has never been anything approaching the amount of currency in the hands of the people that exists today. Bankers scratch their heads and

wonder what it means and where it will all end.

A goodly proportion of the high war wages being paid out currently to workers is going into land investments. Particularly southern in-migrants are plunking out all they can spare to buy farms and other property back near their former homes. Some, in fact, have already left their war jobs and returned to the South as landed gentry, being transformed from poor tenants or sharecroppers by the magic of high-paying jobs in war plants. Others are investing in small plots around Detroit and suburbs, generating one of the greatest land booms in history.

Seniority Rights of Veterans

While the money showers over war workers in the U. S., millions of soldiers, sailors and marines doubtless find a few moments now and then to wonder where they come in when the fighting stops. Recognizing that many of them will seek jobs in the automotive industries, most manufacturers are giving closer attention to the mechanics of employing or re-employing veterans. So far, there have been five proposals advanced for determining the seniority rights of veterans, as follows:

1. General provisions of Selective Service require returning men be given seniority rights above other workers, regardless of how many former employes may have to be discharged as a result. However, rulings covering men who have never worked in plants prior

to their military service are vague and inconclusive.

2. General Motors Corp. has presented suggestions to the UAW-CIO and to the UERMW-CIO that veterans not previously employed in a GM plant, including men handicapped in the service since May 1, 1940, may be hired and retained regardless of the seniority of other employes who were hired after May 1, 1940, the date re-employment rights provided by Selective Service became effective. The other suggestion is that GM employes on military leave who return with physical handicaps be placed and kept on any job they are able to handle or may be trained to handle, without regard to seniority rules. The first of these proposals would give veterans without previous industrial experience—and the majority of them are probably in this class—first choice on jobs over in-migrant workers who obtained war jobs after May 1, 1940, but not over previous GM employes.

3. Chrysler Corp. has made somewhat similar proposals covering new workers, proposing to extend returning veterans who wish to work in Chrysler plants seniority equivalent to the length of time they have spent in the service, but to consider them probationary employes for the first six months of employment. Under existing union contract, former Chrysler employes now in the service may return to their former jobs or similar ones, providing they apply within 40 days of discharge, and retain uninterrupted seniority. Special consideration is proposed for disabled veterans.

4. Ford was the last of the "big three" to disclose plans for veterans' seniority, fixing the date of seniority start for nonemploye veterans at Jan. 1, 1942, or earlier if they entered the service before



FIELD HOSPITAL: A General Motors truck teams up with a transport plane to rush containers of blood to an Army field hospital at a fighting front. The trucks save much time in ground transportation

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that date. Simultaneously the company announced the institution of a bonus vacation plan for veterans under which it will pay ultimately \$3,000,000 in vacation pay to 43,000 Ford employes in the armed forces. The plan has been approved by the WLB and already 2500 returned veterans are scheduled to participate to the extent of \$80,000.

The seniority plan, still to be negotiated with the union, would make seniority effective at the time of employment of a veteran, and a Ford spokesman pointed out the company also proposes to retain the right to hire veterans "at any time, even when there are other employes of the company who have been either temporarily or permanently laid off."

5. The UAW-CIO, with an anxious eye on the seniority of its present members, suggests that returning veterans who have not held jobs previously be given seniority equivalent to the length of time they have been in the service, but inserts a joker in the form of a clause providing that this seniority shall not become effective until after such veterans have been hired. Obviously, if there is the expected postwar contraction in employment, there may be no jobs to offer veterans in this classification, and the offer of seniority if they can find a job is meaningless.

6. The electrical workers unit of the CIO likewise has proposed that non-employe veterans, once hired, can acquire seniority equivalent to military service, but such seniority in no case shall date back prior to Jan. 1, 1941,

thus limiting veterans to replacing workers hired since this date.

The unions also propose establishment of a veterans' committee in each plant to deal with veterans' problems not covered in contract provisions, and they also hint it might be a good idea to extend plant-wide seniority to any employe displaced by a returning veteran.

At their face value, the suggestions made by GM and Chrysler appear to have more impartiality than those of the unions which contain elements of selfishness despite their frosting of whole-hearted assistance for veterans.

Probes Heavy Truck Program

Whip-crackers from the WPB in Washington have been probing into the heavy truck production program, talking across-the-table with manufacturers involved. In the last four months, heavy truck production has been lifted 35 per cent but this is alleged to be inadequate; in fact, figures have been cited to the effect the Army is wearing out 900 heavy trucks a week—which might suggest the question as to the military logic of attempting to push a 10-ton truck over a muddy back-country road in eastern France, when four or five 2½-ton units might get through.

At any rate, various manufacturers outlined their present difficulties. H. H. Coale of Autocar stressed manpower shortage. E. J. Bush of Diamond T said reserve engine banks were being used up. J. C. Keplinger of Hercules said he was short of cylinder blocks, heads,

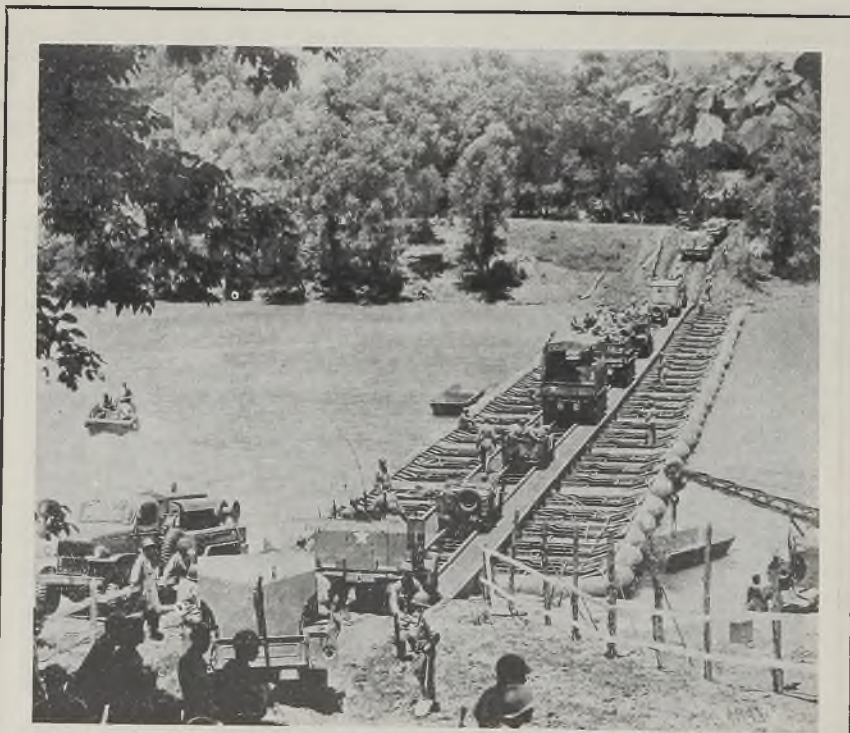
water pumps, crankshafts and bearings. G. W. Cannon of Campbell, Wyant & Cannon said his three foundries were up to schedule, being short on only one part, a camshaft. He added that inspection on castings was too rigid and production was being delayed by the necessity of having to scrap so many pieces. What the foundry industry wants more than anything else is a little surcease from government interference. If it is told what is wanted and when, with reasonable inspection procedure, it will come through.

One aftermath of the Detroit WPB industry conference was the threat emanating from James Byrnes in Washington to rescind authorizations to produce civilian goods which have dribbled out to a handful of companies in this area, if workers do not stop leaving war plant jobs. This would appear to be an empty threat, and would hardly result in any workers going back to war jobs. Competent industrialists are convinced the bottom of the useful manpower barrel has been scraped and it is fantastic to talk about enrolling 200,000 more workers for critical war programs at this stage of the game. More important would be some inspiration which could sell present workers on giving an extra 10 per cent in effort to their present jobs. When Henry Ford said the other day, "The inspiration in work hard has almost been destroyed", he put his finger squarely on the source of the trouble today.

Mr. Ford had further interesting comment on the shape of things to come. Strangely pessimistic, he observed the future is "none too bright as things stand right now . . . for the millions of young men and women whose world this will be in a few years.

"Today we find some disciples of government preaching a doctrine of continued control over private enterprise and that means control over individual initiative. We had more than 150 years of the American way of life before we began to hear this kind of talk. It must be stopped now. . . . No real American workman wants anything for nothing; what he wants is a chance to work and to get ahead on his own."

Keeping in the philosophical vein for the moment, C. E. Wilson, president, General Motors, advanced some sound advice on the social and economic adjustment of the individual, when he spoke at a recent conference here on industry and education. He recommended acceptance of six basic principles: The importance of self-control; tolerance of the opinions and activities of others; respect for truth and scientifically demonstrable fact; sanctity of promises and commitments; realization that work is a part of life and not a means to an end, and "the importance of not being whipped, of playing the game when the rules are not to one's liking, of getting on with the adventure of life despite upsets.



AMERICAN INGENUITY: Heavy tanks, half tracs, and jeeps rumble across a bridge erected by the Engineers Corps. Overhead, fighter planes protect the engineers



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WILLIAM O. McMAHON

William O. McMahon, formerly chief foundry metallurgist of Sloss-Sheffield Steel & Iron Co., Birmingham, Ala., and now its consulting metallurgist, has been appointed southern area technical consultant, Gray Iron Founders' Society.

Wheelco Instruments Co., Chicago, announces that John G. Davison, Denver, has been named Colorado representative, and Olin Phillips, Toledo, O., has been made representative in northern Ohio. The state of Minnesota has been added to the territory served by L. E. Cyrtnus, Milwaukee.

W. O. Lippman has been reappointed manager of the electric appliance division works of Westinghouse Electric & Mfg. Co. at East Springfield, Mass. He had relinquished this position in April, 1943, to become manager of the Canton, O., ordnance division. He will retain his ordnance division post, dividing his time between the two plants. In his absence from Canton, J. C. Smith, newly-appointed manager of manufacturing there, will be responsible for operation of the division.

Pennsylvania Salt Mfg. Co., Philadelphia, announced the following additions to its research and development staff: Isabella A. Romans, Ward W. Whitebread, Dr. George McCoy, Harry Green, Savin Zavarella, Harold B. Staley, Dr. Frank W. Panepinto, Mary F. Hensler, Helen Cunningham and Mildred E. Raesler.

Harold E. Murken has been appointed controller and assistant secretary, Robins Conveyors Inc., Passaic, N. J. T. Webster Matchett has been made secretary and John T. Hoyt has been appointed treasurer.

Frank B. Fairbanks, president, Horix Mfg. Co., Pittsburgh, has been elected president of the Packaging Machinery Manufacturers Institute. Newly-elected vice presidents are H. Lyle Greene, vice president, J. L. Ferguson Co., Joliet, Ill., and George A. Mohlman, president,



GEORGE F. FARLEY

Package Machinery Co., Springfield, Mass. New directors include: Harry A. Miller, secretary and general manager, Burt Machine Co., Baltimore; Boyd H. Redner, general manager, Battle Creek Bread Wrapping Machine Co., Battle Creek, Mich., and Oscar W. Wikstrom, president, U. S. Automatic Box Machinery Co., Boston.

George F. Farley has been elected vice president in charge of sales, Milwaukee Metal Spinning Co., Milwaukee.

Paul Ryan, former president, National Refining Co., Cleveland, and recently with the Petroleum Industry War Council, Washington, has been elected a vice president, M. W. Kellogg Co., Jersey City, N. J. He will manage a new consulting service designed to advise refiners as to the evaluation of production, refining, transportation, marketing and finance.

Charles M. Green has been elected vice president for manufacturing, Sperry Gyroscope Co., Brooklyn, N. Y., and Louis F. Malkovsky has been elected vice president for manufacturing planning.

George S. Eaton, formerly chief of the Forging Section, Aluminum and Magnesium Division, WPB, has been appointed executive secretary of the National Tool and Die Manufacturers Association, which has moved its headquarters from Washington to Cleveland.

Wilbur T. May has been appointed New York regional manager of Dodge division, Chrysler Corp., Detroit, succeeding Edward C. Quinn, who recently was made assistant sales manager of the Dodge division at Detroit.

E. W. La Tourette has been appointed managing director of Underwood Elliott Fisher Ltd. of England.

Frank M. Bates, in association with Leo D. Murphy, S. E. Meyers, Don D. Patterson Jr. and Edward L. Kellner,

has organized an engineering and designing company with offices at 41 East Forty-second street, New York, under the name Frank M. Bates Inc.

Lyman H. Bellows has been appointed sales manager, Sheldon Machine Co. Inc., Chicago. Previously he had been associated with the electric tool division of the Stanley Works, New Britain, Conn.

David Newhall has been appointed vice president in charge of the New York district for Iron & Steel Products Inc., Chicago. Mr. Newhall served the company in this same capacity some years ago.

Frederick Steele Blackall Jr., president-treasurer, Taft-Peirce Mfg. Co., Woonsocket, R. I., has been elected tenth president of the New England Council. Mr. Blackall, a leader in Rhode Island banking and civic activities, is an officer of American Wringer Co., Woonsocket, and a member of numerous engineering and trade associations.

Allen R. Cobb, vice president, Irving Trust Co., New York, has been elected to the board of directors, Ross Industries Corp., New Brunswick, N. J.

Clyde A. Peterson, formerly radio design director, Wells-Gardner & Co., Chicago, has been appointed designer in Westinghouse Electric & Mfg. Co.'s newly-created radio receiver division, Baltimore.

Eugene E. Weyeneth and Joseph G. Van de Loo have been appointed manager and assistant manager, respectively, of the advertising department, R. G. LeTourneau Inc., Peoria, Ill., and Robert G. Prince has been named manager of the company's training department. George C. McNutt, for the past decade LeTourneau advertising manager, re-



LESTER D. MARTIN

Who has been made treasurer of Oster Mfg. Co., Cleveland, as announced in STEEL, Nov. 13, p. 95.

signed Nov. 15 to return to California, and A. R. Thomson left the company on the same date to become associated with Lyle Hosler, advertising, Peoria.

John W. Moxon has been elected secretary-treasurer, Carpenter Steel Co., Reading, Pa., to succeed the late Joseph S. Pendleton, and Willard E. Roberts has been named controller. Other appointments include Paul B. Greenawald, general superintendent of mill operations, and George V. Luerssen, assistant chief metallurgist.

E. E. Mueller, for 16 years with Carpenter Steel Co., Reading, Pa., has become affiliated with the sales department of Ziv Steel & Wire Co., Chicago.

R. W. Davis, formerly assistant manager of the electrical department, Allis-Chalmers Mfg. Co., Milwaukee, has been appointed general manager of the company's Norwood, O., works. For the past two years Mr. Davis has been on leave of absence to serve as director, Electrical Equipment Branch, WPB.

A. C. Palm, previously advertising division manager, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has been appointed advertising and sales promotion manager, Tremco Mfg. Co., Cleveland, and Tremco Mfg. Co. Ltd., Toronto, Ont.

James E. Norcorss has been appointed sales manager, Arcos Corp., Philadelphia, and Albert M. Taylor has been named superintendent of the two Arcos plants.

D. C. Storms, formerly general superintendent of United States Cartridge Co., subsidiary of Western Cartridge Co. which operated the St. Louis Ordnance Plant, has been appointed works manager of the East Alton, Ill., plant of Western Cartridge Co. Mr. Storms succeeds F. A. Schotters, who has been ap-

pointed to the staff of Olin Corp., East Alton, parent corporation of Western Cartridge.

George L. Wiley has joined the Big Three Welding Equipment Co., Houston, Tex., as welding consultant.

Continental Can Co. Inc., New York, has announced resignations of Frank J. O'Brien and Eugene J. O'Connor, both vice presidents.

Dr. Paul W. Leppla, formerly chief chemist, research division, Cardox Corp., Chicago, has been placed in charge of the company's electrochemical activities. Dr. John L. Gring succeeds Dr. Leppla as chief chemist of the research division.

George Fay has resigned as treasurer, Hydril Corp., Los Angeles, to become comptroller of Rheem Mfg. Co., Richmond, Calif.

Allen Mulford has been appointed a commercial vice president, International General Electric Co., New York, and J. A. H. Torry has been named assistant to the president. Both men will make their headquarters in Washington.

Harold Vagtborg, since 1936 director of Armour Research Foundation of Illinois Institute of Technology, Chicago, will become president of the Midwest Research Institute, Kansas City, Mo., Jan. 1. The Institute was organized as a nonprofit, scientific, research organization to develop agriculture, business, commerce, industry and the national resources of the Middle West.

Clyde C. Sowards has returned to Copperweld Steel Co., Glassport, Pa., after serving two and one-half years in the Army. He will report to the New York office to cover the northern portion of

the south Atlantic states, the territory he served prior to his enlistment.

John Thomas Gillespie Jr., who has served with the WPB Shipbuilding Division as chief of staff branch for the past two and one-half years, has been appointed manager of export sales, Watson-Stillman Co., Roselle, N. J. Prior to his service with WPB and other government agencies, Mr. Gillespie was assistant to president, Wilson Welder & Metals Co., subsidiary of Air Reduction Co. Inc., New York.

Officers of Pyrene Development Corp., newly-formed industrial research and development subsidiary of Pyrene Mfg. Co., Newark, N. J., are: Charles G. Durfee, president; Edward J. Waring, vice president, and Edward A. Clapp, secretary and treasurer.

Donald H. McLaughlin has been elected president of Homestake Mining Co., San Francisco, to succeed Edward H. Clark, who has been named to the newly-created office of chairman of the board.

David Baird, Thomas P. Durell and H. Emerson Swart have been elected directors of Faraday Electric Corp. and American Engineering Co. The companies are members of a group operated by American Industries Management Corp., Chicago.

Dr. Jesse E. Hobson, since 1941 head of the electrical engineering department, Illinois Institute of Technology, Chicago, has been appointed director of the Institute's Armour Research Foundation.

W. King White, formerly president of Cleveland Tractor Co., which recently merged with Oliver Corp., Chicago, has been elected vice president of Oliver and a member of the executive committee. B. Haugen was elected Oliver vice president and treasurer; T. W. Kav-



THEODORE S. BONNEMA

Who has been named vice president in charge of production, Oster Mfg. Co., Cleveland, as announced in STEEL, Nov. 13, p. 95.



JOHN D'AGOSTINO

Who has been appointed South American representative of Simmons Machine Tool Corp., Albany, N. Y., noted in STEEL, Nov. 13, p. 94.



JAMES W. COREY

Who has been elected president, Reliance Electric & Engineering Co., Cleveland, reported in STEEL, Nov. 20, p. 88.

anagh, controller, and J. H. Covington, secretary. New directors include Mr. White, C. I. Ochs, president, Eaton Mfg. Co., Cleveland, and F. H. Chapin, chairman and president, National Acme Mfg. Co., Cleveland.

Kenneth McCreary has been elected president of Goetze Gasket & Packing Inc., New Brunswick, N. J., succeeding Frederick Goetze, who died Jan. 30, 1944. Mr. McCreary has been associated with the company since 1932, most recently having served as vice president and treasurer.

Aluminum Co. of America, Pittsburgh, has announced the following appointments in the sales engineering and development division: Frank Jardine, who has been in charge of development work in Cleveland, has been given the title



S. M. RUST SR.

Who has been elected chairman of the board, Rust Engineering Co., Pittsburgh, as reported in STEEL, Nov. 20, p. 67.

of manager of development division, Cleveland branch; John R. Willard has been placed in charge of the sales development division in New Kensington, Pa., and B. J. Fletcher has been made chief engineer of the New Kensington branch.

Clarence F. Jensky has been named by Joshua Hendy Iron Works, Sunnyvale, Calif., to head the company's newly-created turbine sales division. Perry J. Collonge will assist Mr. Jensky.

Carnegie-Illinois Steel Corp., Pittsburgh, has announced the following appointments in the railroad materials and commercial forgings division of the sales department: Orrin H. Baker, manager of sales for the division; Samuel McClements, assistant manager of sales, and Marcus J. Aurelius, assistant to the manager of sales.

OBITUARIES . . .

William S. Horner, 76, retired steel official and president of the National Association of Sheet and Tin Plate Manufacturers from its inception in 1916 until 1927, died Nov. 15 in Pittsburgh. In 1896 Mr. Horner formed a partnership with H. P. Goff, as Goff, Horner & Co., and after several years he acquired Mr. Goff's interests and changed the name to W. S. Horner & Co. Later the Pittsburgh Shovel Co. was organized with Mr. Horner as president and he retained that office for many years. Mr. Horner had acquired interests in certain sheet mills, one of which merged with American Rolling Mill Co. in 1905. About that time he was elected to the board of American Rolling Mill and later to membership on its executive committee and to a vice presidency.

Milo A. Harris, 58, vice president in charge of sales and a director of Newman-Crosby Steel Corp., Pawtucket, R. I., with headquarters in New York, died Nov. 16 in Montclair, N. J. A native of Worcester, Mass., Mr. Harris had been with the Newman-Crosby Steel Corp. for more than 30 years.

William H. Patterson, 62, general service manager, Westinghouse Electric Elevator Co., Jersey City, N. J., died Nov. 16 in Newark, N. J. During his 38-year association with Westinghouse interests Mr. Patterson aided in development of high speed electric elevators and automatic control.

Dudley H. Miller, 74, since 1924 president of Speer Carbon Co., St. Marys, Pa., died Nov. 8 in that city. Mr. Miller was a director of the company and at the time of his death was also president and director of International Graphite & Electrode Corp., Niagara Falls, N. Y.; president and director of International Graphite Corp. of Canada Ltd.; presi-

dent and director of Speer Resistor Corp., subsidiary of Speer Carbon; executive vice president and director, Duriron Co. Inc., Dayton, O., and treasurer, Guerrero Trading Co. of Mexico.

Albert J. McKay, 70, for many years president of Colby-Bessemer Iron Co., with offices in Milwaukee, who resigned from that office to become vice president due to ill health, died Nov. 14 in Oshkosh, Wis.

Arthur A. Jahn, 51, an erection engineer for Falk Corp., Milwaukee, died there Nov. 15.

Nathaniel Frost, 92, superintendent, American Foundry & Furnace Co., Bloomington, Ill., for the past 55 years, died Nov. 13.

George A. Hummell, 60, since 1930 assistant comptroller, Isthmian Steamship Co., United States Steel Corp. subsidiary, died Nov. 13.

Edward M. Joyce, western sales manager, Champion Rivet Co., Cleveland, died Nov. 14 in St. Paul while on a business trip.

Joseph A. Rohner, 87, vice president and a director of Burger Iron Co., Akron, O., and president of Rohner Paper Co., Akron, died Nov. 13 in that city.

Bernard H. Jansen, 70, former owner of the old Royal Brass Mfg. Co., Cleveland, died Nov. 16 in that city.

William Bogenberger, 63, secretary-treasurer, Acme Sheet Metal Works, Milwaukee, died Nov. 17 in that city.

Charles S. J. MacNeil, chief engineer of the aeroproducts division of General Motors Corp., Detroit, died Nov. 18 in Brazil, Ind. Nine years ago Mr. MacNeil and W. J. Blanchard, general manager of the aeroproducts divisions, established

Engineering Projects Inc., in Dayton, O., a small experimental and research organization acquired by GM in 1940.

Roy D. Hunter, 71, director of Sullivan Machinery Co., Michigan City, Ind., and formerly general sales manager for the company, died Nov. 14 in West Claremont, N. H.

David J. Ogilvie, for many years an official of the Perrin Engineering Co., (formerly Perrin & Marshall), Moaday Iron Co. and Niagara Electrolytic Iron Co., died Nov. 16 in Chattanooga, Tenn. He was well known throughout the steel industry through his association with Perrin & Marshall and the development of the steel industry of India and Russia.

John Tissing, 59, vice president, Charles C. Kavin Co., Chicago, foundry chemists and metallurgists, died Nov. 16 in Chicago.

George L. Spence, 63, who retired in 1943 as manager of manufacture, American Can Co., Chicago, died Nov. 13 in Maitland, Fla.

John R. Lambert, 60, general manager and chief engineer, Phoenix Bridge Co., Phoenixville, Pa., died Nov. 12 in that city. Mr. Lambert, who had been associated with Phoenix Bridge since 1906, was an active member of the American Institute of Steel Construction, and the American Society of Civil Engineering.

William H. Barr, 70, for many years a national figure in the brass foundry industry, died Nov. 17 in Buffalo. He was one of the founders of Lumen Bearing Co., Buffalo, serving as its president for approximately 25 years and in 1926 organized William H. Barr Inc., Buffalo. Mr. Barr served as president of the National Founders Association for several years.

Los Angeles Manufacturers Oppose "Balkanizing" the United States

Freezing of war plants and facilities, as proposed by Senator McCarran's committee, attacked as encouraging divisive sectionalism. Chamber of Commerce head says no state's progress should be promoted by limitations on others

LOS ANGELES

LOS ANGELES businessmen and industrialists oppose "freezing" of new war plants and facilities in the eastern states as proposed by Sen. Pat McCarran's Committee to Investigate the Centralization of Heavy Industry in the United States.

This opinion was voiced by W. C. Mullendore, president, Los Angeles Chamber of Commerce, before the Nevada senator's committee hearings in San Francisco, Nov. 16. Opposition to the proposal to "freeze" eastern war plants is based on the grounds that such a proposal advocates divisive sectionalism—would "Balkanize" the United States.

Mr. Mullendore said "we believe that such an action would seriously damage rather than promote the economic and political progress of the nation. We question the notion that the economic progress of any state or group of states can be or should be promoted by governmental limitations on production and employment in other areas."

From Nineteenth to Fifth Place

In his statement to the McCarran committee Mr. Mullendore pointed out that Los Angeles industry was undergoing rapid development before the war and had developed faster industrially than any other major industrial area. In 20 years before the war, Los Angeles county had doubled the number of its industrial employes, and in value of manufacturing production had risen from nineteenth place to fifth place among the nation's industrial areas.

The belief here is that there is no reason to think that this prewar advantage is being lost during the war, but that on the other hand the progress and prosperity of southern California will match that of any major industrial area after the war.

In his statement to the committee, Mr. Mullendore took issue with that body's position on "balanced economy." He stated that in his opinion, a balanced national economy is not one in which various sections duplicate one another in kinds of occupations in ratios of density of population, but means only an economy which operates within one nation.

In the opinion of the Chamber of Commerce, it "would be absurd to expect various sections of the nation to imitate or duplicate one another in types

of occupation or density of population."

Such a policy would destroy national unity and convert what is now a national economy into a regional one. This would "Balkanize" the United States.

Mr. Mullendore called for trial and error method of interested individuals and groups searching for the locations which will be most advantageous for them individually. In this way the most advantageous and economical distribution of the nation's industry and population can be worked out.

The president of the Chamber of Commerce denied the committee's charges that the present transportation rates discriminate against the West and the South. In view of the industrial progress of California, it is an exaggeration to say that eastern interests have succeeded "in subverting our whole transportation system to their purpose to deny the West and South the industries they need."

Any proposal to shift war production to the West and South after the defeat of Germany is opposed by local industry. Such shifting would delay conversion to civilian production in this area

and enable other communities to gain advantages in regaining postwar markets.

Furthermore, spokesmen for industry here believe, that any proposal to "freeze" government-owned facilities in the eastern states would serve to antagonize those whose co-operation is badly needed in removing obstacles to enterprise in every section of the United States.

Mr. Mullendore stated to the committee "that the output of many government-owned facilities of the East will help reduce costs and increase the volume of business for many producers in the West and South. Use of these governmental facilities will increase demands for western mineral and agricultural products and will lower costs for southern and western consumers of many finished products."

Seeks Return to Free Market

In the opinion of Mr. Mullendore, what western industry wants is a return to the free market and free competition at the earliest possible moment after the war. Governmental discrimination against one section to build up another section is not in accord with the American genius and tradition. The West does not think that in time of peace the American people should be directed by government where they shall live and work. What is desired here is a program of greater freedom and less governmental restrictions. The West will work out its own problems best under a free enterprise system.

Among statistics submitted to the committee by Mr. Mullendore, were the following:

Employment, Ranking of Nine Industries in Los Angeles County, 1939

Industry	Total Employment	Local Industry's Rank Nationally
1. Aircraft	21,300	1st in U. S.
2. Apparel	22,000	4th in U. S.
3. Auto Assembly	4,288	2nd in U. S.
4. Food Processing	27,454	3rd in U. S.
5. Furniture and Wood Products	10,171	4th in U. S.
6. Motion Pictures	31,095	1st in U. S.
7. Oil Well Equipment and Tools	3,033	1st in U. S.
8. Petroleum Refining	5,830	3rd in U. S.
9. Rubber Tires, Etc.	5,540	2nd in U. S.
Total	130,711	in nine industries

Industrial Growth of Los Angeles District

Los Angeles County	Number of Plants	Number of Workers (Salaried & Wage Earners)	Value of Product (Millions)	National Rank of Los Angeles County	Average Employees per Plant
1919	3,514	72,000	\$ 418	19	20.5
1929	4,797	125,020	1,165	6	26.1
1935	4,361	113,700	838	6	26.1
1937	4,504	155,818	1,205	5	34.6
1939	5,594	151,573	1,219	5	27.1
1944	7,500	510,000	?	2nd in War Production	68.0

Long Island contributing tremendously to airpower of nation. Area one of America's largest and most diversified wartime aviation production centers. In addition to numerous industries, boasts many flying facilities

ALTHOUGH better known as a residential area and to some extent as a summer playground for New York, Long Island is one of America's largest and most diversified wartime aviation production centers.

More than \$1300 million worth of orders are now on the books of 18 prime contractors of the AAF alone, a figure representing a substantial part of the AAF production accomplished in the 11 northeastern states. The district has a greater volume of production and diversity of products than any of the AAF's other five procurement districts, Col. Kenneth Collins, district supervisor, revealed recently.

While New Yorkers have been accustomed to look with awe upon the gigantic aircraft production industries of Los Angeles, Texas and Detroit, right at their doorstep is the nest of the Thunderbolt and Hellcat airplanes, many of the complex instruments that enable planes to fly under all conditions and perform miracles of navigation and precision bombardment, engines to power the planes, camera instruments for aviation reconnaissance, gliders to drop troops behind enemy lines, aviation textiles for both equipment and crews, and tens of thousands of aircraft and subsidiary parts of every size and description.

It takes more than half-a-million different parts to make up the AAF, Col. Kenneth Collins said, and he estimates that from a third to a half of them are represented in the products of the Long Island industries.

Home of the famed Thunderbolt

fighter plane is the Republic Aviation Corp. at Farmingdale. Here, just two and a half years after the first of these famous aircraft were delivered to the Army Air Forces, the ten thousandth plane recently rolled out of the door. From the original plant at Farmingdale the facility has spread out not only over vastly increased acreage on Long Island, but also to a new plant at Evansville, Ind. From a corporation with assets in land, buildings, machinery and equipment totaling about a million dollars, it has grown to one thirty-one times that size. And in the same period, the total man-hours required to build a single one of these 7-ton high-altitude fighters has dropped from 22,927 to 6290, largely due to the "cycle system", under which crews of workers perform an allotted number of operations in a specified time at each station.

Produces Complicated Mechanism

At the plant of the Sperry Corp. some of the air power's most delicate and complicated mechanisms are produced, such as gyropilots, central station computing systems, detonation indicators, gyro horizons and directional gyros. In addition devices of incredible ingenuity and almost human behavior are under development and it is believed will soon be contributing to the safety of American air transport.

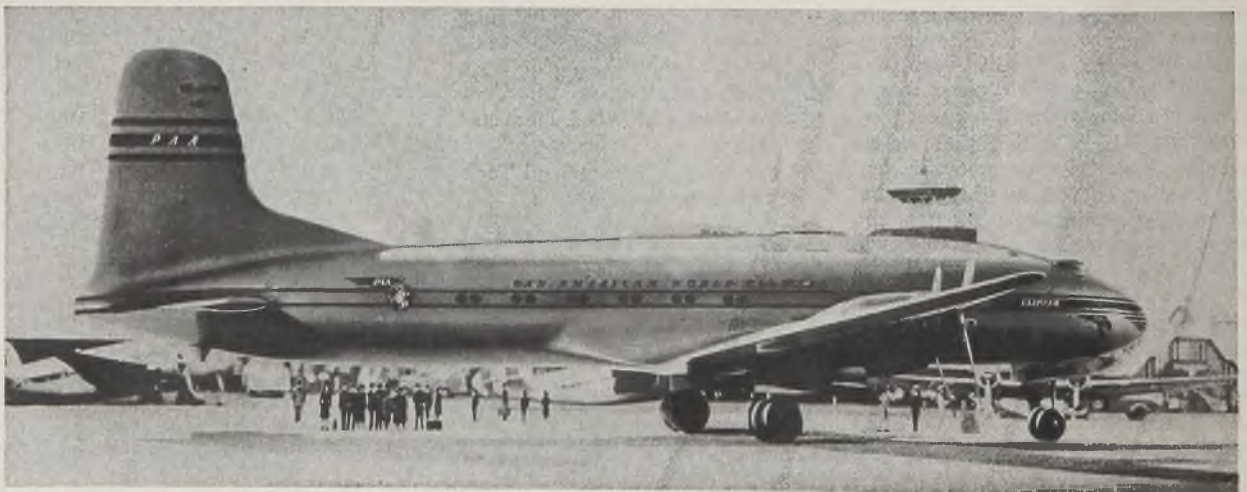
Barely five months before Pearl Harbor ground was broken for Sperry's huge Nassau plant. Its achievements since that time take on a stature unsurpassed in American technical progress.

Today the Nassau plant of Sperry covers 2,118,000 square feet of space. Including the extension buildings, this is equivalent to nine city blocks. More than 150 acres of ground are included in the plant proper, surrounding company areas and parking lots.

Especially impressive is the statement of a Sperry official that the company's shipments to the Army Air Forces have increased more than 2400 per cent since Munich (Sept. 30, 1938) and that since 1940 Sperry directional gyros and horizons have been supplied to 159,807 aircraft. The same official, commenting on Sperry's huge research laboratories, where approximately 2000 engineers are constantly seeking improvements and scientific advance, stated that of all products supplied the Army Air Forces in 1943, 74 per cent were products newly created since the United States entered the war.

Across the street from Republic Aviation at Farmingdale, L. I., is the main plant of the Ranger Aircraft Engines division, Fairchild Engine & Airplane Corp. This is one of six plants of various sizes operated on Long Island by the Ranger company. Products of Ranger include Ranger 6 and 12-cylinder engines, superchargers and various other parts for the Rolls Royce engine, and Andover auxiliary power units for B-29s, B-24s and light bombers.

In Jamaica the Fairchild Camera & Instrument Corp. produces aerial cameras of nine different designs, comprising about 90 per cent of all aircraft cameras used by the United States Armed Forces. Here also are produced sextants (Fairchild supplies more sextants to the Army Air Forces than all other manufacturers put together), radio direction finders, electric computing gunsights, and other devices which must remain on the secret list until hostili-



POSTWAR CLIPPER: This is an exact scale model of the DC-7 to be used by Pan American World Airways in its postwar transAtlantic operations. The plane, which has a wing spread greater than the height of a 17-

story building, is seven times the size of the familiar DC-3s now in service on many domestic airlines. The clipper will carry 108 passengers and a crew of 10, cruises at more than 300 miles an hour. NEA photo

Meet the three sheet steel "Paint-Grippers"



These paintable surface-treated sheet steels suggest many new cost-saving, product-improving opportunities. Two of these special ARMCO PAINTGRIP sheet steels are given the definite rust protection of zinc coatings before they are Bonderized at the mill. Bonderizing neutralizes the chemical action of zinc on paint; it prevents premature flaking and peeling of the paint or enamel. Moreover, it eliminates all "makeready" costs before painting. There are three ARMCO PAINTGRIP grades—a surface-treated sheet for every requirement. One of them is likely to "fill the bill" for you.



1. The ARMCO Cold Rolled PAINTGRIP "Man" has a light electrolytic "flash" of zinc under a Bonderized surface. He will draw, form, weld, and solder readily. His uniformly smooth surface insures a handsome appearance when painted. He is ideal for products that are not subjected to severe corrosive conditions. Before painting he resists rust during shipment and in normal storage conditions.



2. For utmost rust-protection in corrosive applications, the ARMCO Galvanized PAINTGRIP "Man" gets a full zinc coating and then is mill-Bonderized. Like others in the family, he takes paint readily and helps preserve it. His habits in forming operations are good, but if you want deep-drawing qualities you'll want to meet . . .



3. ARMCO ZINCGRIP-PAINTGRIP. He's the born-contortionist of the zinc-coated family. His forming and deep-drawing qualities are excellent; his full zinc coating clings tightly to seams and corners as well as flat parts. He takes and holds paint as well as the rest of the family. (For zinc-coated products that do not require painting, ARMCO ZINCGRIP without the PAINTGRIP treatment can be specified).



Write us for more information about these paint-gripping sheet steels. They can make your products look smoother and more attractive and make them last longer. Just address The American Rolling Mill Company, 3361 Curtis Street, Middletown, Ohio.

THE AMERICAN ROLLING MILL COMPANY



DOUBLE ASSEMBLY LINE: Boon to mass production of heavy bombers is the twin assembly line at Ford's Willow Run plant. In the foreground the planes have been towed toward gasoline and service areas from which they will go to the flight apron and their maiden trips aloft. NEA photo

ties have been concluded. The dollar volume of Fairchild products delivered to the armed forces during the war and immediately prior to it will, by the end of this year, approximate \$116 million, and an indication of the company's post-war activity can be gleaned from the fact that while sales are now only about 25 times those of the prewar period, the number of units manufactured has increased about 100 times due to increased manufacturing efficiency.

Lack of time prevented a recent press tour from visiting many other Long Island aviation and accessory plants. Biggest and best-known, of course, is the Grumman plant, from which have come the thousands of Navy Hellcats, Wildcats and Avengers which have played such an important part in America's strides back across the Pacific. At Belhpage, workers combine aviation "know-how" and skill to produce an exceptional number of combat planes. Last year, from a total sales volume of \$110,000 in the company's first twelve months, sales soared to \$278,700,000.

Nor is Long Island a factor to be overlooked in the production of the motorless aircraft that have recently figured so largely in the military operations in France. At the plant of the General Aircraft Corp. in Astoria, there are being constructed daily the web-like frames for the Army's famous CG-4A gliders. At this plant, also, where 200,000 feet of floor space are devoted to war production, plans for postwar production are being sandwiched into the work of designers. Begun before the war, and already proved, the Skyfarer, a revolutionary type of light aircraft, may be expected to come in improved version from General when conditions permit.

At the first small shop of the Kollsman Instrument Co. (now a division of the Square D Co.), one day in 1928, an American flyer named Jimmie Doolittle took in his hands the first practical Sensitive Altimeter, paint still wet, and bore it carefully to an airplane awaiting its installation. A few days later he used this Kollsman instrument to make the first blind flight in history, from Mitchell Field,

and thus started Kollsman on a career which has made it now one of the largest, if not the largest, suppliers of aircraft instruments to the government and the airlines.

Other products and their manufacturers in Long Island include ignition crest voltmeters (L. H. Scott Laboratories), nylon cloth (Barthels Mfg. Co.), aircraft instruments (Bulova Watch Co.), machined parts (City Tank Corp.), punching binders (Einson-Freeman Co. Inc.), spare parts (Hub Industries Inc.), camera instruments (Jerome Engineering Co.), aircraft instruments (the Liquidometer Corp.), machined parts (Matam Corp.), paste and gaskets (Specialties Co.), machine parts (Standard Motor Products Inc.), fasteners (Universal Slide Fastener Co. Inc.). Brewster Aeronautical Corp., in Long Island City, has contributed many of the Navy's versatile aircraft.

Today Long Island stands in a position unique in American aviation. Following the trans-Atlantic flights, flying facilities were rapidly developed. Today, in addition to its industries, the Island boasts twelve major airports, including the famous LaGuardia and Floyd Bennett Airports and Roosevelt and Mitchell Fields. And the increasing number of small, privately operated flying fields, plus the growing number of facilities for the private flyer, as well as its pre-eminent position in the development and manufacturing phases, gives ample evidence that the Island has not lost the vision and energy with which it has so long furthered the cause of aviation.

Envision Electric-Driven Air Liners at Meeting

Trans-oceanic air liners of the future may be powered by electric motors that will enable giant ships to carry greater loads for longer distances at a substantial saving in fuel, members of the American Institute of Electrical Engineers were told at a recent Pacific Coast meeting.

Use of electric drive on multi-engined

planes would eliminate much of the air resistance, or "drag", caused by engine nacelles built in the wings or by engine and propeller mounted in the nose of the fuselage. In present day planes, this drag may waste from 20 to 40 per cent of the horsepower output of the engines. Because electric motors are much smaller than the modern gasoline engine, they can be submerged entirely in the wing structure, offering practically no resistance to air flow.

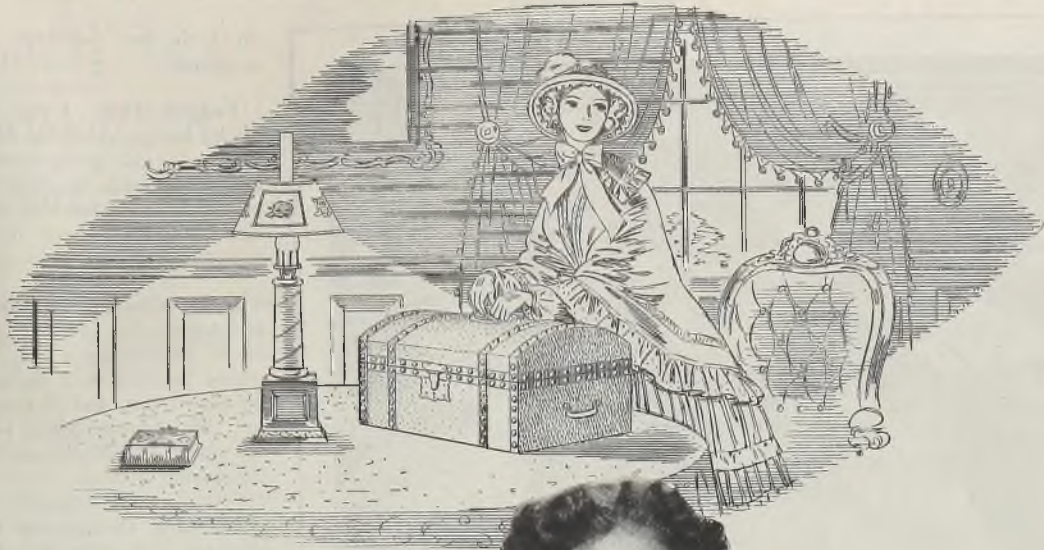
Engineers attending the Los Angeles Technical Meeting of the AIEE heard this prediction in a paper presented jointly by Lt. Col. T. B. Holliday of the U. S. Army Air Force, William L. Berry of the Hughes Aircraft Co., and Frank W. Godsey, Westinghouse Electric & Mfg. Co.

With electric drive, the power plant—consisting of new high-speed power sources and electric generator—could be placed in the fuselage of the plane, the engineers were told. This concentration of weight in the center of the plane would increase the maneuverability of the craft and provide a convenient "shock absorber" to withstand the recoil of heavy machine guns and cannon in giant bombers.

Since motors may be sunk in the wings, the electric drive system would make possible the use of pusher-type propeller located at the rear of the wing, instead of the present-day tractor type. At high speeds, pusher-type propellers provide increased lift to the wings.

Chief disadvantage of electric drive in airplanes, it was pointed out, resulted from increased power plant weight, lower efficiency between fuel tank and propeller shaft and increased cost of power plant. But these could be offset by using fewer and lighter materials in the power plant, propellers, plane structure and accessories and by re-designing planes to eliminate aerodynamic drag.

While this is the biggest task facing electrical engineers in the near future AIEE members were told, it is only one of many obstacles to be overcome before the completely electrical airplane is a reality.



On Yesterday's "Hair Trunks" . . .

On Today's Airplane Luggage . . .

*Brass is
always Modern*

In thousands of rural attics, today, there are battered old trunks and chests whose locks and catches are still fit for active service, and whose brilliance could be restored by a quick polishing. For these are exactly the same metal as that used in much of the smartly designed, modern luggage . . . honest, long-lived Brass hardware that has the strength and resilience to hold together a tough situation like an overstuffed suitcase, without flying open or sticking shut.

This is one of the countless uses in which Brass itself has always been the most modern material, no matter how often it has been changed in its forms to fit a change in fashion. For the unique qualities of this versatile alloy place it beyond reach of substitutes, either in adaptability to fabrication or serviceability in use. Then when you consider the quality for which the Bristol brand of Brass is known . . . dimensional and physical accuracy in every shipment of sheet, rod, and wire . . . you can see why so many manufacturers have gained new advantages in production, selling, and customer-loyalty through the standard use of Bristol Brass. And when Brass puts on civilian clothes again, Bristol will be ready to impart these advantages to *your own* peacetime products.



Bristol Brass

THE BRISTOL BRASS CORPORATION, BRISTOL, CONNECTICUT · MAKERS OF BRASS SINCE 1850



INDUSTRIAL SERVICE: This is a section of the engineering department of the Contract Service division, Sheffield Corp., Dayton, O. It is one of the few American manufacturers of machine tools and production equipment which also manufactures gages and precision instruments. The company also offers a contract service to manufacturing plants engaged in tooling for new or improved products

air raids, fire, sabotage, and avoidable accidents.

—○—
Federal Drop Forge Co., Lansing, Mich., has provided for additional coverage under the group insurance plan for benefits payable to employes when dependents for whom they are insured become hospitalized or undergo surgical operations.

—○—
Briggs Clarifier Co., Washington, has appointed the following distributors: M. N. Dannenbaum Co., Houston, Tex., whose territory will be east Texas and the Gulf coast, and McGregor & Werner Inc., Washington, whose territory will be Maryland, Delaware and the District of Columbia.

—○—
Wheeling Corrugating Co. and Consolidated Expanded Metal Co., Wheeling, W. Va., have jointly announced their activities will on Jan. 1 be combined.

—○—
Hercules Electric & Mfg. Corp., New York, announces it is now located in its new plant and offices at 2500 Atlantic avenue, Brooklyn, N. Y.

—○—
Pottsville Castings & Machine Shops, Pottsville, Pa., recently purchased \$250,000 worth of new equipment to handle the many new contracts received as part of the firm's expansion plan.

—○—
Howe Scale Co., Rutland, Vt., describes a wide variety of its counting scales in a recently published circular.

—○—
Henry Disston & Sons Inc., Philadelphia, has been notified by the Pennsylvania State Council of Defense that the company has been approved for the National Security Award.

—○—
National Screw & Mfg. Co., Cleveland, has appointed the Electrical & Steel Sales Co. Inc., Milwaukee, as sales representative in Wisconsin.

Midwest Mfg. Co. Reveals Important Policy Change

Midwest Mfg. Co., Galesburg, Ill., manufacturer of household and commercial refrigerator cabinets, recently announced major changes in the company's policies for postwar activities. The "Midwest" line of commercial reach-in cabinets will be discontinued. Principal reason for going out of the commercial cabinet field is to enable the company to devote more plant capacity to its line of steel household cabinets which were introduced in 1941. A greatly expanded sales organization is being set-up for sale of these cabinets.

Negotiations for the sale of production quota, designs, good-will, engineering service and tools and dies on the "Midwest" commercial line were completed a few days ago between Midwest and United Refrigerator Mfg. Co., Hudson, Wis.

BRIEFS

Paragraph mentions of developments of interest and significance within the metalworking industry

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., reports scholarships worth almost \$82,500 have been awarded the 300 winners of the second annual science talent search, completed in 1943, to help young people through their first year of college.

—○—
Midland Steel Products Co., Pressed Steel division, Detroit, has arranged to increase its floor space by 105,000 square feet in order to increase its production of essential war materials.

—○—
U. S. Slicing Machine Co., LaPorte, Ind., announces acquisition of the Standard Computing Scale Co., Detroit, and its Canadian subsidiary as well, Standard Computing Scale Co. of Canada Ltd.

—○—
Brown Instrument Co., Philadelphia, has introduced electric contact controls for circular electronic potentiometers. Electric contact controllers will be available in two forms.

—○—
Pittsburgh Coke & Chemical Co., Pittsburgh, is the new name of the Pittsburgh Coke & Iron Co. Its name was changed Oct. 19.

—○—
Continental Can Co. Inc., New York, will move its Central Division office in Chicago from the Conway building to the

Field building, 135 S. La Salle street, on or about Dec. 1.

—○—
E. I. du Pont de Nemours & Co., Wilmington, Del., predicts an expanding field of postwar uses for polythene, a versatile new plastic developed as an insulating material in military and naval devices.

—○—
Presstite Engineering Co., St. Louis, announces successful development of three types of spot weld sealer, produced as flow gun, brush or spray type.

—○—
Tool Equipment Co., Chicago, announces opening of a branch office at 419 W. State street, Rockford, Ill.

—○—
Thompson Electric Co., Cleveland, has published a 20-page supplementary catalog about its entirely new and recently developed line of hangers.

—○—
Dresser Industries Inc., Bradford, Pa., plans to move its headquarters from Bradford to the Terminal Tower, Cleveland.

—○—
National Tube Co., Ellwood Works, Ellwood City, Pa., recently received the National Security Award for its security and protective measures against enemy

Engineers To Observe 75th Anniversary

Western Society of Engineers, third oldest engineering organization in the country, was founded in 1869

WESTERN SOCIETY OF ENGINEERS, Chicago, which was founded in 1869 and is the third oldest engineering society in the country, celebrates its seventy-fifth anniversary on Dec. 5 at the Sherman hotel, Chicago.

Purpose of the society as defined in its constitution is the advancement of theory and practice of engineering, the improvement of the status of engineering practice as a profession and maintenance of high professional standards. The society represents all branches of the engineering profession and virtually every type of business organization and institution in the nation.

It has co-operated with various engineering organizations on matters of national scope. During the past few years it has acted as a sort of post-graduate school whereby engineers have been able to keep abreast of the latest developments in engineering science.

The society has a library containing more than 23,000 volumes and pamphlets, making it one of the outstanding engineering libraries in the country. The group participates in four major engineering awards: Octave Chanute Medal, Washington Award, Charles Ellet Award and Alfred Noble prize.

Officers of the society for the current year are: P. R. Elfstrom, president; Henry T. Heald, first vice president; A. K. Bushman, second vice president; Titus C. LeClair, treasurer, and Leigh S. Keith, secretary.

Pyrene Mfg. Co. Forms Development Organization

A new industrial research and development organization, Pyrene Development Corp., Newark, N. J., has been formed as a subsidiary of the Pyrene Mfg. Co., Newark. Officers of the new organization, drawn from the executives and directors of the parent company, are Charles G. Durfee, president, Edward J. Waring, vice president, and Edward A. Clapp, secretary and treasurer.

Superior Tube Co. Marks Tenth Year in Business

A decade of growth and development was celebrated in November by Superior

Tube Co., Norristown, Pa., manufacturer of metal tubing.

Since its founding, the company has worked only in the field of fine small metal tubing, and through intensive specialization has pioneered in the manufacture of stainless steel, "Monel" and "Inconel", carbon steel, nickel, aluminum, copper and beryllium copper and alloy steel tubing.

Industry's great demand for quality small tubing has brought about the steady growth of Superior's facilities. The company today has a modern and fully equipped mill, comprising several buildings which house unique, specially-designed production equipment. The modern laboratory wing is the latest addition.

Cites Steel Industry's Wartime Record on Radio

In order to meet war needs, the steel industry is now producing nearly one and one-half times the tonnage of pre-war years—an increase from the peacetime level of 60 million to the present peak of 89 million tons, according to E. L. Ryerson, chairman, Inland Steel Co., Chicago.

How the steelmakers mobilized for war, building new plants, developing armor-piercing shot steel, fragmentation bomb steel and other new products was described by Mr. Ryerson on a radio network broadcast Nov. 26. The program, featuring a salute to the nation's steel industry, was carried on 123 stations from coast to coast.

Western Electric Observes Seventy-fifth Anniversary

Western Electric Co., New York, manufacturing, purchasing and supply unit of the Bell System, this month celebrates its seventy-fifth anniversary.

As part of its anniversary observance, about 100,000 employees of the company in key cities from coast to coast will preview a feature length motion picture entitled, "Heritage for Victory," which is the film history of the company.

The company began in Rochester, N. Y., when Enos Barton, a young telegrapher, started for Cleveland with \$400 to manufacture telegraph instruments. He formed a partnership with Elisha Gray, a prolific inventor.

From that beginning, the company has grown into the nation's largest producer of communications and electronic equipment for the armed forces.

Monsanto To Build Plant For New Ordnance Product

Monsanto Chemical Co., St. Louis, recently announced it has been authorized by the Army Ordnance Department to design, build and operate a facility for production of a new ordnance development. The plant, estimated to cost about \$8 million, will adjoin the Longhorn Ordnance Works, which Monsanto operates for Army Ordnance at Karnack, Tex.

When in operation, the plant will have a personnel of about 700.



TRAINEES: The Do-all trade school, organized in July, 1941, with a record of more than 2000 placements, has moved from Minneapolis to larger quarters in Des Plaines, Ill. The school recently received the Air Force certificate of award

THE BUSINESS TREND

War Requirements Set At \$5.7 Billion Monthly

MUNITIONS production schedules over the next few months will be the highest of the war to date. Until the conclusion of the European war monthly military requirements have been established at \$5.7 billion, or \$100 million above the monthly peak reached in December last year. The present goal of \$5.7 billion monthly represents total requirements, and does not necessarily relate to what can be produced. There is some doubt that these entire requirements can be met. Latest monthly munitions output figures available show September production of \$5.3 billion.

Some 25 per cent of the war programs are behind schedule due to the following reasons mentioned in the sequence of their importance.

Development of military requirements before production can be brought into the picture. This is said to be the cause of about 40 per cent of the lag in overall munitions schedules. Design changes and improvements account for 25 per cent; labor shortages another 25 per cent. The remaining 10 per cent of the failure to meet war requirements is attributed to shortages of particular facilities.

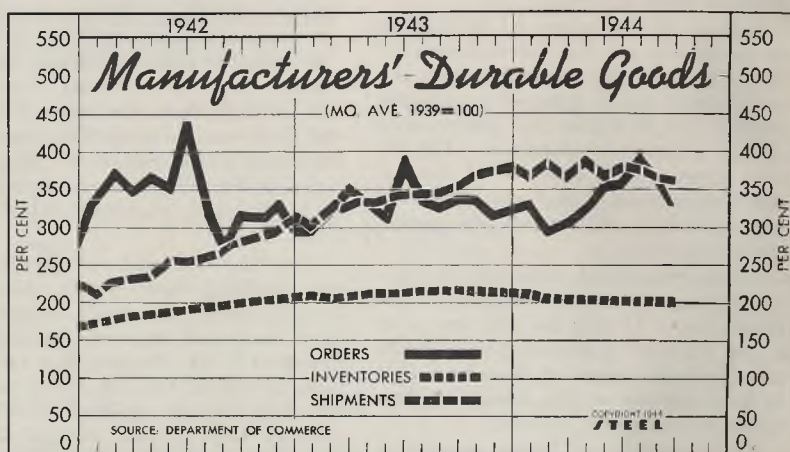
To help ease the critical munitions situation the Army has announced release of 1000 soldiers to work in foundries and forge shops on heavy artillery and ammunition, tanks and military trucks. "Speeding up of our present offensives in Europe and the Pacific depends on an immediate increase in the production of these items" the War Department states. The men released will be those with previous experience in these critical jobs.

INVENTORIES—Downward trend of manufacturers' inventories clearly reflects the anticipated recession in output of war materiel expected by many throughout most of this year. As long as munitions production schedules were rapidly increasing manufacturers' inventories were necessarily expanded more rapidly than sales. These inventories rose from \$11.9 billion at the close of 1940 to a peak of

\$17.9 billion on Nov. 30, 1943. The stabilization of the war program as well as anticipation of reduction in war orders in the first nine months this year has permitted manufacturing firms not only to stop accumulation but also to begin a gradual liquidation of inventories. Estimated average inventories for the third quarter were \$17.2 billion, 3 per cent below fourth quarter, 1943.

Total value of goods delivered by manufacturers in the third quarter continued virtually at the rate of the preceding three months. For the three months ended Sept. 30 last, it is estimated manufacturers delivered \$39.2 billion worth of goods, little changed from the record second quarter shipments and 7 per cent more than in the corresponding 1943 quarter.

Manufacturers' sales are expected to be well sustained only moderately below record levels during the balance of this year, reflecting renewed emphasis to increase output among the lagging war programs.



Index of Manufacturers Durable Goods

	Orders		Shipments		Inventories	
	1944	1943	1944	1943	1944	1943
January	331.5	293.5	365	208	212.0	211.3
February	294.4	326.6	384	337	208.6	209.6
March	309.7	349.2	369	330	207.2	210.7
April	325.0	329.8	387	338	204.9	213.5
May	351.6	313.0	369	338	204.0	213.5
June	358.9	392.7	378	343	203.6	212.5
July	392.7	338.7	375	346	201.9	211.4
August	366.9	319.4	368	354	200.9	213.4
September	329.8	339.5	366	356	200.3	214.9
October	...	339.5	...	371	...	214.0
November	...	316.1	...	374	...	213.3
December	...	324.2	...	380	...	212.8
Average	...	332.3	...	339	...	212.7

FIGURES THIS WEEK

INDUSTRY

	Latest Period*	Prior Week	Month Ago	Year Ago
Steel Ingot Output (per cent of capacity)	96.5	96.5	96.5	99
Electric Power Distributed (million kilowatt hours)	4,410†	4,397	4,345	4,513
Bituminous Coal Production (daily av.—1000 tons)	1,777	1,991	1,979	1,922
Petroleum Production (daily av.—1000 bbls.)	4,730†	4,727	4,745	4,414
Construction Volume (ENR—unit \$1,000,000)	\$29.4	\$8.8	\$20.8	\$68.9
Automobile and Truck Output (Ward's—number units)	20,930	20,900	20,660	18,440

*Dates on request.

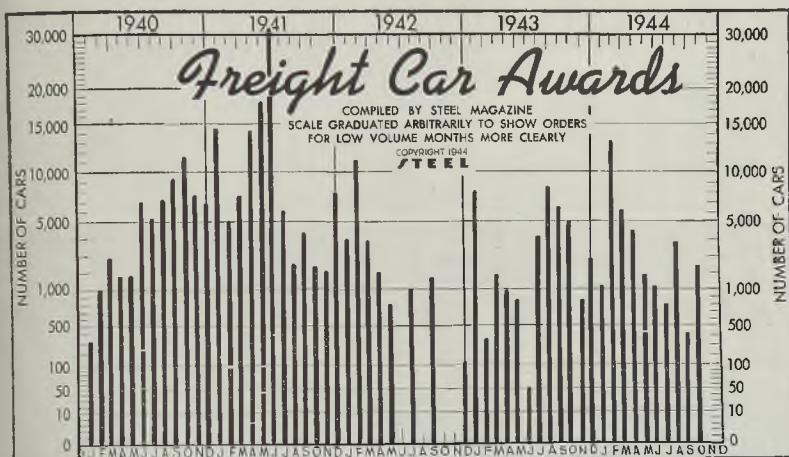
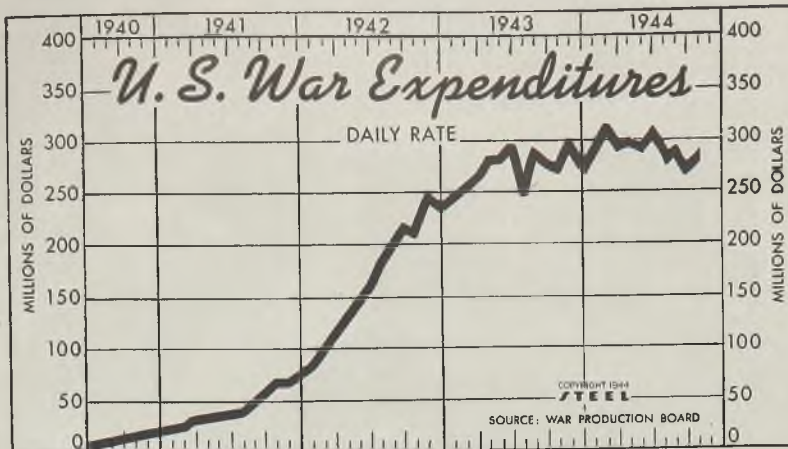
TRADE

	Latest Period*	Prior Week	Month Ago	Year Ago
Freight Carloadings (unit—1000 cars)	845†	839	906	882
Business Failures (Dun & Bradstreet, number)	20†	22	12	29
Money in Circulation (in millions of dollars)†	\$24,717	\$24,674	\$24,157	\$19,559
Department Store Sales (change from like week a year ago)†	+6%	+11%	+16%	+10%

†Preliminary. †Federal Reserve Board.

War Expenditures (millions)

	1944		1943	
	Monthly Expenditures	Daily Rate	Monthly Expenditures	Daily Rate
Jan.	\$7,416	\$235.2	\$6,254	\$240.5
Feb.	7,808	312.3	6,081	233.4
Mar.	7,948	294.4	7,112	263.4
Apr.	7,493	299.7	7,290	260.4
May	7,918	293.3	7,373	263.4
June	7,957	306.0	7,688	295.7
July	7,355	282.9	6,746	249.9
Aug.	7,798	288.3	7,529	269.6
Sept.	7,104	273.2	7,312	277.4
Oct.	7,447	286.4	7,105	273.3
Nov. . . . .	.....	.....	7,794	293.8
Dec. . . . .	.....	.....	6,951	267.3
Total	Av.	Ttl. 85,135	Av. 273.9	



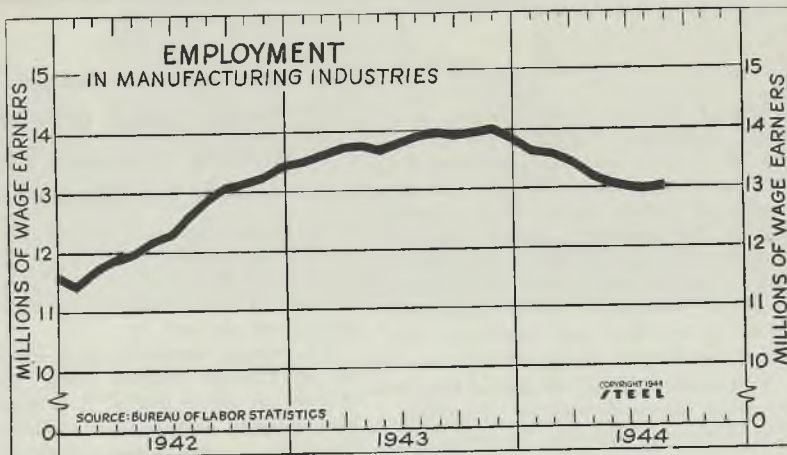
Freight Car Awards

	1944	1943	1942	1941
Jan.	1,020	8,365	4,253	15,169
Feb.	13,240	350	11,725	5,508
March	6,510	1,935	4,080	8,074
April	4,519	1,000	2,125	14,645
May	1,952	870	822	18,630
June	1,150	50	0	32,749
July	795	4,190	1,025	6,459
Aug.	3,900	8,747	0	2,668
Sept.	400	6,820	1,863	4,470
Oct.	2,425	5,258	0	2,499
10 mo.	35,911	37,585	25,893	110,871
Nov. . . . .	.....	870	0	2,222
Dec. . . . .	.....	2,919	135	8,406
Total	.....	41,374	26,028	121,499

Factory Employment† (000)

	1944	1943	1942
Jan.	13,669	13,503	11,456
Feb.	13,594	13,633	11,654
March	13,406	13,727	11,821
April	13,173	13,735	11,988
May	13,020	13,700	12,127
June	12,985	13,827	12,282
July	12,931	13,911	12,564
Aug.	13,001	13,990	12,869
Sept. . . . .	.....	13,935	13,079
Oct. . . . .	.....	13,965	13,166
Nov. . . . .	.....	14,007	13,267
Dec. . . . .	.....	13,878	13,474

†Source: U. S. Dept. of Labor



FINANCE

	Latest Period*	Prior Week	Month Ago	Year Ago
Bank Clearings (Dun & Bradstreet—millions)	\$9,380	\$9,229	\$9,408	\$8,683
Federal Gross Debt (billions)	\$212.5	\$210.5	\$211.3	\$169.8
Bond Volume, NYSE (millions)	\$44.5	\$36.0	\$46.4	\$42.5
Stocks Sales, NYSE (thousands)	4,752	3,570	4,092	4,141
Loans and Investments (millions)†	\$53.6	\$53.9	\$54.1	\$52.1
United States Government Obligations Held (millions)†	\$39,467	\$39,656	\$40,130	\$37,732

†Member banks, Federal Reserve System.

PRICES

	Latest Period*	Prior Week	Month Ago	Year Ago
STEEL's composite finished steel price average	\$56.73	\$56.73	\$56.73	\$56.73
Spot Commodity Index (Moody's, 15 items)†	248.5	248.5	248.6	244.4
Industrial Raw Materials (Bureau of Labor Index)†	114.3	114.0	113.2	111.7
Manufactured Products (Bureau of Labor index)†	101.1	101.1	101.2	100.3

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



Deep Drawing Oil

EARLY in the North African campaign, experience indicated the necessity of a more effective provision for removal of silt, sand, and dirt that accumulated rapidly inside truck engines due to the extremely severe exposure to dust and sand of the desert atmosphere. Regardless of how effective an air cleaner was employed, silt penetrated to motor cylinders and tended to collect at the bottom of the oil pans.

To provide a ready means of removing these accumulations, L. T. White, chief engineer, Geometric Stamping Co., Cleveland, explains that a special sump pan was designed to be bolted underneath the regular oil pan as indicated in Fig. 7. The regular oil pan had to be changed in that the drain plug opening was enlarged and fitted to take the sump pan flange bolts.

Also the intake pipe to the oil sump was extended to reach to the bottom of the sump pan. The plug that screws into the sump pan bottom carries a screen and is so placed that all oil drawn into the intake pipe must pass through this screen, thereby helping to filter out sludge and silt.

Any accumulation in the sump pan can be removed quickly by unscrewing the plug at "D", Fig. 7, and flushing. At the same time, the screen can be

Improved die designs and drawing lubricants permit making 5½-inch deep draw in a single operation instead of two formerly required. Stamping plant adds resistance and arc welding, lead dip bath and lead burning facilities to completely finish parts

cleaned as it is attached to the plug and comes out with it.

This simple modification is employed on all General Motors Corp. engines utilized on Army trucks, it is reported. The method employed by Geometric Stamping in production of the sump pan for 2½-ton GMC trucks is described here.

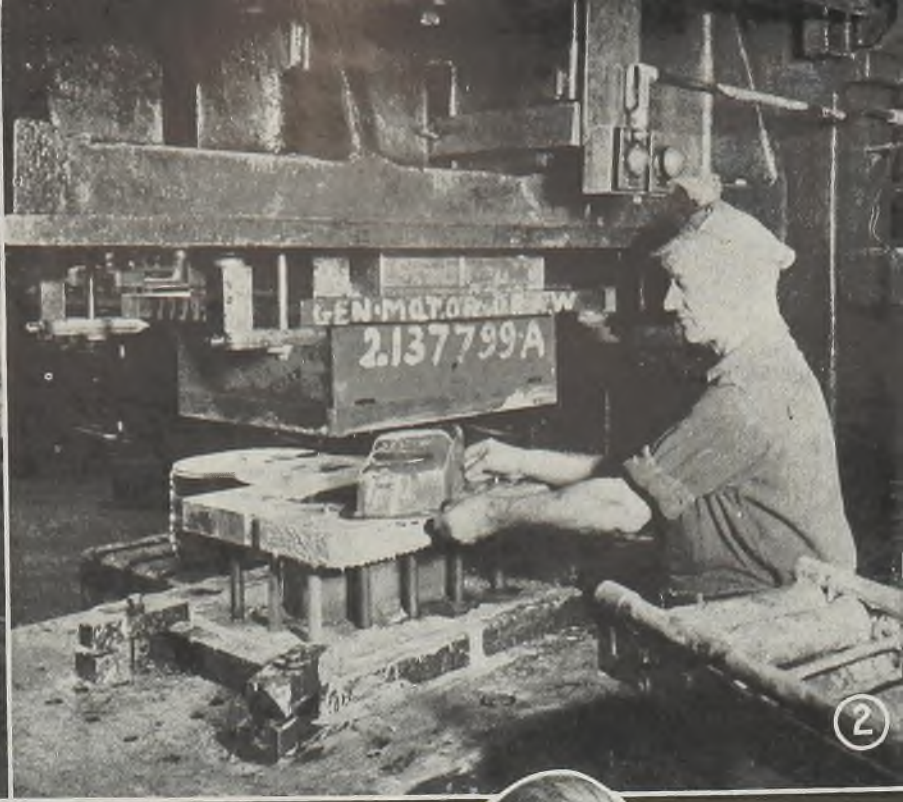
Material: The pan is made from 21.5 x 70-inch sheets of SAE-1010 hot-rolled low-carbon deep-drawing steel, whose thickness is 0.055-inch plus or minus 0.006-inch. Stock is No. 4 temper. Four blanks are produced from each sheet. Blanks have an irregular outline roughly oval in shape and measuring approximately 17.5 x 21.5 inches.

Blanking: Fig. 1 shows the blanking operation being done on a Cleveland No. 154 C, a 150-ton mechanical press, operated at a crank speed of 32 r.p.m. The sheet is gaged against an end stop pin and against a guide pin on the left side. Fig. 1 shows entry side of press, sheet from dies being pushed through

to second operator on back side who handles skeleton and blanks.

Outside section of lower or male member of the die set floats on rubber blocks which strip the skeleton from the die as soon as the dies separate. Knock-out pins in the upper or female die are actuated by the bar seen extending from the upper platen. As the upper platen reaches maximum point of upward travel, extended ends of this bar encounter adjustable striker pins mounted on the frame, causing the knockout pins to expel the blank from the upper die.

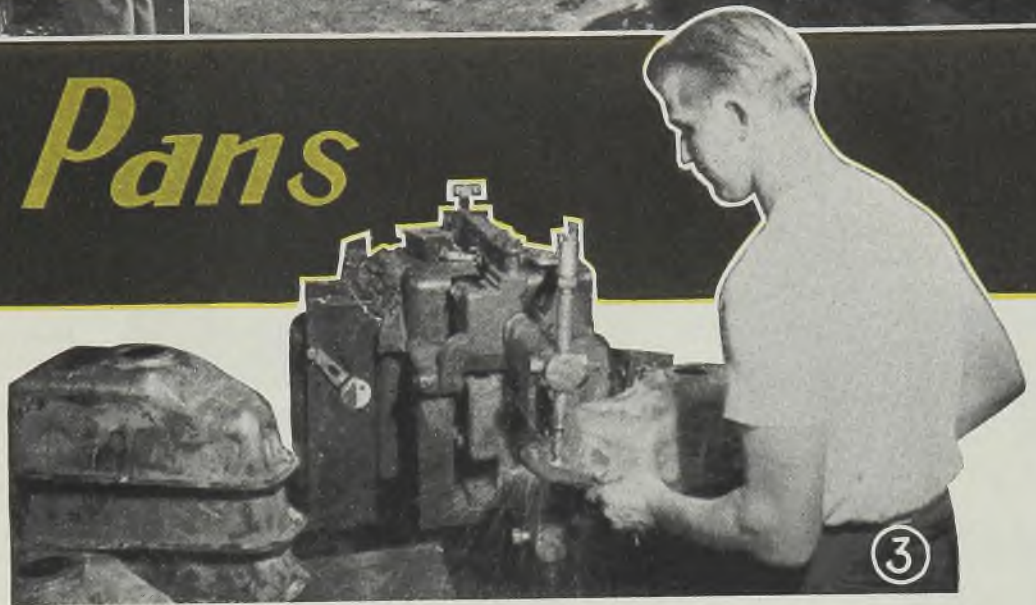
Success of the deep drawing operation that immediately follows blanking hinges on obtaining the correct outline in the blank. The amount and distribution of excess stock left in the flange after drawing determines the manner in which metal flows into the cup during drawing. The pressure exerted by the draw ring around the periphery of the blank in drawing is practically uniform. Thus the radial flow of metal



Sump Pans

By

G. W. BIRDSALL
Associate Editor, STEEL



from periphery of blank towards the center in making the deep draw is controlled by leaving more or less excess stock in the flange—the more stock left, the greater the force required to move the material towards the center, less stock allowing more metal to flow.

By being familiar with this principle and its application in die work engineers can adjust the amount of metal in the flange so that tendencies toward wrinkles and tears can be minimized. This is especially important where the cup drawn is irregular in shape as in the sump pan.

Deep Drawing: Fig. 1 also shows overall view of the forming line which consists of three presses. The first, in the foreground, is an E. W. Bliss 300-ton crank press; second is a 60-ton; third is another 300-ton unit. All three units are connected by short sections of

Fig. 1—First step is blanking from 21.5 x 70-inch sheets on a 150-ton mechanical press seen here at extreme left as viewed from the feed side. Blanks are roughly oval in shape, have irregular outline to control drawing operation. Also overall view of deep drawing and forming line: Of the three presses, the 300-ton unit at near right handles the deep draw, second unit, a 60-ton press, perforates the drain plug hole; the last at extreme rear, another 300-ton unit, handles finishing operations

Fig. 2—A line of conveyors connects the three presses shown in Fig. 1. Here an operator is removing a pan from the deep draw dies of the first 300-ton press and is about to place it on the gravity feed roller conveyor leading to second press in the line. Note the 5½-inch deep draw and the irregular shape of the sump pan

Fig. 3—After coming from the triple-die finishing setup shown in Fig. 4, pan has the reinforcing strips ("A" in Fig. 7) spot welded to the rim at 18-20 points around circumference. The work is done on this 20-k.v.a. rocker-arm type welder. A fiber jig placed on rim of pan is notched to facilitate positioning the welding electrodes, thus speeds the operation at same time assuring that welds are made at the points wanted

gravity feed roller conveyor as shown.

Another factor contributing greatly toward the successful production of this deep draw in a single operation instead of the two formerly required is the use of an improved lubricant called Kondor Draw. Arriving in drums in paste form, this material is mixed with water in the ratio of three portions of water to one of paste. Resulting drawing compound is almost pure white in appearance, does not become rancid, has a pleasant odor, brushes on smoothly, and greatly aids the draw operation.

It has permitted lower draw ring pressures, thereby reducing power requirements. Too, it contributes toward elimination of cracks and wrinkles in the work.

Draw ring is made of Castalloy, an air-hardening close-grained steel cast to shape by Detroit Alloy Co.

Pressure pad works with six air cush-

ions, each being connected to the piston of a 14-inch diameter cylinder which is fed air at a pressure around 60 p.s.i. Air cushions can be adjusted individually. Pressure pad pressure is varied by changing force of air fed to cushions. This control is employed to accommodate the slight variations in drawing quality of the steel from one heat to another.

Operator in extreme right in Fig. 1 brushes lubricant on the blank. Press operator places blank in dies against stop pins, pushes electric control button actuating the air-electric clutch control and closing the dies. Press operates at crank speed of 15 r.p.m. Shut height of press is 18 inches.

After the 5½-inch deep draw is completed, a third man on back side of the press removes the work from the dies and places it on a 10-foot section of roller conveyor as shown in Fig. 2.

Perforation: Second press in this line

of three is a Bliss "C" 60-ton unit, with a crank speed of 52 r.p.m. It is employed to perforate a 1¼-inch diameter hole where the drain plug is to go. From this operation, the work is placed on another short section of gravity roller conveyor that delivers it to the second 300-ton press, seen at center rear in Fig. 1. This press is equipped with three separate die sets as shown in Fig. 4 to handle the three finishing operations.

Size, Trim, Flange: In the first stage, extreme right Fig. 4, the work is sized and material around the hole in the bottom is upset. In second set of dies, center Fig. 4, excess metal is trimmed off from the rim. In the third die set, at left, the flat rim is turned down at the outside edge, forming a flange around the rim.

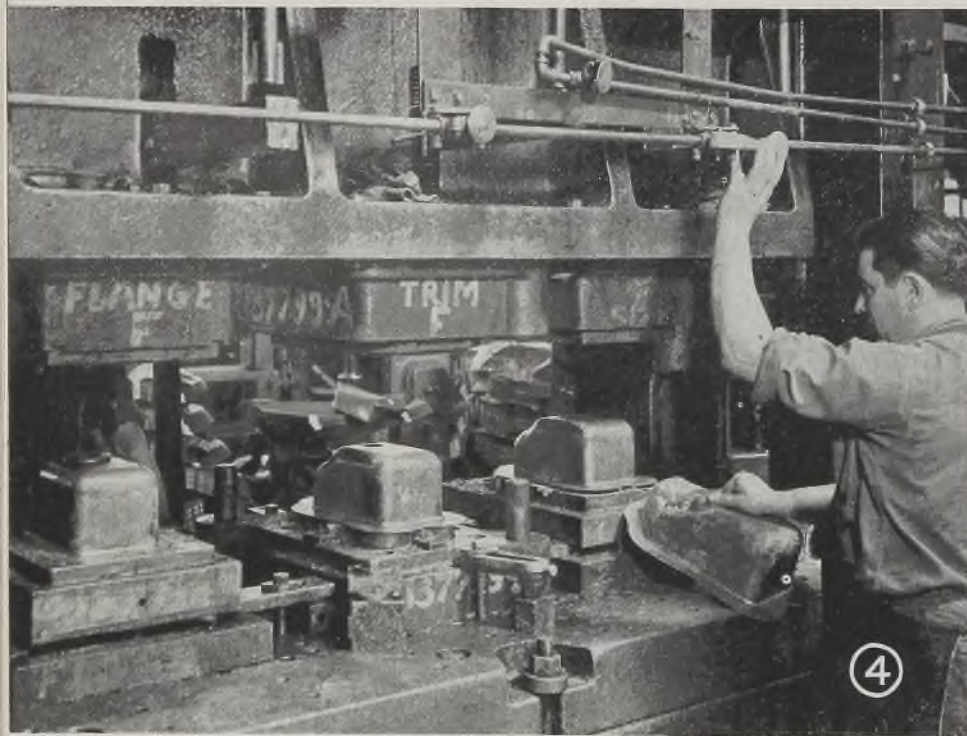
All three die sets of course operate simultaneously, the work being placed in succession from the first, to the second, to the third. A completely finish formed sump pan is produced at each stroke of the press.

Three operators are employed. One loads and unloads the first station and also loads the second station. The next operator unloads second station and loads third die set. The other man works on the back side of the press, unloading from the third station. First man controls operation of the press.

Crank speed is 15 r.p.m. Knockout pins in upper dies are operated by bars extending outside, in turn operated by adjustable stationary striker studs similar to the operation of the blanking die, explained in connection with Fig. 1.

Blanking Reinforcements: The reinforcing strip placed under the lip at A in Fig. 7 is divided into four sections. Two of these are identical L-shaped segments. All are blanked from 9-gage stock. The two L-shaped pieces are about 4 inches long on the short leg, 7 inches on the long one.

These are blanked one at a time, 47 pieces being obtained from a strip 8½ inches wide and 64 inches long. This



is done on a 150-ton Bliss press operating at a crank speed of 34 r.p.m.

The two other reinforcements are blanked simultaneously on a 250-ton press equipped with two die sets and operated by two men feeding in separate strips of stock.

Welding Reinforcements: The reinforcing strips are assembled to the stamping by electric spot welding at about 18-20 points around the rim as shown in Fig. 3. Spot welds are located by a fiber jig which is placed on the rim. This jig has notches at proper points, permitting the upper electrode to be positioned rapidly from point to point around the rim and at the same time assuring that the welds are made at the exact place wanted.

Welding machine is a 20-k.v.a. unit and is the rocker arm type, controlled by a foot pedal.

Perforating the Flange: Next step is to punch the 16 holes in the flange for the mounting bolts used to fasten it to the bottom of the regular oil pan. Fig. 5 shows this operation being done on a 150-ton press, one die punching all 16

of the 9/16-inch diameter holes in a single operation.

Now the sump pans are given a lead bath, that is the flange and its reinforcing strips are covered with lead which of course also flows into the joints and fills up cracks and corners, making the pan easy to clean. Also the ring at C in Fig. 7 must be welded on and the crack around it filled with lead so the entire contents of the sump pan can be drained through the bottom opening without being trapped around the ring.

Lead Bath: After perforating the flange holes, the work is prepared for the lead bath by first cleaning with chemicals and steam. Then the pan is dipped into a bath of muriatic acid, the tank at the right foreground in Fig. 6 being employed. This is a wood tank, 2 x 4 feet, with a hood to carry off fumes. Pan is inverted, held by the operator through the hole in the bottom so the flange is dipped into the acid a few inches. Acid is pure 100 per cent muriatic.

Next the pan is dipped into a liquid
(Please turn to Page 110)

Fig. 4—Three die sets handle finishing operations in sequence. Work first goes to right die set for sizing and upsetting; then to center set for trimming off the rim; left hand dies then form flange by turning down outside edge of rim

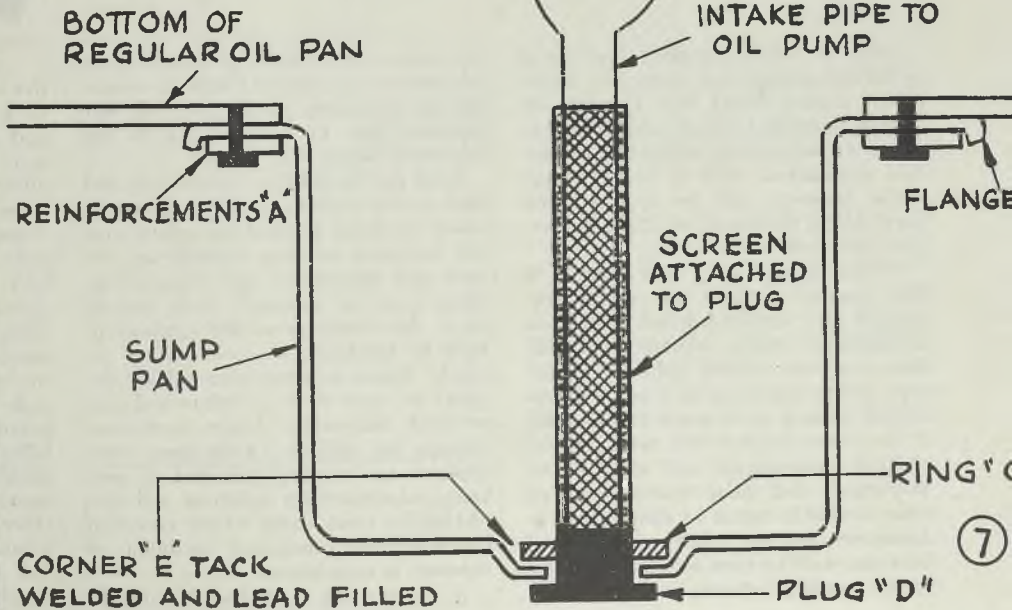
Fig. 5—Here sixteen 9/16-inch diameter holes are perforated around the flange in one stroke of the 150-ton press. Note skid racks for efficient handling by power lift trucks. Shape of sump pan also can be seen here

Fig. 6—Lead bath department: Muriatic acid tank at right, lead bath at center rear with small flux tank on wall between other two large tanks; racks for wiping at left

Fig. 7—Section through sump pan to show related parts and various elements of sump pan: Reinforcement strips at "A"; pan flange at "B"; threaded ring at "C" for plug "D" carrying screen which comes out with plug for cleaning

Fig. 8—Lead "burning," or melting in lead around the bottom ring to fill all cracks and make pan easy to drain completely. Operator uses small oxyacetylene flame after work has been preheated to about 200 degrees Fahr. on a small gas plate. This follows arc welding, Fig. 9

Fig. 9—Arc welding ring C of Fig. 7 into bottom of pan. Work is held by air-operated fixture working from below pan, giving clearance for welding

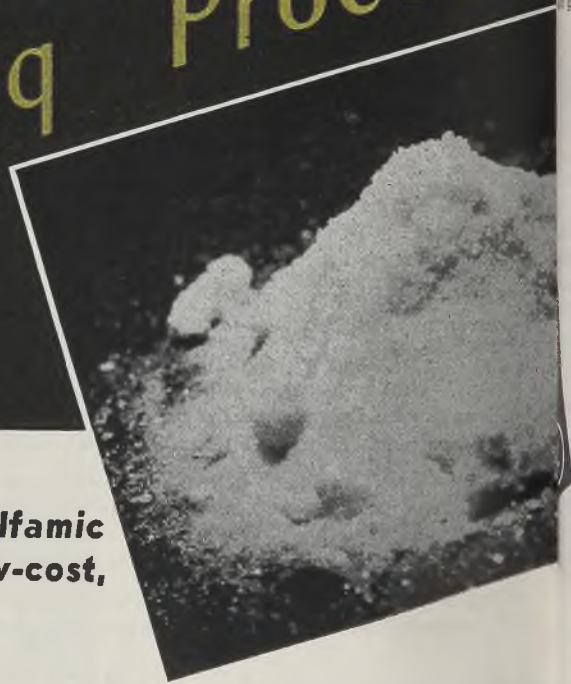




Lead Plating

New Process

based upon commercial production of sulfamic acid is developed for application of low-cost, protective coating to steel



USE of electrodeposited lead as a protective coating first came into prominence during World War I, where its unique chemical resistant properties rendered it particularly adaptable to certain applications such as lining of gas shells, boosters, and for coating other parts where resistance to attack by certain chemicals was necessary.

Following the war, lead plating in this country declined to certain specialized uses restricted primarily to those applications where resistance to sulfuric acid was desired, although in Europe it was employed as a general protective coating on a much larger scale. It has taken another war with its specialized requirements and most of all restrictions and acute shortages of all other available metals to demonstrate to American industry that electroplated lead can well be used as a general protective coating not only as a substitute

for more critical metals at a time when the country is confronted with the necessity of maximum production for war purposes, but for general use in the peacetime which will follow.

Lead can be used to protect iron and steel and nonferrous metals against corrosion in those applications where rust and corrosion resistant coatings are desired and appearance and abrasion resistance are of relatively little importance. In certain specialized applications such as resistance to chemicals or severely corrosive atmospheres lead deposits are superior to cadmium and zinc provided sufficiently heavy nonporous deposits are applied. Aside from these applications, electroplated lead is now being substituted for cadmium and zinc plating in some cases where corrosion under ordinary recognized conditions of exposure is experienced.

In practice the most desirable protec-

tive coating for a given metal depends on numerous factors. Besides economic and aesthetic considerations, the chemical environment and mechanical requirements are important. It is a well known fact that the metallic state is uncommon in nature and that metals corrode by means of chemical reactions with the nonmetallic elements of their environment. Important conditions affecting corrosion processes are the composition, physical state, and surface nature of the protective coating as well as such variables as temperature and temperature fluctuations, nature and solubility of corrosion products produced, circulation or movement of medium in immediate contact with the coating, plus other well known influences such as humidity, dust and atmospheric pollution. The value of any protective coating is closely related to the naturally acquired

exceedingly thin protective films that form on these coatings under conditions of use.

It is interesting to consider the film forming characteristics of certain metals based on data obtained from exposure to indoor summer atmosphere and Fig. 3 gives the gain in weight with time for copper, zinc, lead and iron which shows that the corrosion-time curve for lead becomes parallel with the time axis after the initial stages. The film in this case differs from that of copper, zinc and iron in that it becomes impervious to the constituents of the environment and is of the so-called "self-healing" type, of which the air formed film on aluminum, stainless steel and chromium are examples.

Naturally acquired protective oxide films are generally not resistant to wear

Fig. 1—Crystals of sulfamic acid used in association with lead as lead sulfamate in a new process for electroplating steel

Fig. 2—Shown here is dry sulfamic acid. Up to a few years ago, this acid was regarded as a laboratory curiosity

Fig. 3—This chart shows the corrosion-time relationships of lead, zinc, copper and iron when exposed to the atmosphere

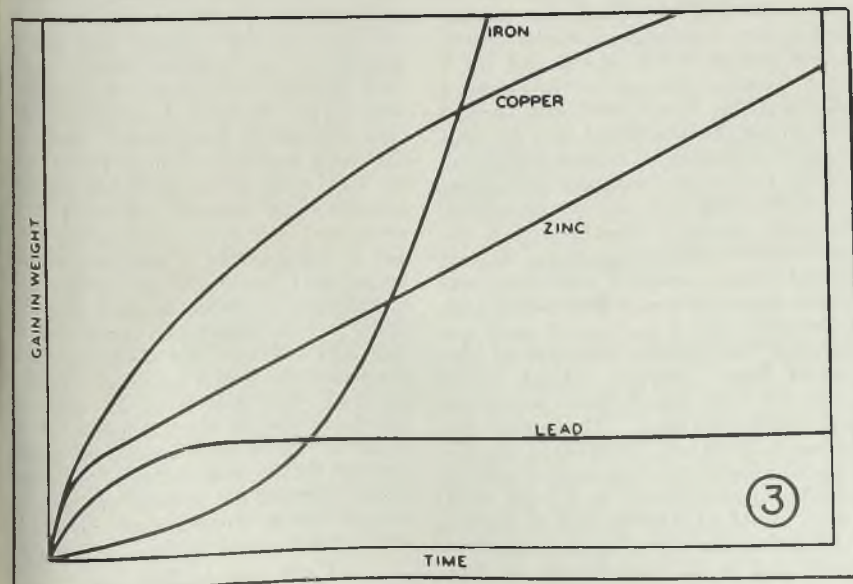


TABLE I
TIME REQUIRED TO DEPOSIT A GIVEN THICKNESS OF LEAD BASED ON 100% CATHODE EFFICIENCY

Thickness of Deposit	Wt. of Deposit, Oz./Sq. Ft.	Minutes Plating Time at Current Densities							
		2	5	10	20	25	30	50	100
0.00005	0.047	10.3	4.1	2.0	1.0	0.8	0.7	0.4	0.2
0.0001	0.094	20.6	8.2	4.1	2.0	1.6	1.4	0.8	0.4
0.0002	0.188	41.2	16.4	8.2	4.0	3.2	2.8	1.6	0.8
0.0003	0.282	61.8	24.6	12.3	6.1	4.8	4.2	2.4	1.2
0.0004	0.376	82.4	32.8	16.4	8.2	6.4	5.6	3.2	1.6
0.0005	0.47	103	41	21	10	8	7	4	2
0.0006	0.56	123	49	25	12	10	8	5	2.5
0.0007	0.66	144	57	29	14	11	10	5.5	2.7
0.0008	0.75	165	65	33	16	13	11	6.5	3.2
0.0009	0.84	183	74	37	18	14	13	7	3.5
0.001	0.94	206	82	41	21	17	14	8.5	4.2
0.0015	1.41	309	122	62	31	25	21	12.5	6.2
0.002	1.88	412	165	83	41	33	28	16.5	8.2
0.0025	2.35	512	206	104	52	41	35	20.5	10.2

TABLE II
SULFAMATE LEAD BATH COMPOSITION

	Preferred Composition		Allowable variance	
	G./L.	Oz./Gal.	G./L.	Oz./Gal.
Lead Concentration	140	18	110-165	15-22
Formulated Sulfamate Lead Plating Salts for bath preparation	375	50	300-450	40-60
Addition Agents	Used as recommended			

and are of little value unless they are automatically kept in repair by the atmosphere under the conditions of use. Lead electroplates which are produced substantially pore free are resistant to atmospheric corrosion because of the natural formation of a superficial oxide film, relatively impervious in character, which may preserve the coating and protect the underlying ferrous base for long periods of time. Upon injury to the lead plate, this protective film automatically repairs itself. As a rule, lead coated materials will stand considerable deformation without noticeable damage to the protective quality of the coating. Like other coating metals, lead has certain disadvantages the most important of which is its softness which does impose some limitations on the use of lead plate on articles subject to considerable mechanical abuse. This, however, can be counteracted to a great extent by increasing the thickness of the deposit. The electrochemical equivalent of lead

is the highest of any common metal except silver and gold. Thus, at the same current densities lead deposits will be more than twice as thick as zinc when plated for the same length of time and since lead is also the cheapest of coating metals, thick plates are entirely practical. Table I shows the rate of deposition in lead plating.

Applications

The uses to which lead plating is being applied are becoming constantly more numerous, in providing protective coatings for such articles as nuts, bolts, washers and many miscellaneous parts. The corrosion resistance of lead to many chemicals and chemically corrosive atmospheres such as sulfuric and sulfurous acids, and brines has resulted in the use of fairly thick lead electroplates in tanks, pipes, pumps, and other equipment used in the widespread manufacture and storage of such products. One of the most important single commercial applications of lead plating is in fittings for lead storage batteries where exposure to sulfuric acid is encountered. Lead plating has also been recommended for lining the copper shells of the ordinary hand fire extinguisher and for lining flues for conducting the waste gases from gas heaters.

In lead lined fire extinguishers, it has been found that the addition of one ounce of sodium phosphate per gallon of water inhibits the corrosion of both the lead coating and any exposed areas of steel; sodium silicate has been found effective for the same purpose².

The use of lead for water pipes was at one time quite extensive and the fact that this metal is generally corroded less rapidly by soils than iron and steel have resulted in the consideration of lead coatings for pipes used underground. Paint and lacquered coatings adhere well to electroplated lead and this coating has been proposed as a substitute for hot

galvanized coatings especially when paint is to be subsequently applied. A preliminary report of the wire test committee of the American Society for Testing Materials shows that while lead coated wires may show slight superficial rusting, the pores apparently become

and steel. The thickness of plate required to insure continuity and freedom from pores or bare spots depends upon a number of factors such as the character and type of plating process employed, the condition of the bath at the time of use and pretreatment, con-

tainers. German railroads specify a 0.012-inch coating on structural parts providing an expected life of 10 to 20 years⁵.

Freedom from porosity rather than actual thickness of deposit is in a large part the criterion for the protective value of lead deposits. In any case, the exact thickness of lead required to give an impermeable coating will depend upon the smoothness and cleanness of the initial surface and upon the structure of the lead deposit. Two processes occur on the surface of weather exposed lead plated steel; the actual corrosion of the lead coating resulting in film formation, and corrosion of the steel through the pores in the coating. As the coating is weathered and the protective film gradually worn away from time to time, more pores are gradually opened up to the steel. Lead is cathodic to iron and steel and as a general rule, will accelerate corrosion of the underlying metal if the lead plate is porous or worn away by abrasive action. There is some evidence that under certain conditions of exposure, lead is weakly anodic to steel and therefore will exert some electrochemical protection although this cannot be depended on. However, it appears that lead coatings protect iron electrochemically better than copper or nickel, but is in no sense comparable with zinc. In consideration of the electrochemical properties of lead as applied in electroplating, platers should attempt to obtain the same qualities in a lead deposit as are recognized of utmost importance in the depositing of metals of definite cathodic behavior such as copper and nickel, where for adequate protection as compared with cadmium and zinc, the plate must be sufficiently heavy, free from pores and inclusions, and possess proper mechanical characteristics.

Plating Solutions

While it is true that lead has been electrodeposited from many types of solutions, the common lead salts are not generally applicable to electroplating because of the diverse character of the deposits produced and for this reason it has been necessary in past lead plating practice to use complex fluorine acids such as fluoboric or fluosilicic acids described as "capable of restraining the crystallization of the deposit." Baths of the above type have been in general use for some time in the electroplating and electrorefining industry, although it is recognized that both solutions are subject to the hazards of handling hydrofluoric acid and entail painstaking and inconvenient methods in their preparation⁶. Of the above two types of fluorine acid solutions, the fluoborate bath has found the largest use in electroplating and the fluosilicate is confined largely to use in electrorefining. Formulae are given in a number of publications⁶ for the preparation of the fluoborate solution, but because of the special equipment required, time consumed, and health hazards involved in the han-

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TABLE III
SOLUBILITY OF VARIOUS INORGANIC LEAD SALTS

Sulfamate 218	Grams salt per 100 grams of water at 25°C.			Sulfate 0.004
	Nitrate 58	Acetate 55	Chloride 1.08	

TABLE IV
EFFECT OF LEAD CONCENTRATION ON PLATING CHARACTERISTICS IN THE SULFAMATE LEAD BATH

Lead Concentration G/L	Oz./Gal.	Current Density Plating Range Amps/sq. ft.					10
		120	90	60	40	25		15
30	4	loose sponge	deposit	deposit	deposit	deposit	no deposit
60	8	sponge	deposit	deposit	deposit	deposit	thin
90	12	sponge	smooth lead deposit	smooth lead deposit	smooth lead deposit	smooth lead deposit	smooth lead deposit
120	16	sponge	smooth, dense lead deposit	smooth, dense lead deposit	smooth, dense lead deposit	smooth, dense lead deposit	smooth, dense lead deposit
150	20		smooth, dense lead deposit	smooth, dense lead deposit	smooth, dense lead deposit	smooth, dense lead deposit	smooth, dense lead deposit
180	24		smooth, dense lead deposit	smooth, dense lead deposit	smooth, dense lead deposit	smooth, dense lead deposit	smooth, dense lead deposit
		120	90	60	40	25	15

sealed before corrosion of the iron occurs. Substantially pore free electroplates of lead should find application in the protection of structural steel parts, an application which has received little attention in this country, but is reportedly widely practiced in Europe.

Prior to the war, some 12,000,000³ pounds of lead were used annually in the manufacture of terne plate containing 15-20 per cent tin. While it is claimed that methods have been developed for applying hot dip lead coatings containing as little as 2 per cent up to 12 per cent tin, electroplated lead requires no tin for coating steel. A broad outlet for lead plating is indicated for the steel industry in the application to the continuous plating of moving strip steel with tin and terne plate in the manufacture of many types of containers, tanks, and other articles.

Lead Technically Satisfactory

Sufficient experimenting work has been done to show that continuous strip plating of steel with lead is technically satisfactory and it is expected that equipment and methods similar to those for the production of electrolytic tin plate will be used, allowing for one significant difference in that lead coatings 0.002 up to 0.001-inch will be required for appreciable long time corrosion resistance, such coatings being much thicker than the usual thin tin coatings used for cans. If lead-tin alloys show advantages over pure lead as a coating material such alloy deposits can be produced by basically the same principles used in straight lead plating. The unusual physical properties of lead are utilized to advantage for special plating purposes such as a lubricant in the drawing of wire. The possibilities of using lead as an electrodeposited bearing alloy component are becoming evident.⁴

Porous or very thin lead plates do not provide satisfactory protection to iron

and type of base metal. Thin, slightly porous lead coatings may be materially improved by slightly working, burnishing, or scratch brushing the surface following plating. Industries accustomed to plating cadmium and zinc are naturally interested in thickness of lead required for satisfactory protection under similar conditions of exposure.

Due to inherent differences in properties of lead as a protective metal when compared with cadmium and zinc as well as lack of extensive data on the protective value of lead deposits it is impossible to equate a certain thickness of lead to thickness of these other metals. It has been reported⁵ that lead coatings 0.00025-inch thick exposed at a 45-degree angle on a roof in the industrial atmosphere of Detroit showed rust spots after three months tests; test panels plated 0.0005 to 0.001-inch thick remained substantially free from rust after 10½ months exposure under the same conditions. These results can be compared to a 0.0002-inch zinc coating which was exposed in a similar atmosphere and protected against rust for 7 to 8 months. For outdoor exposures, a thickness less than 0.0005 inch of lead should not be considered and for prolonged protection of ferrous metals exposed to weather conditions thickness of 0.001-0.002-inch are recommended. Severely corrosive conditions may require 0.004-0.008-inch coatings. In protected indoor exposures free from corrosive fumes where 0.0001-0.0002-inch cadmium or zinc were formerly used, it is probable that 0.0002-0.0003-inch of lead would prove adequate. Lead plated nuts and bolts usually have thicknesses of 0.0005-0.001-inch. Thicknesses between 0.00005 and 0.0005-inch are being considered for commercial use in plating of strip steel. In Europe sheet steel plated to 0.00052-inch is recommended for use as roofing sheet, gasoline tanks and in the manufacture of con-

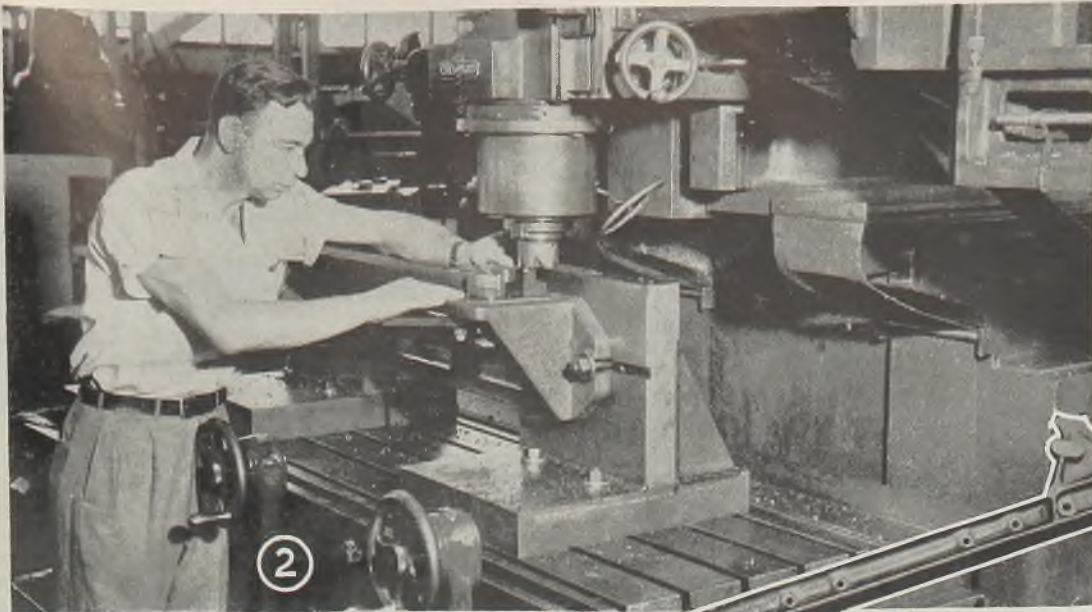


Fig. 1—Link of the aircraft nose wheel landing gear milled with negative rake carbide tipped milling cutters at Douglas Aircraft. The rough casting is shown above and the finished piece below. Use of this cutter increased production 600 per cent



Fig. 2—Milton Freeman, tool project engineer for Douglas, is shown checking the setup for superspeed machining of the landing gear link with a 30-degree negative rake carbide-tipped shell mill

Carbide tipped shell end mill with negative rake

Boosts Production of Tough Steel Link

By DELMER H. RHINO

Plant Superintendent
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HIGHLY interesting results have been achieved in a test recently completed by Douglas Aircraft Co. on carbide tipped shell end mills of a negative rake design. The job involved was the milling of the "link" used in the nose wheel landing gear of the C-54 cargo plane. This part can be seen in Fig. 1. Production on this operation was increased 20 times.

The tool utilized in this operation was a Wendt-Sonis negative rake shell mill which has a 30 degree negative axial rake angle, carbide tipped, with a steel cutting grade of carbide insert. Its cutting edges were designed according to the same principles as apply in single point hyper-milling or flycutting. However, this shell end mill has the advantage of eight cutting edges.

The side and face cutting edges were sharpened on a 5 degree clearance angle. The radial angle was neutral. The shank was hardened to approximately 48

rockwell "C" in order to attain maximum strength. The stock removal was approximately 3/16-inch of nickel chromium-molybdenum steel, with tensile strength of 165,000 to 185,000 pounds per square inch, brinell of 380 and requiring a rigid and powerful machine for the demonstration.

Feed and Speed Increased

The cutter this new tool replaced was operating at 29 revolutions per minute with a feed of 1½ inch per minute. The first test run with the carbide-tipped shell mill was at 466 revolutions per minute with 17½-inch feed. Chips on this speed and feed came out very light blue, and finish was fair. The second test was run at 606 revolutions per minute with a 23-inch feed per minute.

Chips came out blue with no sparks, and finish improved.

The third test was run at 778 revolutions per minute with a 30-inch feed. This time the chips were very hot, finish was smooth and work was cool. As tool project engineer of Douglas Aircraft, M. E. Freeman, stated, "the results were perfect".

We emphasize again that the finished work piece was cool and that chips were very hot. Hence, in addition to a good finish, warpage caused by excess heat of the previously used cutter was greatly reduced. Added production effected by the increased feed alone would warrant applying the new tool to this job. However, it was found that not only did more production result, but also the life of the tool between sharpenings was increased so much that it outlasted four conventional tools. One factor contributing to this long life was that the start-

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MUCH progress has been made in developing a mechanical description of the action of the carbon atom in the process of hardening steel, but not nearly as much clarity has been achieved in the description of the part third elements play in co-operation with the carbon atom to increase hardenability of steel. This report is intended to determine the kinetics of the molybdenum atom during the hardening process.

Early attempts to explain the effect of third elements on hardenability postulated that the added element retarded the rate of diffusion of carbon in austenite. Wells and Mehl have shown

that the carbides formed by isothermal transformation at 1300 degrees Fahr. contained a major portion of the total molybdenum which was originally present in the austenite.

In that temperature region where molybdenum displays its greatest influence, austenite decomposes into a lamellar aggregate of ferrite and carbide. This transformation proceeds through a process of nucleation and growth and the nucleating phase, as determined by metallographic observation, is the carbide. The fact that these carbides contain a large portion of the total molybdenum present indicates that the partition of

prepared by vacuum melting electrolytic iron, pure molybdenum powder, and carbon. Developments in technique, however, permitted the new alloys to be vacuum cast into a 1-inch internal diameter thick-walled steel mold. As a result, less segregation of molybdenum was encountered in these ingots than in the earlier ones, which had been allowed to solidify in the crucible. After being forged into strips $\frac{1}{8} \times 1$ inch in cross section the materials were homogenized in vacuum for 50 hours at 2200 degrees Fahr. Newly determined diffusion data indicated the advantage of the higher homogenization temperature over the treatment at 2000 degrees Fahr. used formerly. No decarburization could be detected by metallographic examination.

Times for the completion of the subcritical transformation of austenite in the various alloys were determined metallographically from samples austenitized in a deoxidized lead bath at 1600 degrees Fahr. and then quenched into lead baths and held for various lengths of time at 1200, 1100, and 1000 degrees Fahr.

Lower Temperature Ineffective

Attempts to separate the carbides electrolytically from material transformed at 1200 degrees Fahr. were unsuccessful. Although the results obtained by identical methods from alloys transformed at 1300 degrees Fahr. were excellent, the increased fineness of the carbides formed at the lower temperature greatly increased their reactivity toward the electrolyte.

Samples austenitized at 1600 degrees Fahr. and completely transformed at 1200 degrees Fahr. in a lead bath were prepared for X-ray examination. Scale was removed and the surface was deeply etched in dilute nitric acid. Diffraction patterns were made in a Debye-Scherrer type camera with the sample arranged to intercept the beam with an edge. Excellent patterns of the carbides were obtained in each case and the structures were found to be identical with those formed at 1300 degrees Fahr. The pattern of the 0.30 per cent molybdenum alloy revealed the orthorhombic structure of cementite, while those from the alloys containing 0.51, 0.74, and 1.02 per cent molybdenum revealed the presence of the face-centered cubic $(Fe, Mo)_{23}C_6$.

In the case of the alloys transformed at 1300 degrees Fahr. the X-ray method gave data agreeing excellently with those obtained by chemical separation and analysis of the carbide. However, as noted earlier, satisfactory chemical separation of the carbides formed at 1200 degrees Fahr. was impossible. Furthermore, the ferrite back-reflection patterns from the alloys transformed at this lower temperature were much more diffuse than those obtained from the material transformed at 1300 degrees Fahr. This diffuseness of interference line, which can be due to fineness of the grains, inhomogeneity, or stresses, increased appreciably with the molybdenum content of the alloy. Therefore, the results given in Table I, although the best obtainable,

Partition of MOLYBDENUM in STEEL and Its Relation to Hardenability

During transformation of austenite to pearlite, molybdenum in iron-carbon-molybdenum alloys of approximately eutectoid carbon content segregates in the carbide phase. Necessity for its diffusion during transformation process is indicated

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for nickel and manganese, and Ham, Parke, and Herzig have shown for molybdenum that the effect of these elements upon the rate of diffusion of carbon in austenite cannot account entirely for their influence upon the rate of transformation of austenite.

Diffusion of the alloying element remained as the most obvious explanation for the increased hardenability produced by the alloying element. Decomposition of austenite, at temperatures above that at which martensite is formed, involves the formation of two constituents, ferrite and carbide. If the diffusion of the alloying element in austenite is the factor determining the rate at which the austenite transforms, the alloy content of one or the other of these constituents must be higher than that of the parent phase. In this report it will be shown that molybdenum does diffuse to the carbide during transformation of austenite even at subcritical temperatures as low as 1100 degrees Fahr. It has been shown

this element is related to its effect upon hardenability.

Results of a study of the partition of molybdenum which occurs during the isothermal transformation at 1300 degrees Fahr. of pure iron-molybdenum-carbon alloys of approximately eutectoid carbon content, have been reported earlier. That report also included the data obtained from long-time tempering treatments of the martensitized alloys. The present work is concerned with an extension of the study to transformation temperatures down to 1000 degrees Fahr.

A new series of alloys was prepared, closely approximating the composition of the eutectoid alloys used in the earlier work. As previously, these alloys were

This paper was first presented by Mr. Bowman in October at the twenty-sixth annual convention of the American Society for Metals held in Cleveland in conjunction with the National Metal Congress. It is re-presented with permission of the Society.

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are not of the same degree of accuracy as those reported earlier for 1300 degrees Fahr., but these findings do permit an estimation of the alloy content of the two phases.

It was found that the carbides formed from martensite tempered at 1300 degrees Fahr. were of the orthorhombic variety. Although they increased gradually in molybdenum content with time at the tempering temperature, within 250 hours they did not reach molybdenum contents approaching the values obtained in a much shorter time by direct transformation. In order to determine the extent of molybdenum concentration which would take place in similar periods of time at 1200 degrees Fahr., small samples of each homogenized alloy were quenched from lead bath at 1600 degrees into water. After removal of scale, the samples were placed in a vacuum furnace and held for 150 hours at 1200 degrees Fahr. It was found, by metallographic examination after this treatment, that all samples had completely graphitized. No graphitization had been encountered at 1300 degrees even after 250 hours. New samples were similarly tempered for 100 hours at 1200 degrees Fahr. and partial graphitization was found in the three lowest molybdenum alloys, the amount of graphitization decreasing with increasing molybdenum. The 1.02 per cent molybdenum alloy was graphite-free, and metallographic examination revealed spheroidized carbides although they were much finer than those found after the 150-hour treatment at 1300 degrees Fahr. The undecomposed carbides in all tempered samples yielded the diffraction pattern of the orthorhombic structure. The distribution of molybdenum in the one alloy which did not graphitize is shown in Table II.

Alloys austenitized at 1600 degrees

Fahr. and completely transformed isothermally at 1100 degrees Fahr. were also investigated. The transformation times for the two alloys of highest molybdenum content were not only much greater than at 1200 and 1300 degrees, but also the microstructures were different. At the higher transformation temperatures the expected lamellar pearlite was formed with increasing fineness as the temperature of formation was lowered. However, at 1100 degrees Fahr. an acicular structure was formed in which the carbides were much more massive than those in the coarsest pearlite.

Size Permits Analysis

Because of the size of these carbides it was possible to make an electrolytic separation and obtain a chemical analysis, although even here there was considerable decomposition of the carbides in the separation process and no material balance could be obtained. Diffraction patterns of the separated carbides indicated a high predominance of the face-centered cubic material in both cases, but the predominance was much greater in the higher molybdenum alloy. The carbon contents of the carbides supported this evidence. However, the carbide patterns obtained from a sample of the alloy itself indicated a much greater amount of the orthorhombic material than existed in the residue. Apparently the orthorhombic carbide formed at 1100 degrees Fahr. along with the face-centered material possesses greater reactivity toward the electrolyte than does the more complex carbide or the orthorhombic material formed at higher temperatures. In the lower molybdenum alloys the carbide structures as obtained from isothermally transformed samples were entirely orthorhombic. These carbides were present as fine pearlite, and no successful separation could be made. The results of

both the chemical and X-ray analysis of the alloys isothermally transformed at 1100 degrees Fahr. are listed in Table III.

It will be noted in Table III that the times for complete transformation of the 0.74 and 1.02 per cent molybdenum alloys are much longer than at 1200 or 1300 degrees Fahr. This fact plus the radically different microstructures produced by transformation at 1100 degrees suggest that the relative importance of the factors determining the transformation process is altered in this temperature range. This suggestion will be discussed further in the section to follow.

Attempts to obtain partition data on alloys quenched and tempered at 1100 degrees were unsuccessful. Graphitization was found to have occurred in all alloys after 100 hours. Here again the extent of graphitization increased with decreasing molybdenum. Tempering for less time resulted in a ferrite diffraction pattern that was much too diffuse to be of any benefit in obtaining an accurate lattice parameter value. It was found that after 24 and 50 hours at 1100 degrees Fahr. the carbides formed from martensite were entirely orthorhombic.

Relation to Hardenability

Isothermal transformation at 1000 degrees Fahr. did not yield structures on which measurements of the ferrite lattice constant could be made. In this case even the carbide patterns were not sufficiently complete to permit positive identification. It appears, however, that the orthorhombic material is formed in alloys isothermally transformed at 1000 degrees Fahr.

Data have been presented showing the partition of molybdenum resulting from the isothermal transformation of eutectoid austenite containing this element at 1300, 1200, and 1100 degrees Fahr. No definite rule can yet be seen which provides a basis for the quantitative prediction of this partition. A few conclusions can be drawn, however. After isothermal transformation of austenite at the temperatures investigated, molybdenum is present in the carbide in large amounts. The magnitude of the segregation decreases with decreasing transformation temperature. A face-centered cubic carbide which contains at least 3 per cent molybdenum is found. This carbide is formed by the direct transformation of austenite at 1200 and 1300 degrees when the austenite contains more than 0.50 per cent molybdenum.

It is hoped that the results of similar investigations of hypo- and hypereutectoid alloys will yield results which will aid in establishing the laws which must govern this partition phenomenon.

During the transformation of molybdenum-bearing austenite to pearlite the composition and, in some cases the structure of the carbides formed is greatly altered by the presence of the alloying element in the austenite. It is apparent that the presence of molybdenum in these carbides is essential to their formation. There is now evidence to show that during the transformation of the alloyed austenite to pearlite diffusion of the al-

TABLE I
ALLOYS ISOTHERMALLY TRANSFORMED AT 1200 DEGREES FAHR.

Alloy No.	Per Cent		Transformation Time, Seconds	Per Cent Mo in Ferrite	Type of Carbide	Per Cent Mo in Carbide (Calculated)
	Mo	C				
54	0.30	0.78	250	0.19	Orthorhombic	1.11
71	0.51	0.74	600	0.10	Face-centered cubic	3.04
72	0.74	0.74	1500	0.26	Face-centered cubic	3.73
38	1.02	0.80	2500	0.37	Face-centered cubic	4.64

TABLE II
ALLOY QUENCHED AND DRAWN AT 1200 DEGREES FAHR. FOR 100 HOURS

Alloy No.	Per Cent		Type of Carbide	Per Cent	
	C	Mo		Mo in Ferrite	Mo in Carbide
38	0.80	1.02	Orthorhombic	0.87	2.09

TABLE III
ALLOYS ISOTHERMALLY TRANSFORMED AT 1100 DEGREES FAHR.

Alloy No.	Per Cent		Transformation Time, Seconds	Carbide Structures		Per Cent Molybdenum in		
	Mo	C		From Alloy (Percentages Estimated)	From Residue	Ferrite X-ray	Carbide Calc.	Carbide Chem.
54	0.30	0.78	90	Ortho.		0.23	0.86	
71	0.51	0.74	800	Ortho.		0.31	2.08	
72	0.74	0.74	28,800	40% Ortho.	25% Ortho.			
38	1.02	0.80	38,000	60% F.C.C.	75% F.C.C.	0.39	3.12	3.51
				25% Ortho.	5% Or'ho.			
				75% F.C.C.	95% F.C.C.	0.40	4.40	5.65

Ortho. = orthorhombic, F.C.C. = Face-centered cubic.

PORTER Steam Locomotives



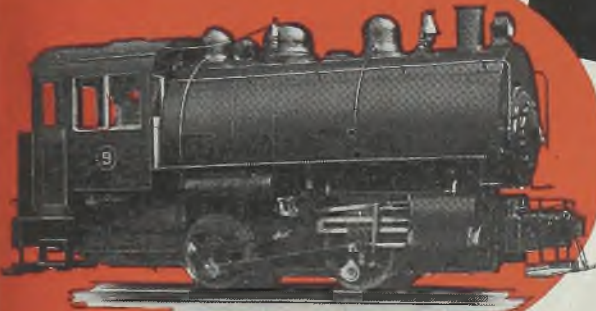
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loying element takes place and the ultimate rate at which this transformation proceeds is dependent, directly or indirectly, upon the rate of diffusion of molybdenum.

Austenite transforms by a process of nucleation and growth at all subcritical temperatures above that at which martensite is formed. Mehl has shown that both the rate of nucleation and the rate of growth must be combined in the final rate of the transformation itself. Ham has proposed an explanation for the manner in which molybdenum diffusion ultimately determines the rate of growth of the carbide nucleus. Consideration will be given here to the manner in which the partition of molybdenum can affect the rate of nucleation and consequently the extent to which this rate determines hardenability.

In Constant State of Flux

According to the nucleation theories outlined by Mehl and Jetter, a homogeneous solid solution such as austenite must be considered as being in a constant state of flux with regard to the composition of submicroscopic volumes. It is only when this continuous atomic migration establishes, by chance, a region of the proper composition and size that the nucleus of a new phase can be formed. The continued existence of this nucleus and its ability to grow is dependent upon its having a smaller free energy than the parent phase. This free energy is, in part, a function of nuclear size and it increases with decreasing size, as pointed out by Sirota.

Apparently molybdenum raises the temperature of the maximum rate of nucleation by carbide until it no longer coincides with that by ferrite and a temperature range exists in which austenite transformation is nucleated at a rate which is considerably slower than the

maximum of either nucleating phase.

In the pure iron-carbon-molybdenum alloys studied, such a region of decreased reaction rate was found at 1100 degrees Fahr. The microstructures resulting from transformation at this temperature revealed massive carbides, which suggest that the growth rate may have become the controlling rate. The fineness of the carbides formed during transformation above and below this region indicates that the rate of austenite decomposition may be governed at these temperatures by the rate of nucleation.

Conditions Governing Growth

Once formed, a stable nucleus can grow because of the free energy decrease which results from its increasing size. In the case of eutectoidal decomposition the unstable phase maintains a constant concentration throughout the transformation process and consequently its free energy remains constant. It has been shown by Hull, Colton and Mehl that, in plain carbon steels, while the rate of growth increases slightly with a decrease in transformation temperature, the increase in nucleation rate is tremendous. For instance, in a "pure" iron-carbon alloy containing 0.92 per cent carbon, the nucleation rate at 1013 degrees Fahr. is some 10^8 times as great as at 1320 degrees. It would appear then that in spite of the decrease in the diffusion rate of carbon with temperature, the increase in transformation rate can be accounted for on the basis of increased nucleation, which in turn, as has been pointed out, is a function of the difference in free energies of the carbide nucleus and the parent austenite.

When as has been suggested, the maximum nuclear size determined by the probability of its formation becomes less than the stable size determined by energy relationships, the decomposition of austenite

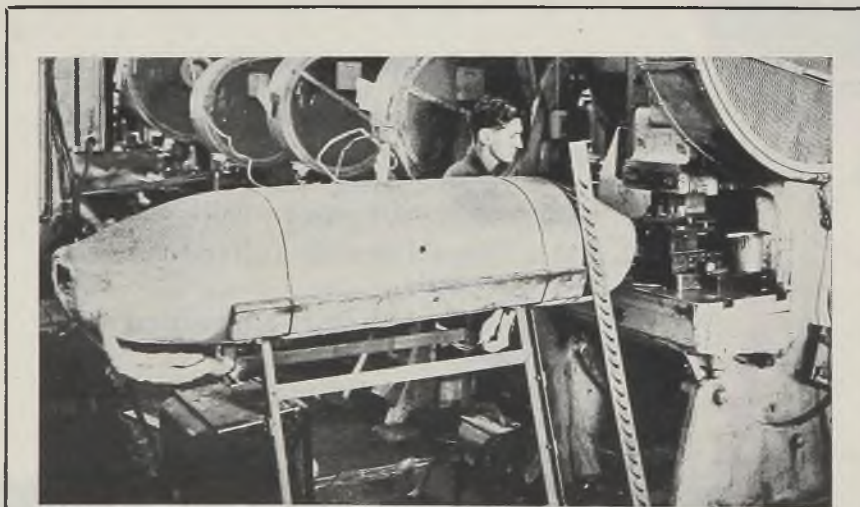
is initiated by ferrite nuclei. Here again similar conditions of free energies must determine the nucleation process. In this case, however, the "fluctuations" in concentration must be such as to allow a sufficiently large area to form free of carbon to provide a nucleus of the stable size. Growth of this nucleus is dependent then upon the rate at which carbon diffuses away from the advancing austenite-ferrite interface. That the conditions governing a eutectoidal reaction in this range of transformation temperatures are no longer in effect is evidenced by the almost complete absence of proeutectoid constituents in hypo- and hypereutectoid alloys allowed to transform to bainite.

The effectiveness of molybdenum in retarding the pearlite transformation has already been pointed out. It remains to fit it into the theories just outlined. The retarding effect of molybdenum on the austenite transformation reaction is brought about by the necessity for segregation of the element in the carbides during the transformation.

Can Prevent Orthorhombic Formation

It must be assumed that the presence of molybdenum in austenite in amounts greater than 0.50 per cent so alters the energy relationships of the phases involved that at certain temperatures the orthorhombic carbide of the Fe_3C type cannot form directly from austenite. The face-centered cubic $(Fe, Mo)_{23}C_6$ found in isothermally transformed iron-carbon-molybdenum alloys, containing 0.50 per cent molybdenum or more, has a unit cell volume of approximately 1200 cubic angstroms as compared with about 225 for cementite. The unit cell of the cubic carbide contains 116 atoms in contrast to the 16 in the cementite cell. In addition, Westgren has reported that the molybdenum atoms appear to occupy specific lattice points in the face-centered cubic carbide. It can be seen that the probability of the formation of an $(Fe, Mo)_{23}C_6$ nucleus is less than that of the formation of Fe_3C . The present work has been conducted on pure iron-carbon-molybdenum alloys, and direct comparison with alloys of commercial steel analysis may be unwarranted; yet an indication that the presence of molybdenum greatly decreases the rate of nucleation is to be found in some unpublished work carried out in the laboratory of Climax Molybdenum Co.

During the isothermal transformation of an austenitized 0.80 per cent carbon, 0.75 per cent molybdenum alloy at 1250 degrees Fahr. the rate of nucleation was 267 nuclei per square centimeter per second, while the rate of nucleation of a plain carbon steel at the same temperature was 24,900 nuclei per square centimeter per second. The delay in the rate of transformation caused by molybdenum cannot be accounted for entirely on the basis of rates of nucleation, however. It has been shown by the S-curves of molybdenum steels that molybdenum also decreases appreciably the rate of growth of the nuclei as compared with the rate in plain carbon steels.



PROLONGS TOOL LIFE: Thermostatically controlled electric furnace designed for Westinghouse Electric & Mfg. Co.'s South Philadelphia plant heats 5/16-inch stainless steel bars before punching to reduce tool breakage and scrap common in cold punching. It maintains temperature of bars like that shown below the critical point so that physical structure is unchanged yet material is more readily penetrated by the punch



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Forming and Parting Dies

Special tools permit production in multiples; minimize distortion; simplify operations

THE forming and parting die, as its name implies, forms a piece of metal previously blanked and pierced to a desired shape, and then cuts it into two or more individual parts or pieces.

Various conditions and requirements dictate the advisability or inadvisability of constructing a die of this type. One requirement that might indicate the practicability of such a tool would be the need to reduce the number of operations in the production of parts when they are desired in quantity. A condition that would suggest combining two parts for the forming operation would be one in which an undesirable distortion of the parts resulted during the forming operation where each piece is formed separately. Figs 1, 2, 3 and 4 show different stages in the production of two parts which would distort beyond the allowable limits imposed, while Figs. 5, 6 and 7 show another die-forming operation.

In Fig. 1 several parts of two different widths are lying on the bolster plate of the press, in the original flat blanked and pierced condition and also completed in the formed and parted state. Both widths are formed and parted on the same die.

Punch and die construction is sectional, with two leading punch and die blocks hardened and ground to fit, which do the cutting. They lead the adjacent die parts by the thickness of the metal to be formed and parted, in this case, 0.064-inch SO alclad.

Fig. 2 shows the three locating pins

By JAMES WALKER
Tool Research Analyst
Consolidated Vultee Aircraft Corp.
And
CARL TAYLOR
Fort Worth, Tex.

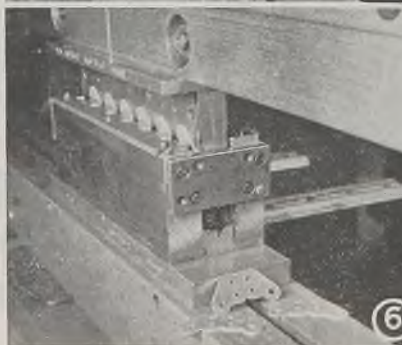
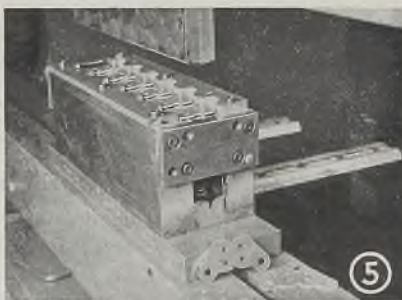
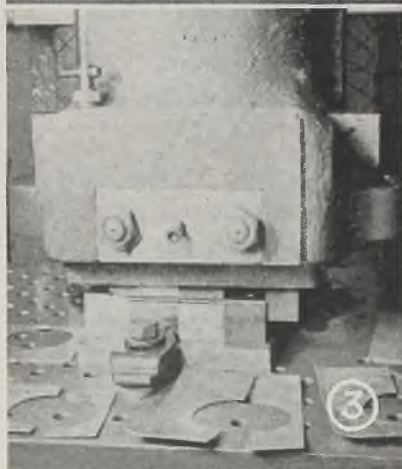
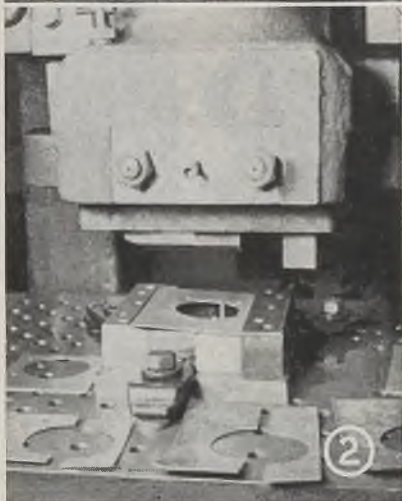
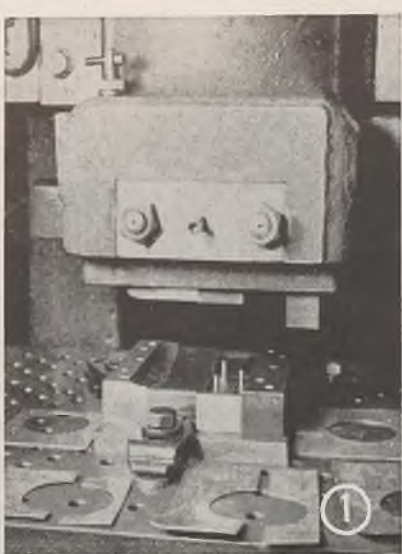
and the position of the part about to be formed. In Fig. 3 the punch has descended to a point where the part has been almost completely formed and parting is ready to take place. In Fig. 4, forming and parting operations are completed and the two finished parts are still lying in the die. The ram has ascended to the top of its stroke.

The die shown in operation in Figs. 5, 6 and 7 was designed for use on a press brake and forms flanges on two identical pieces pierced and blanked at one time, as are those parts shown in Fig. 1, and also parts them after forming has taken place. After forming and parting, these identical pieces become left-hand and right-hand parts.

Pad Holds Parts

Principles of the die are almost identical with the one previously described. However, in this case, a spring-actuated pressure pad rides between the two die blocks, holding the parts being formed as well as ejecting them when the operation is finished. The pressure pad is in two sections; one moves independently. It is forced upward at the bottom of the stroke and cuts the piece apart, in conjunction with the off-set punch sections as seen in Figs. 5 and 7.

In Fig. 5, all 6 pieces are in place ready for the punch to descend. In Fig. 6 the punch has descended and the flanges are turning up as the punch compresses the pressure pad and pushes the parts into the die. When formed and parted, the original 6 pieces will make 6 left-hand and 6 right-hand parts, shown completed and ready for removal in Fig. 7.



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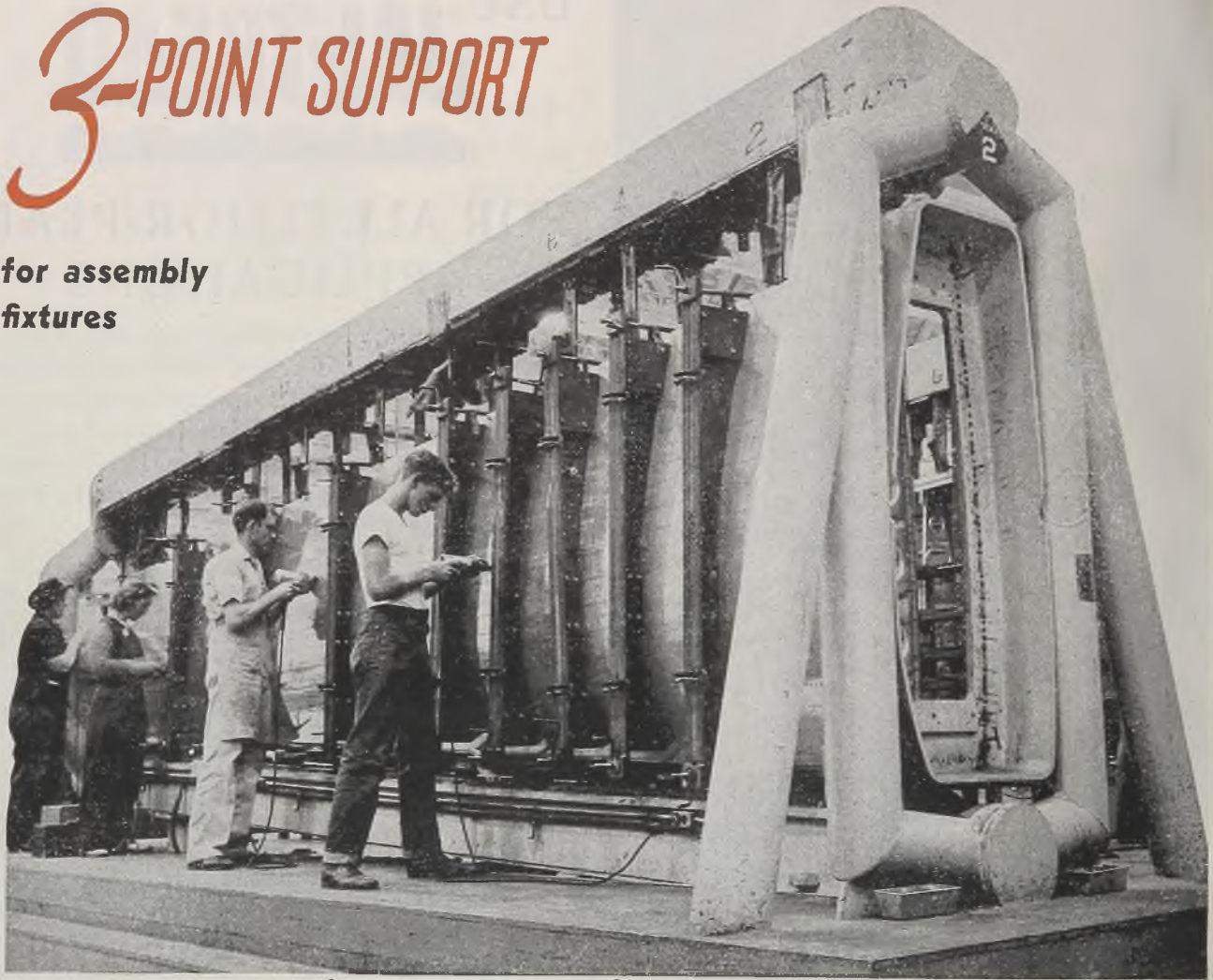
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3-POINT SUPPORT

for assembly
fixtures



Principle of the three-legged milking stool is utilized in this jig which does not depend upon a level floor for accuracy. A jig builder's transit is used to establish center lines and critical points. Lines are set up in about 20 minutes instead of the customary 6 to 8 hours

PRIMARY concern of tool designers in building assembly jigs or fixtures is that of obtaining and maintaining accuracy. This is obvious because of the fact that the uniformity and accuracy of all parts made in jigs depend upon the dimensions of the jig. It has been difficult to maintain true jig dimensions in many plants because of the movements of foundations and concrete floors. This shifting may be caused by changes in the earth structures of filled material or, in the case of locations near the ocean, tidal disturbances. Large jigs may become distorted because of the strains set up by weight alone.

Because of these disadvantages, Ryan Aeronautical Co., San Diego, Calif., began to search for a more reliable type of jig, which would not depend upon the level of the floor for its rigidity or accuracy. Result of this study was the design of a new type of fixture, fashioned on the principle of the three-legged milking stool. (See accompanying illustration). This three-point suspension method has proved to be the answer to the

question of isolating the jig from the changes occurring in the floor levels.

The most logical material from which to construct the jigs was found to be tubular steel sections such as oil well casing. In some instances square tubing is used. It has been possible to make these jigs with relatively unskilled labor because it is not necessary to hold a tolerance closer than plus or minus $\frac{1}{4}$ -inch. Angles and attaching plates are welded to the framework to hold all holding devices and locating points. After welding, it is desirable to normalize the structure to relieve possible welding strain.

Now Done in 20 Minutes

A jig builder's transit is used to establish center lines and critical points. This technique has eliminated a great deal of time. Where it formerly required 6 to 8 hours to set up these lines, it now takes about 20 minutes. All of the critical holding devices and points can be installed after the framework is complete.

The use of the three supporting points

eliminates the necessity of having to build a special foundation or bolt the fixture to the floor as is the case with jigs supported upon four or more points. In addition to these advantages, the new type jig can be moved about to facilitate construction of an assembly without the need for leveling or checking.

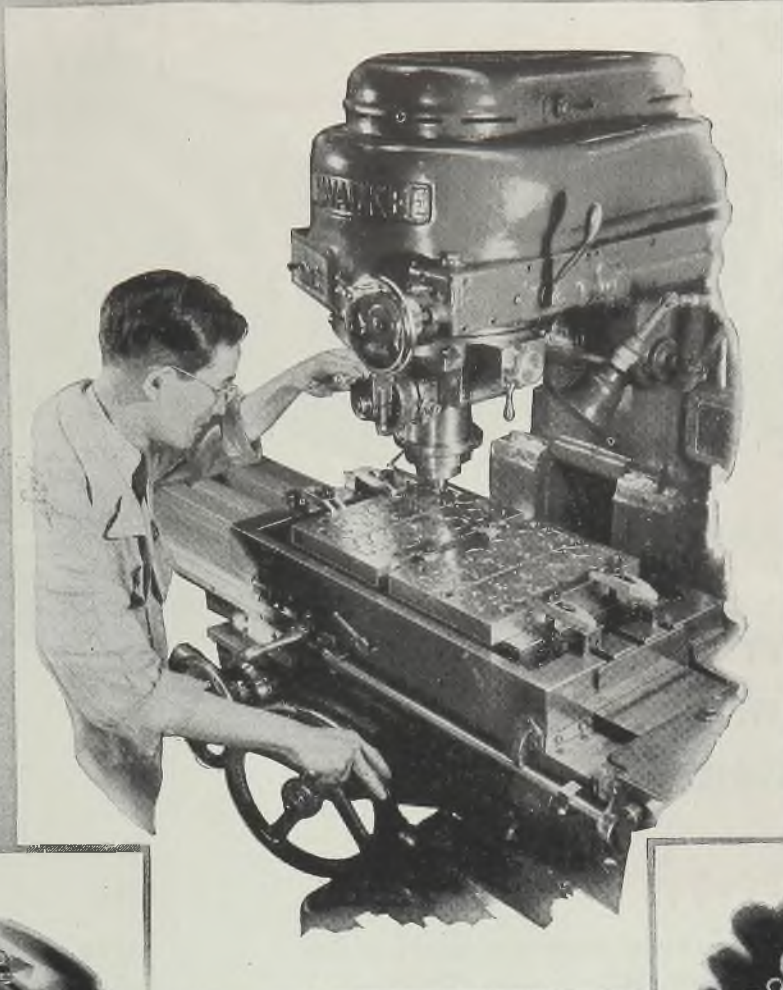
Although the adaptation of 3-point support here described is new, variants of the idea are in use.

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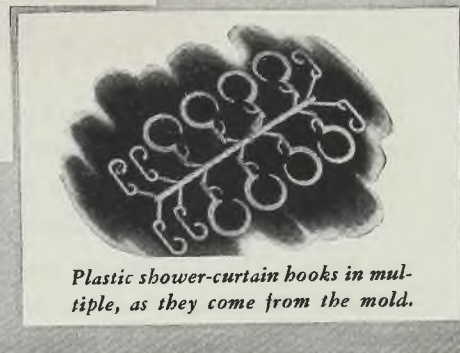
An aluminum alloy, now being used in the construction of B-29 Super-Fortresses, is strong as any structural metal but only one-third as heavy and has greater compression strength than other aluminum alloys. It is being prefabricated into top center wing skins for these bombers.

Use of this alloy, R-301, may cut hundreds of pounds from B-29 weight, as well as speed production, as it often requires less complicated fabricating procedures, according to Reynolds Metals Co., New York.

Could you Mill this 14 Cavity Mold complete in 52 Hours?



Close-up view of cavities in the solid mold block.



Plastic shower-curtain hooks in multiple, as they come from the mold.



Photos — Courtesy The Kampa Manufacturing Co.

1000-P

This 14-cavity plastic mold is a "sticker" if you try to produce it by ordinary methods — but read this report of its production with the Milwaukee Rotary Head Milling Machine!

The Milwaukee Rotary Head method made it possible to set up both halves of this shower curtain hook mold on the machine table. One cavity of each shape was then laid out by means of a scribe held in the machine

spindle. Each milling operation was first performed on the location of the layout and then repeated for each additional cavity. Uniform and unvarying precision is repeated by this multiple origination of cavities with the Rotary Head Method. Total milling time complete — 52 hours.

Write for Bulletin 1002-C for full information on this unusual machine tool and the Rotary Head method of milling.

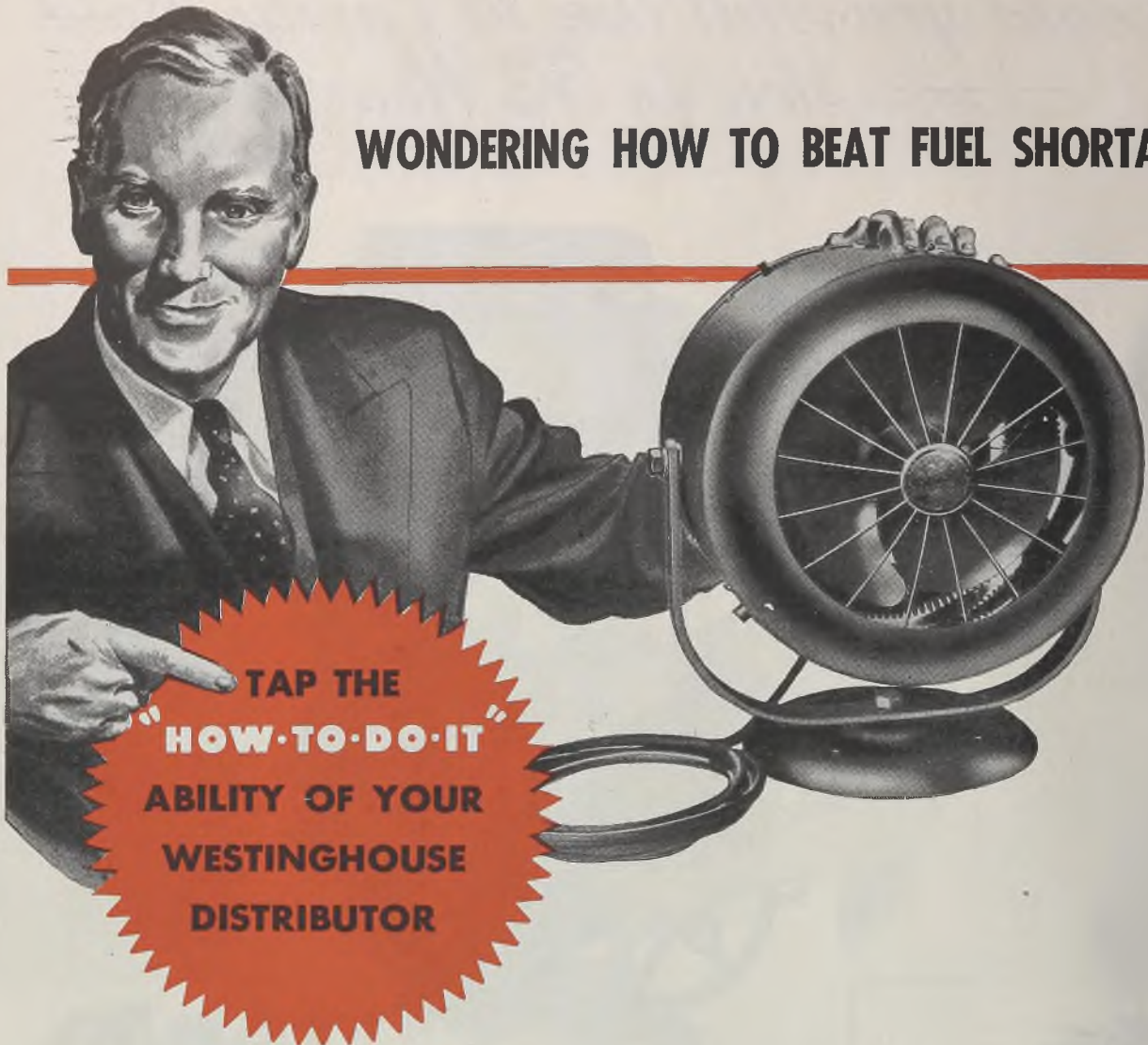
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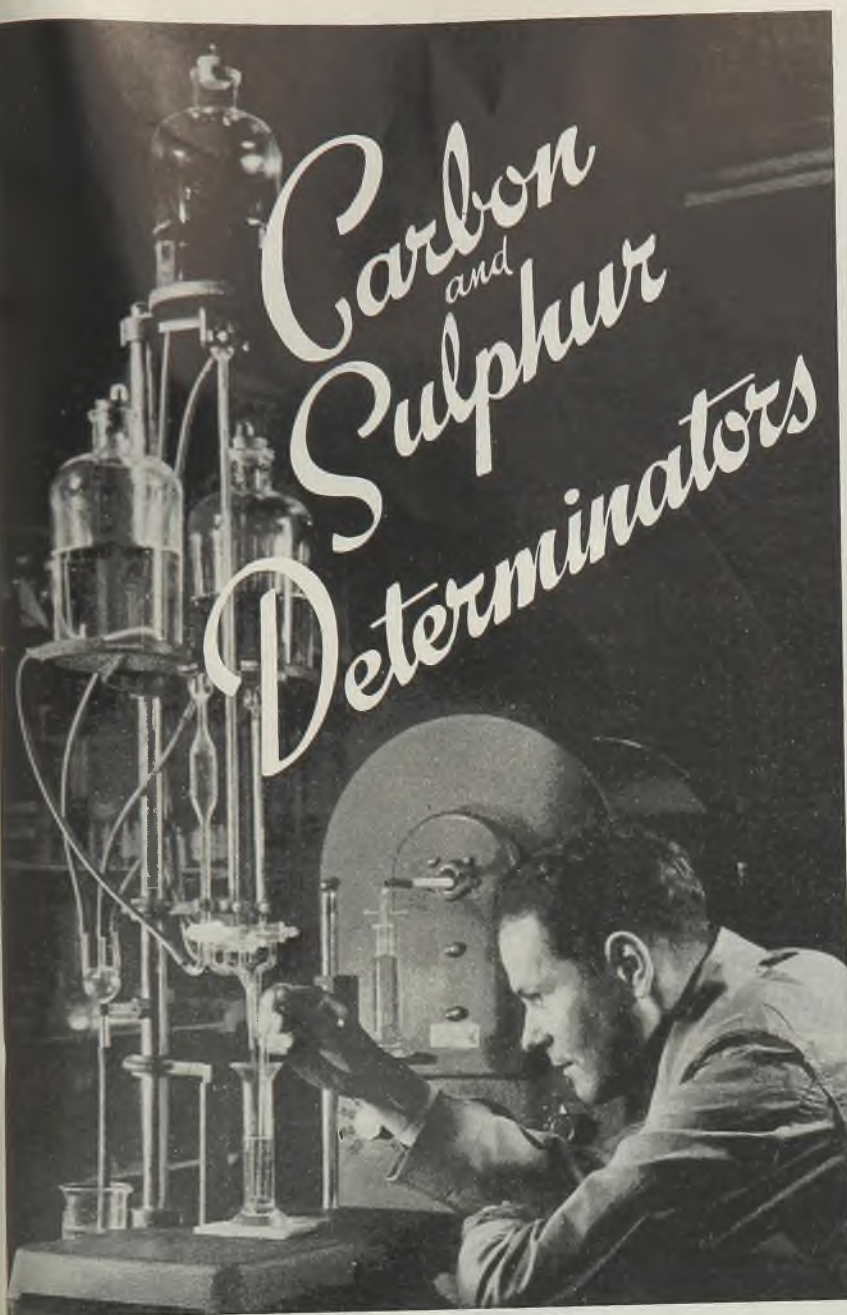
More than 40 pages of useful ordering and application information are contained in this handy catalog of Westinghouse Electric Heating Units and Controls (Catalog 28-000). Products listed include strip heaters, finned heaters, cartridge heaters, immersion heaters, air and oven heaters, thermostats and special controls. Ask your Westinghouse distributor for your copy, or write Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., Dept. 7-N.



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Carbon and Sulphur Determinators

IMPROVED 3-minute sulphur determinator and a 2-minute carbon determinator have been brought to a high degree of efficiency by Harry W. Dietert Co., Detroit, makers of this equipment for rapid and accurate determination of the two elements in steel, iron, nonferrous metals, and materials such as coal and coke.

For example, in testing for sulphur, the sample is ignited by a high-temperature furnace in an oxygen atmosphere. Sulphur in the sample is converted to sulphur dioxide gas which is filtered free of all dust particles by a hot ceramic filter within the furnace combustion tube. The gas then bubbles through an alkaline solution which reduces the alkalinity of this solution. The greater the sulphur content in the sample, the lower the solution alkalinity. Alkalinity is measured by titrating with a standard acid solution.

The determinator, shown at left, is

divided into two units, measuring burettes with 2-liter solution bottles mounted as one unit, a standard and support for holding the solution vessel at the furnace as the other.

This arrangement increases the speed of sulphur determination, since one sample may be in the process of combustion while another is being titrated. Sulphur percentages are read direct from the burette scale. The gas bubbler is separated from the solution vessel, permitting these parts to be inexpensive and easy to clean. Large solution bottles hold ample amounts of prepared solutions and may be quickly removed for refilling. A special blue reflector with a frosted glass base causes the end point to be a distinct color change from yellow to blue.

The 2-minute carbon determinator consists of a sturdy metal support on which is mounted a precision burette, a large 5-way valve, sulphur trap and absorber.

provide faster, more accurate, and simpler testing system for all steel, iron, nonferrous metals and coal and coke

Carbon dioxide and other gases from the test sample enter the sulphur trap which contains manganese dioxide to trap all of the sulphur that may be contained in the gas. Purified carbon dioxide gas is trapped in the large water-jacketed quick-draining burette.

To insure a trouble free valve, a 1½-inch diameter glass stopcock is provided to connect the burette to the absorption vessel. After the gas is trapped in the burette, it is forced through the absorption vessel where all carbon dioxide gas, representing the carbon contained in the sample, is absorbed. The remaining portion of gas is brought back into the burette and measured. Loss in volume of gas is read as percentage of carbon.

Accurate Reading Provided

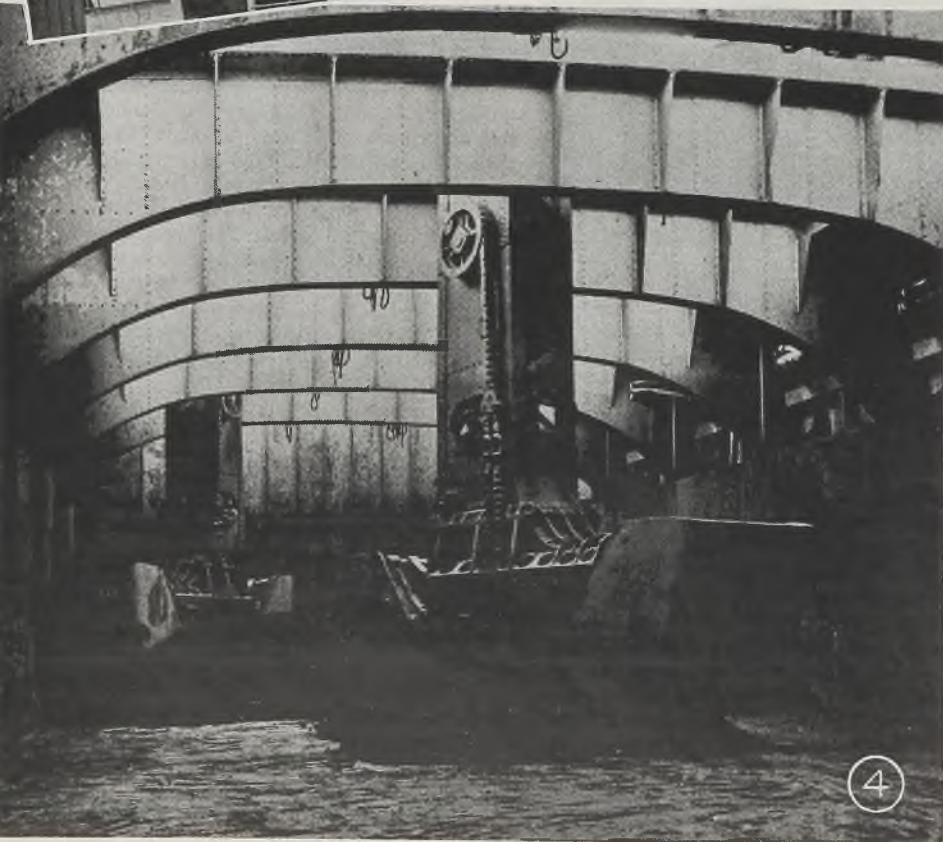
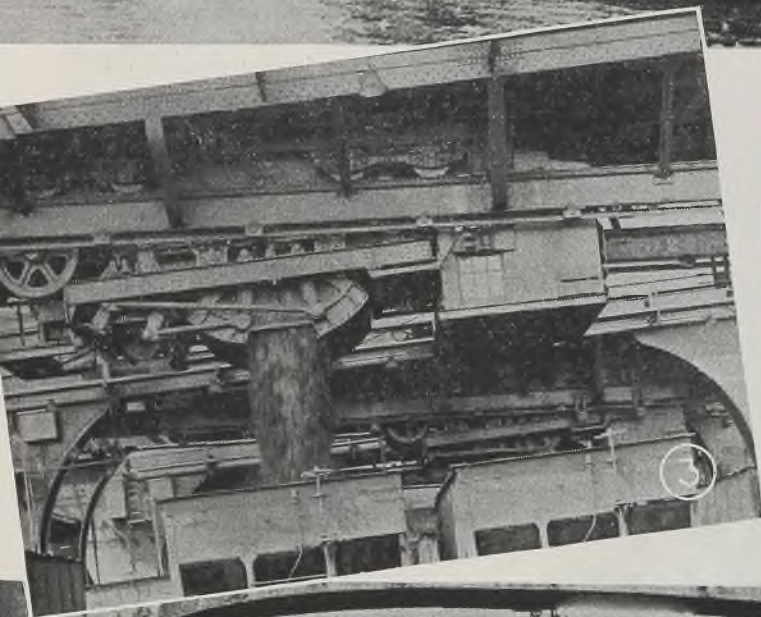
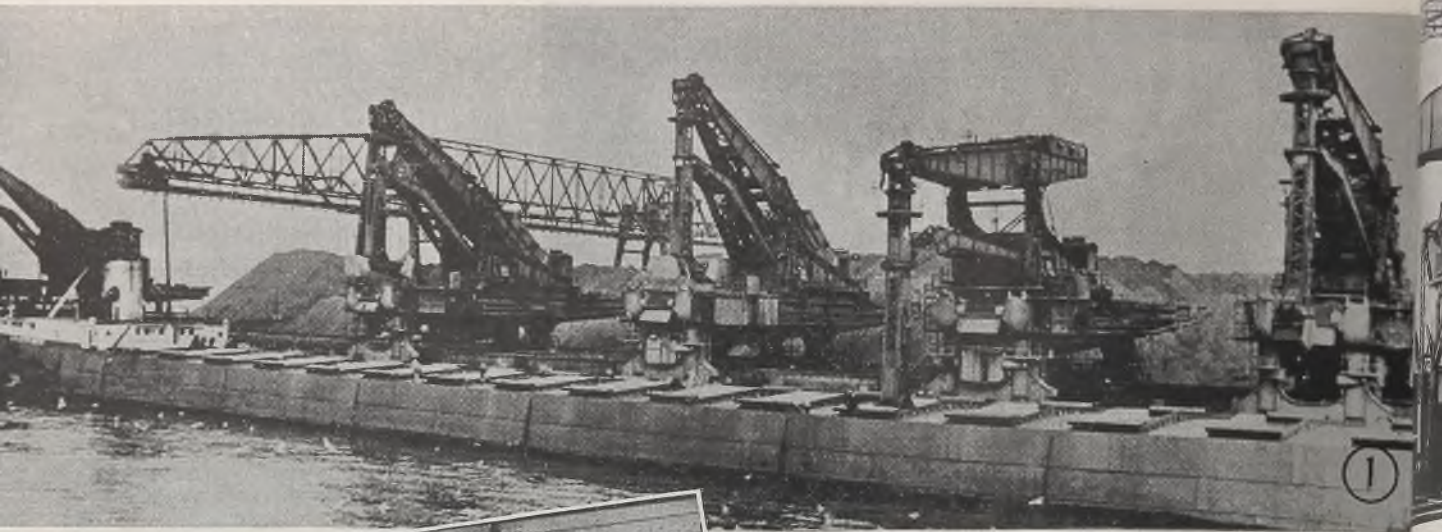
A mechanical elevator is provided for aspirator bottle containing slightly acid water. By lowering and raising the bottle, full control of gas flow from burette to absorption vessel is obtained. The aspirator bottle will remain in any position in which it is placed, reducing fatigue of the operator.

The absorption vessel is of U-tube design with a hollow stem valve located to automatically control gas bubbling during the absorption cycle and to allow the potassium hydroxide liquid to quickly seek its atmospheric pressure level. A capillary tube with a line marker is at the atmospheric liquid level. This provides a positive means of having gas pressure in the determinator at atmospheric pressure at the end of the combustion period and at the time the carbon percentage reading is taken. Doubtful eye-leveling procedure is eliminated.

The 5-way stopcock is equipped with two atmospheric vents so located that the burettes and absorption vessel are automatically subjected to atmospheric pressure at proper times by the operator merely turning the stopcock through normal operating range.

A simple rapid calculator is provided so that the burette reading may be quickly corrected for temperature and barometric pressure.

An adjustable metal engraved carbon percentage scale working with a precision bore burette, the No. 3001 2-minute carbon determinator, is available with sliding transparent marker to facilitate accurate reading of meniscus in burette stem and of the metal scale.



Ore and Coal

ON THE

IRON ore deposits of the Mesabi range, Minnesota, have played the greatest part in the industrial development of the United States of all the many and varied natural resources found in our country. Through remarkable coincidence, this vast deposit is situated at the head of the greatest inland waterway in the world, making its transportation cost exceedingly low.

Steel is America's outstanding industrial romance; our northwest ore deposits have made this possible; our Great Lakes waterway is the artery which brings the ore to the highly developed steel mills of the midwest.

Discovery of ore in the Lake Superior district dates back to 1844, but shipment of ore down the Lakes started in 1852. The locks at Sault Ste. Marie had not yet been built and shipments in those early years were small. Early cargoes of ore were loaded in barrels since the ships had to be unloaded and the ore hauled around the rapids by horse and reloaded into ships below the rapids. Opening of the Sault locks in 1855 made possible the uninterrupted shipment of ore and marked the real beginning of its water transportation.

Fig. 3—Weighing larry discharging ore from Hulett unloader into hopper car

Fig. 4—Two Hulett bucket legs cleaning up ore in hold of modern boat

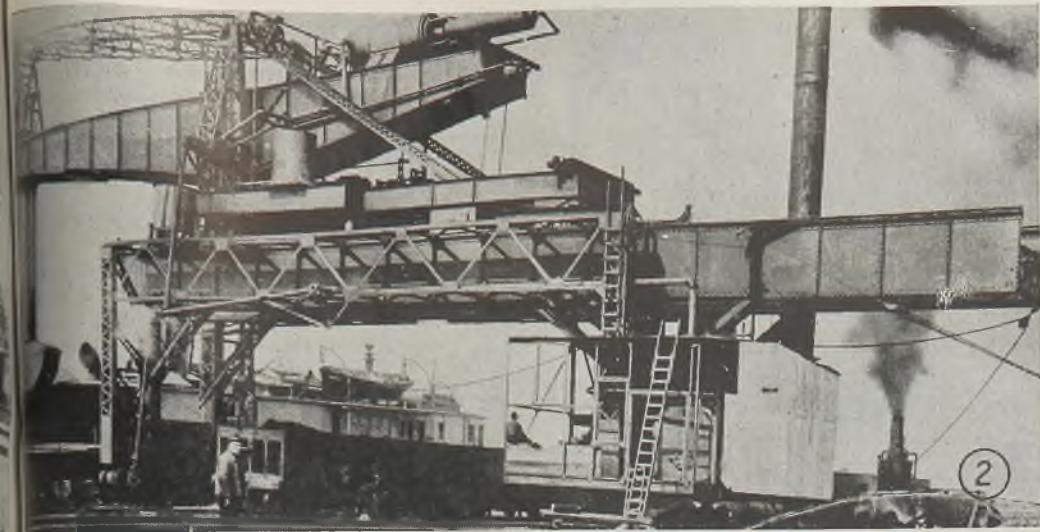


Fig. 1—World's fastest unloading dock—the Pittsburgh & Conneaut Dock Co., Conneaut, O.

Fig. 2—Original 10-ton Hulett ore unloader placed in service in 1900. Steam-hydraulic operation

Handling TOWER GREAT LAKES

By A. E. GIBSON*
President
Wellman Engineering Co.
Cleveland

For a period of 11 years following 1855, no mechanical equipment was used in unloading boats. Staging was built in the hold of the ship, the ore was shoveled onto it and again from the staging to the deck, where it was reshoveled into wheelbarrows and wheeled onto the dock. Ore cargoes then ran about 300 tons and required approximately four days to unload. In contrast, today one Hulett unloader can handle that tonnage in something like 15 to 20 minutes.

Tubs Are Employed

The next step in development of unloading was the use of horses hauling a manila rope reaved to the ship's rigging and attached to a tub of ore still shoveled by hand. The ore was wheeled in barrows as usual after being hoisted out of the ship.

In 1867 the first application of mechanical power to unloading resulted from the ingenuity of Robert Wallace who designed and built a 6 x 12-inch steam engine geared to winding drums. This was a portable rig which could be moved along the dock. The application of power to hoisting permitted the handling of three tubs of ore at one time and cut the unloading time to one day. This method was in general use until 1880. It is estimated that the cost of unloading was 40 to 50 cents per ton.

The next development was the installation of cableways, bridges and re-

volving derricks—the latter known as whirlies with which self-dumping buckets were used for dumping ore into cars or on stock piles.

Cleveland being a steel center and having a navigable river and safe anchorage within a breakwall, was naturally a terminus for ore. It was also the home of several companies of unusual ability in the design and fabrication of bulk handling machinery. One of these was the Brown Hoisting Co. founded by Alex. E. Brown, whose engineering ability and development made the term "Brown Hoist" internationally known wherever bulk materials are handled.

In 1880 Brown interested himself in the promising ore industry, or at least in that part of it having to do with the unloading of ships. His company installed three mechanical ore unloaders on the N.Y.P. & O. docks in Cleveland, and these delivered ore from the hold of the ship to cars or stock piles without rehandling.

These rigs consisted of two towers, one at the rear of the stock pile, the other on the dock, with a cableway stretched between them. A hinged boom attached to the front tower could be lowered, thus carrying the cable over the boat. A trolley from which a bucket or tub was suspended traveled on the

cable. A 12 x 24-inch steam engine coupled to three clutched drums furnished the motive power for each of the three rigs. The cableway was 383 feet long, 75 feet high at the rear and 61 feet at the dock. The height of the operating cable at the dock was 28 feet.

This mechanism, by permitting the carrying of the ore tub out of the ship for loading into cars or onto the stock pile without rehandling, naturally reduced the unloading time of the boat materially.

Develops New Type Rig

Shortly after Brown's first venture, Robert Aspin built for the Illinois Steel Co. rigs known as the Champion hoists. These consisted of a stationary tower supporting a shear leg, which could be raised and lowered to permit a tub of ore to be hoisted from the hold of a ship and brought to the dock so the ore could be dumped into wheelbarrows or tram-cars. In later rigs the ore was dumped into a hopper with gates from which it dropped into cars. Unloading with this type of equipment was so efficient that it was not replaced until 1906, at which time new and modern unloading machinery was installed.

Two years after Mr. Aspin's unloading venture at Chicago, another Cleveland enterer entered the field, John McMyler applied the revolving derrick or "whirley", as it was commonly called, to the unloading of ships. They were a clattering collection of reversing steam en-

*This article by Mr. Gibson was originally prepared as an address for presentation before the American Society of Civil Engineers in Cleveland in July, 1944. The meeting was canceled at the request of ODT.



Fig. 5—(A) 15-ton ore bucket which when heaped picks up 23 tons. (B) 8-ton coal bucket. (C) 15-ton Hoover & Mason type ore bucket which picks up over 20 tons of ore. (D) Ten-ton ore bucket of Wellman type of welded low-alloy steels

unloading from an entirely new standpoint. His machine consisted of a self-propelled gantry spanning the tracks along the docks, on which was mounted a trolley traveling at right angles to the ship. A walking beam was pivoted at the top and forward end of the trolley. At the water end of the beam, a bucket leg was suspended; it extended above the walking beam and to the top of the leg and to the top of the trolley, a stiffening member was attached. In raising and lowering the bucket leg, a parallelogram formed by the walking beam and leg brace kept the leg in a vertical position. A hopper or larry supported by the main gantry received the ore for loading into cars.

Design Survives Time Test

Hulett's invention was revolutionary and it seems remarkable that he persuaded any one to buy the first machine. However, the first automatic stiff leg unloader was purchased by the Pittsburgh & Conneaut Dock Co. in 1898 and erected at their dock at Conneaut Harbor, O. It was tested in 1899 and placed in regular service in 1900.

So sound was the engineering of Hulett's invention that it has stood the test of time for a period of 45 years. The functioning of these machines has not changed over the years. Motive power was changed from steam-hydraulic to electric; details were re-designed, increases in speed and capacity have naturally resulted, but in all the years since its conception, no ore unloading mechanism has challenged its efficient

gines, clutches, and drums. However, they were fast, and in the hands of an experienced engineer the operating cycle ceased only for the few seconds when the hook was shifted from an empty to a loaded tub in the hold of the ship. A good operator dumped the bucket into the waiting gondola or hopper car "on the run". Even today, where small tonnages are handled, the whirley has survived competition. They were the early vintage of the revolving crane often encountered in industry.

In 1888-89 ore unloading equipment was revolutionized by two developments. One was the introduction of bridge-type unloaders equipped with clam-shell buckets. Previous to this date the ore was still shoveled by hand. Early clam shell buckets were of small capacity, 1½ tons. They were the first mechanization of the industry which eliminated the hard labor of hand shoveling. Clam shell bucket handling of ore has continued in use since its innovation and capacities of buckets have increased from the original 1 ton to over 23 tons.

The other development coincident with clam shell bucket unloading resulted from the invention of the stiff

leg unloader by G. H. Hulett, then associated with Webster Camp & Lane Co., Akron, O., (later a division of the Wellman-Seaver-Morgan Co., and now known as the Wellman Engineering Co., Cleveland.)

Hulett was an inventor of outstanding merit. Ignoring all that had gone before, he attacked the problem of ship

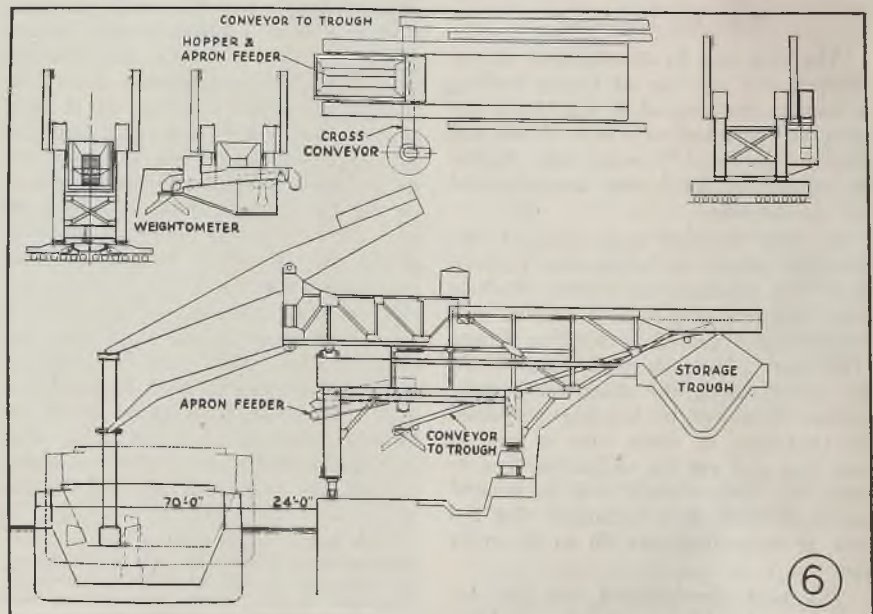
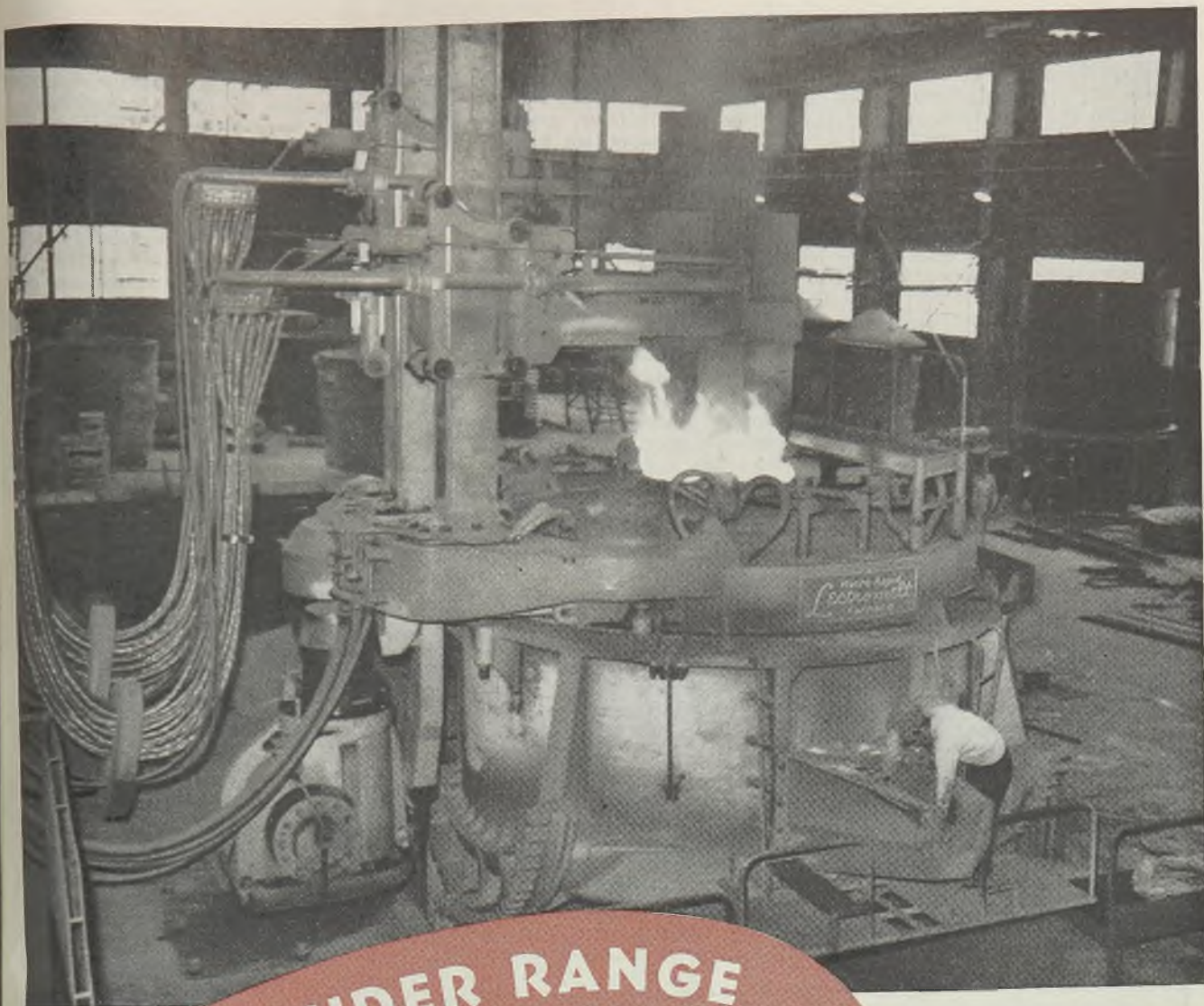


Fig. 6—Layout of 20-gross ton Hulett ore unloader for installation at Lorain, O. Note 24-foot span between dock and ship



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The wide range of operations possible with Lectromelt furnaces is an important consideration in the melting of quality steels and irons. With the Lectromelt, all the products that can be made in cupola, open hearth, Bessemer or crucible types of melting furnaces can be made under better control and of superior quality.

This flexibility is but one of the advantages of the Lectromelt furnaces which can be operated on either cold scrap or hot metal charges. Greater production per-man-hour, maximum refractory life and lowered electrode costs as well as the ability to pour large

and small heats are other features of Lectromelt's top-charge swing-aside-roof furnaces.

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and low-cost unloading of large tonnages of ore.

Since the installation of the first machine at Conneaut in 1899, a total of about 66 Hulett's have been built. The capacities of these machines have varied from 8, 10, 15, 17 to 20 tons of ore. One machine has a capacity of 8 tons of coal, another of 20 cubic yards of garbage and rubbish. Of these, there are in operation today a total of approximately 40 machines 30 years or more old, and eight over 25 years old. This service life is the result of sound engineering and efficient operation at the docks. Large tonnages of coal and limestone are unloaded with Hulett's at steel plants, and in the past, cargoes of pig iron have also been unloaded.

Acknowledgment is made of the contributions of the leading manufacturers of electrical equipment and particularly to the Cutler-Hammer Co., whose electrical control has been continuously improved and which has played so important a part in the success of Hulett operation. Some of the machines over 30 years old have their original controls. Naturally, many contactors and other parts have been replaced, but the original equipment is in the main still in use.

During the past two years improvements in Hulett's have resulted from the cooperation of dock managements and engineers. The benefit of their experience and cooperation was of great value in the re-engineering of new 17-ton Hulett's for Chicago and Cleveland and in the complete new engineering of 20-ton machines for Gary, Ind., and Lorain, O. The use of hardened tooth

gears, alloy steels, antifriction and swivel bearings, low-alloy steel in highly stressed structural members, increased motor capacity and larger bucket scoops in the new machines, promise not only increased capacity, but longer life with minimum repairs.

Machines Are Unique

The new machines now being fabricated for installation this winter at the Lorain plant of the National Tube Co., are unique. This plant is located on a curve of the river and the dock is semi-circular with a radius varying from 1259 to 1400 feet. The original unloading plant consisted of four Hulett's of 10-ton capacity. These have been in continuous operation since 1906, or 38 years. The front sills and trucks travel on a circular track of varying radius 5 feet larger than the dock. The rear sills and trucks operate on a concentric track giving a span of 57 feet. The rear tracks are elevated 8 feet 8 inches above the front trucks. Naturally, when the unloaders move from hatch to hatch on a circular track, their centerline can only coincide with one hatch of the boat. At all other hatches, it is necessary to swivel the unloader to line up with the hatch. This is accomplished in a unique, and we believe, in a previously untried way on so large and heavy a structure.

Rear sills are pivoted to the rear tower, the front sills and tower are connected through a large crank. To align the unloader at right angles to the ship, the front of the machine is swiveled on the crank. Instead of the conventional larry used to load ore into cars

or into the receiving trough at the rear of the unloader, the ore is carried from the receiving hopper at the front of the machine, on a cross conveyor operating in both directions. This conveyor can be swiveled to load the ore into cars on either of two tracks; when reversed in direction it will load the ore onto a flight conveyor, which carries it to the rear of the machine where it is dropped into the trough. The ore then is rehandled by a bridge onto the stock pile.

The new 20-ton Hulett's at Gary and for Lorain were designed not only for the recently built 67-foot beam ore boats, but to unload future boats of 70-foot beam. When one of the new boats is docked at Lorain, there will be a span of 24 feet of water between the dock and the center of the ship. To span this distance and reach the outboard side of the ship, it was necessary to increase the walking beam reach from the normal 54 feet to 64 feet. The maximum reach of the bucket beyond the dock is 67 feet. The longer beam and leg brace greatly increased the weight, which is reflected in high wheel loads. This was taken care of by increasing the number of main travel trucks and by using double rails of wide face on the girders and double tread, universally equalized trucks on the trolley.

The question of why the latest design increased the rated capacity of the scoops only from 17 to 20 tons, or 17 per cent plus, may arise. Two conditions were responsible. First, there are in operation today many ore ships of old design, moderate tonnage and with narrow hatches. These boats will be in service for many years. Some of them have 8-foot hatches which limit the width of bucket scoops. There is a more or less definite relationship between width and depth of scoop, therefore the capacity of buckets is limited by the width of ship hatch. Second, most new machines are placed on existing docks, many of which are of considerable age and limited carrying capacity. Wheel loads are thus limited and the number of traveling wheels and trucks supporting an unloader are governed by the center to center distance of hatches. However, the increase of 3 tons rated capacity of bucket does not tell the whole story. Decreased operating cycle with larger capacity motors and higher speeds, shorter travel obtained by moving the receiving hopper forward and lower, fewer delays from breakdowns as a result of using better materials both mechanically and electrically will, we are sure, materially increase the overall average capacity per hour. Then, too, the increased reach of the new machines reduced the clean-up time.

The peak year of ore shipments was 1942. A total of 92,076,781 tons was brought down the lakes. In 1943, due to the lateness of the season's opening and bad weather at the end of the year 84,404,852 tons were hauled.

(Concluded in next week's issue)



CRADLE CAN'T ROCK: Cradles holding steel rounds are used by Westinghouse to accommodate bar stock of medium size and keep it in a neat stack which can be moved quickly to another location whenever necessary. Cradles are made of 1½-inch square steel bars with flanges welded on the inside to prevent rods from rolling and on the outside to hold cradle in a vertical position



ARC WELDING HIGHLIGHTS

It has always been the policy of the Metal & Thermit Corporation to pay special attention to the development of electrodes for welding special steels. Murex Carbon Moly. 50, Molex and Type M, for example, are outstanding in their performance for welding carbon-molybdenum steel plate, castings, high pressure, high temperature piping and pressure vessels. Murex R.C. and C.F., for the repair and welding of air-hardening steel castings are among the electrodes developed to meet the needs of war production.

As the electrode requirements of fabricators change with the advent of industrial conversion, suitable Murex Electrodes will be available.



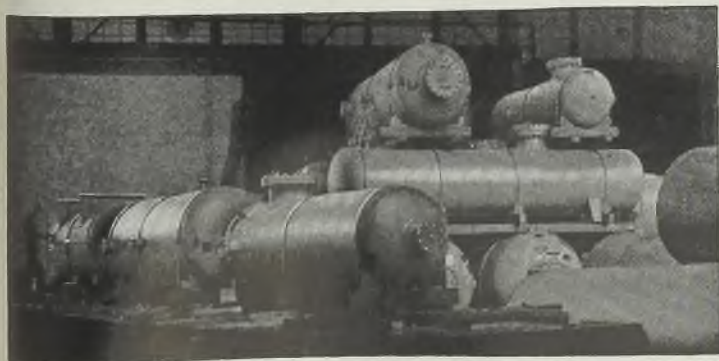
PROVIDING HEAT AND FRESH AIR FOR OUR COMBAT VESSELS, these heating units, produced by McQuay, Inc. of Minneapolis, must be rugged to withstand gunfire shock and near miss bomb concussion. To combine sturdy construction with light weight, welded construction using Murex Electrodes was adopted for the heater casings.



HUGE TURBINES FABRICATED WITH MUREX ELECTRODES by S. Morgan Smith Company, world's largest exclusive turbine builder. The illustration shows welding of a three-way branch inlet of a Vertical Impulse Turbine. Advantages of arc welding are: elimination of possible defects of complicated castings; less metal used; figuring of exact weights possible, thus enabling manufacturer to keep within estimates. Down-hand Murex Electrodes are used.



THIS 7½-TON STEEL CYLINDER on an 800-ton hydraulic press developed a crack 20 inches long and after preparation for welding 3 inches wide, and from 4½ to 6½ inches deep. Preheated 9 hours at about 700° F., this temperature was maintained during 17 hours of continuous welding with Murex Type F ¼ inch rods. The Detroit & Cincinnati Welding Company report that cylinder wall distortion was only about .0015" and that the flange moved only .004".



PRESSURE TANKS FOR HIGH OCTANE GAS, produced in quantity by The Bigelow Company of New Haven, Connecticut, are welded with low alloy Murex Electrodes to withstand pressures of from 100 to 600 pounds.

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New Accuracy and Perfection of Finish Achieved by

Liquid Honing

Peening effect of abrasive emulsion also improves physical properties and fatigue life of metal parts. Increases of 200 per cent in tool life achieved

LIQUID honing, the direction of a high-pressure stream of fine abrasive mixed with a chemical emulsion against parts to be deburred, finished, or polished, has indicated that it may be a valuable adjunct to other surface treatments in the results of experimental work and several applications to actual plant production.

The abrasive and emulsion mixture is discharged from a conventional sandblast nozzle by compressed air at a velocity of 3200 feet per second, equivalent to 10 or 15 pounds of material per minute. It has been tested on rough-machined, ground, and rough-polished parts, including supercharger, impellers, articulating rods, bearing races, guide vanes, connecting rod bolts, gears, splines, gyroscope, and other aircraft engine and instrument parts.

Early experimental machines, first built about 6 years ago, were designed for cleaning structural plate. A rust inhibiting chemical was added to deter oxidation. Unusual results with particles of finer mesh than silica sand led to experimental work with cereals and rice husks, and eventually resulted in the concept of liquid honing. Primary tests with 100, 200, and 400 mesh fine abrasives finally resulted in the adoption of novaculite rock ranging from 100 to 2500 mesh as the abrasive. Commercially, the process is known as vapor blasting, and standard units were marketed by Vapor Blast Mfg. Co., Milwaukee, in 1940.

A cabinet to house pumps, nozzles, and accessory equipment was developed as a means of using several abrasive types, with preliminary treatment of coarse mesh material and finishing with finer grades. Present cabinet design is flexible and suited for adaptation to automatic conveyors, with turntables, fixtures, and belts. Provision is made for tumbling

baskets, and for other equipment.

Units have finished to tolerances of 0.0001-inch by proper balancing of abrasives, air pressure, nozzle size, and distance from nozzle. A 2-stage machine and two or more abrasives may be required for very deep grinding or machining marks. A ground or cut gear with sharp edges and tolerances of less than 0.0001-inch may be shielded with a metal protector, and tooth edges treated with a coarse liquid blast. The shield then is removed and the entire part finished with 1200-mesh abrasive.

The angle at which the stream of liquid strikes the part is important. The closer this approaches normal direction, or a 90 degree cutting angle, the poorer the cutting action. For polishing parts with tolerances of 0.0001 to 0.0002-inch, the recommended abrasive mix is 50 pounds of dry abrasive and 50 pounds of water. The proportion of abrasive is reduced for finer tolerances.

Liquid abrasive treatment provides some peening effect, similar to that of shot blasting, improving physical properties and fatigue life. A number of test bars treated by this method showed a 5 to 10 per cent increase in tensile strength over others hand polished.

Partial deburrment of fluid coupling impellers and runners on the Pratt and Whitney aircraft engine at Nash-Kelvinator Corp. is accomplished in 8 minutes by this method, one-fifth of the time required by hand treatment. Abrasive is 40-60 mesh novaculite, suspended in water. Other parts not adaptable to barrel tumbling (with stones and soap powder) or sand blasting are finished by liquid honing.

A number of parts for the Allison aircraft engine produced by Cadillac also are finished by this method, including

rough machined, ground, and rough polished connecting rods, supercharger impeller entrance guide vanes, a 10-inch flange or disk on a large gear, pinion gears, and connecting rod bolts. In one experiment, plant engineers treated thin steel test strips on one side by the vapor blast process, using 80-mesh abrasive for 1 minute and 2 minutes, respectively. Each strip showed curvature, indicating some peening effect. To determine how much metal was removed by this method, a test strip was submitted to direct (90 degree) impingement of the abrasive stream for 10 minutes. Thinning was only 0.00015-inch. A more pronounced cutting action probably would have resulted from a greater angle of impingement.

Liquid abrasive finishing of cutting tools and broaches has provided increases in tool life up to 200 per cent. This is especially true with certain small reamers. Average improvement is approximately 75 per cent. It is believed that polishing action of the abrasive removes microscopic metal "fuzz" from the cutting edge, improving tool cooling and reducing friction between tool and metal being cut.

An adaptation of this process now being studied is the cleaning of aluminum and magnesium castings after removal from sand molds. High-pressure water blasting of castings to clean out cores and moldings is not new, but the use of abrasive in the liquid may have beneficial effects.

Wheel Dressers Set With Diamonds

Wheel dressers made with small commercial diamonds set into a matrix of cemented carbide provide a considerable saving in time and money at a large aircraft engine plant in Detroit. They are used to true-up recesses in finish grinding wheels which grind the outside diameter on aircraft cylinder sleeves.

The recessing operation, facilitating cutting of a short corner at the bottom of a cylinder sleeve flange by the grinding wheel, is performed by single diamond dresser. The holder is ground flat and the diamond lapped permitting an accurate dishing out operation. The holder does not touch recess edges when swinging through an arc.

The Carboloy diamond-impregnated dresser contains diamond particles distributed throughout the matrix, which is said to insure that at least one or more stones is in contact with the grinding wheel at all times as the holder is swung through a small arc. New cutting faces are presented to the abrasive wheel as each diamond layer is reached and exposed, due to gradual wearing away of the carbide matrix. No lapping or re-mounting is needed.

Reports from the grinding department at this plant are said to indicate that these dressers lower wheel dressing cost on the average job and stand abuse ruining a single diamond dresser.