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JUNE 12, 1944

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Unfinished Business

Nothing that has happened in many centuries can match in importance the invasion of the Normandy coast by Allied forces last Tuesday morning. It is important, not primarily because it is the greatest military offensive ever undertaken, but because its objective concerns the well-being of a great majority of the people of the world.

It is particularly important to the people of the United States. Millions of our finest young men are or will be engaged in this enterprise. Much of the material and equipment which made this great undertaking possible is the product of our skills, our resources and our labor. On the speed with which our effort to liberate the enslaved masses of Europe progresses depends the timing of our gradual shift from the business of war to the business of peace. On the final outcome, which must be the unconditional surrender of our enemies everywhere, lies our hope for the future of our boys and girls and their children and for the preservation in this nation of a mode of life characterized by freedom of opportunity.

With so much at stake, none of us can look at the activities on the Cherbourg peninsula or in the other theaters of war lightly. Presumably we have done our best to insure the success of our great plan. Since Pearl Harbor we have produced 220,-000,000 tons of steel, constructed 35,000,000 deadweight tons of merchant shipping, enlarged our navy to the most powerful fleet ever commanded by any nation, turned out 180,000 airplanes and manufactured guns, tanks, ammunition and other items in unprecedented volume.

In doing all of this, we made possible this attempt to wipe gangsterism from the face of the world. Now we must stand by to do whatever becomes necessary to finish the job as quickly as possible. Our plants may receive emergency calls for spurts in the production of this or that necessity. At the same time we may be told that we have enough of most war items. It is more than likely that in general, we have passed the peak of production for war.

But we must be ready for anything. While we remain alert to war needs, we should be eager to tackle every other bit of unfinished business.

Today marks the beginning of the fifth war bond drive. It is one piece of unfinished business to which all of us can respond whole-heartedly.

Buy liberation bonds!

LADEN WITH DYNAMITE: Every thoughtful American should ponder the points made by Thomas F. Patton, counsel for Republic Steel Corp. against maintenance of membership and the checkoff in the steel wage case.

Mr. Patton showed that a majority of WLB declared for union maintenance and the checkoff on the ground that "the maintenance of a stable union membership makes for the maintenance of responsible union leadership and responsible union discipline, makes for keeping faithfully the terms of the contract and provides a stable basis for unionmanagement co-operation. . . ."

77661 June 12, 1944

This defense is similar to that of some advocates of unlimited license to unions who say in effect "give the unions everything so that they can acquire experience and responsibility."

Mr. Patton cites the strike record to show that

maintenance of membership and the checkoff have not induced responsibility or discipline. In fact, the no-strike pledge, given in exchange for promises of union security, has been broken repeatedly.

Maintenance of membership and the checkoff also create a dangerous political situation in that huge sums can be devoted to the interests of one party without due regard to the wishes of individual union members.

The security clause and the checkoff are loaded with dynamite. -p. 68

TALK WHEN HE QUITS: Some employers have always maintained that it is good policy to have the employe who is quitting depart with a smile, if possible. Such employers will be interested in the suggestion of ODT that "exit interviews", if conducted intelligently, will reduce labor turnover.

"Exit interview" is the bureaucratic term for a heart-to-heart talk between employer and employe after the latter has said he wants to quit. ODT claims that if the boss or his representative will talk frankly to the quitting employe, he will accomplish several things:

He will clear the air of misunderstanding and in some cases this may cause the employe to decide to stay. He will learn much about the attitude of men in the shop, which should be helpful in reducing labor turnover in the future. In short, he will give information and receive information and in the process induce friendly relations.

Talking frankly to the man who wants to quit is well worth while. —p. 77

WHY DECENTRALIZE? So much has been said recently about decentralization of industry that it is well to keep in mind the distinction between decentralization which is prompted by motives of local pride and politics and that which is based upon sound economics.

Alert industrial and civic organizations of Southern California have figured that in 1939 the people of 11 western states consumed 15 per cent of the national output of electrical appliances while only 2 per cent of this output was produced in these states. They point to this unbalanced condition as a good argument for the growth of the manufacture of electrical appliances in the Far West.

This is much more logical than the reasoning of some political advocates of decentralization who ask for new industries solely because their constituent areas have none at present. -p. 87 **REPAIR IN THE FIELD:** Action in almost every combat area in this war has accentuated the importance of air supremacy. This in turn has focused attention upon the necessity of maintaining suitable landing fields. The American bulldozer for leveling the terrain and steel mats for providing a smooth surface have played a major role in our air successes to date.

But what happens to one of these fields when the enemy drops bombs upon it? Obviously the steel "planks" of the matting are bent and distorted. How do we deal with this situation?

The army foresaw this emergency. It has portable reconditioning plants which can handle battledamaged steel landing planks at the rate of 85 per hour. Badly twisted planks are hammered back into rough shape, brush-cleaned by machine, finish straightened in a powerful press, thoroughly cleaned, dipped in paint, baked at 350 degrees Fahr., and bundled for shipment.

All of this is done in the field, far from the shops where the mats were manufactured originally.

—p. 123

BLACK LIGHT AT WORK: A Cleveland manufacturer is employing "black" light to inspect bearings for aircraft engines. Engineers who have been working with this method believe that it extends the sensitivity of the inspectors' range of examination about 25 times over that previously obtainable.

First the bearings are thoroughly cleaned and heated to open up the pores. Then they are immersed in a treated oil which seeps into any pores or cracks that may be present. The bearings are cooled, sealing the oil in these defects if they exist. All surface oil is carefully removed and the work heated slightly to drive to the surface oil that had been entrapped in cracks. At this stage the bearings are examined under "black" light (in the nearultraviolet band of 3650 angstroms). If defects are present, they are revealed clearly by the brilliant glow of the yellowish green light of the fluorescent oil.



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The section marked in chalk, measuring 8" wide and 14" deep, was descaled in 2 seconds with an Airco descaling torch. Note the scale-free surface, the absence chisel dents and the scale which has been removed, lying in the troughs at the side and the

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Hot weather will decrease the efficiency of steelworkers, many of whom now are working from 60 to 100 hours a week

WHAT will be the pattern of steel production and metalworking activity in the immediate months ahead? How will it be affected by the invasion of Fortress Europe? What will be labor's reaction? These were pertinent industrial home front questions last week as Allied troops stormed the beaches of France. While admitting that much depends on the progress of the invasion, many observers believed the start of the big push heralded the beginning of the end of America's wartime way of economic life. At the same time, it is believed that special strains may develop on the home front, for a limited period, as the attack progresses, and that these extra demands will be met with patriotic fervor. But there also is the belief that the peak in overall demand for war materiel was reached with the European invasion. Tactical shifts in demand will, of course, continue. It is possible the slight losses n landing craft and the ease with which first landings were made may cause a cutback in the landing craft program. On the other hand, stiff resistance as the drive is pushed inland may increase demands for artillery and other land fighting equipment.

Present outlook is for a decrease in steel production. Not only are the demands for direct war uses likely to decrease, but producers believe it will be physically impossible to maintain present rates, due to declining manpower, hot weather and necessity for more repairs to equipment.

Members of the Iron and Steel Industry Advisory Committee, meeting with

Arms Orders To Be Geared To Progress Of Allied Drive

Steel producers expect output to drop during summer months due to dwindling manpower, hot weather and necessity for more frequent repairs. Military developments may cause shifts in materiel requirements

War Production Board officials, recently asserted that neither the labor nor equipment in the industry can much longer stand the present grueling pace.

Concerned Over Manpower Prospects

Serious concern was expressed over future manpower prospects. Further whittling away of the labor forces, industry representatives said, would inevitably have an adverse effect on the rate of production, already 5 per cent below that for the first quarter. Furthermore, they said the hot summer weather will seriously affect output by the present force and that unless some relief is granted it will be difficult, if not impossible, to meet all demands of the military services, plus essential civilian requirements. One producer reported more than 3000 sixteen-hour turns worked in one week, an obvious impossibility over an extended period during hot weather.

Most acute labor shortage at present is among unskilled workers in the open hearth, blast furnace and coke departments, and to a lesser extent in the blooming mills and heat treating departments. In recent months many men in these jobs have been averaging 60 hours a week or more. The workers generally are older than those normally employed.

Indicative of the shortage is the statement by Buffalo producers they need 2500 more workers. Frank C. Farrell, Republic Steel Corp.'s Buffalo manager, says many workers are putting in 100 hours a week and fears operations may drop to as much as 25 per cent below capacity during the hot months. Edward F. Entwisle, superintendent of Bethlehem Steel Co.'s Lackawanna plant, says his working force has been shrinking steadily for months and predicts a 10 per cent decrease in production.

In Cleveland, Otis Works of Jones & Laughlin Steel Corp. reported 600 fewer



workers now than a year ago; American Steel & Wire¹ Co. has lost 550; and Republic Steel's Corrigan McKinney plant has 500 fewer.

In the East, steel producers, in an effort to forestall the summer decline as much as possible, have launched intensive recruiting campaigns through newspaper advertisements. Sentiment on maintaining production varies, but many are pessimistic with some forecasting declines of up to 10 per cent.

The present Selective Service policy of inducting only those workers under 26 years of age is alleviating the draft drain somewhat, although the steel industry already has lost 32 per cent of its labor force to the military services, as compared with 27 per cent for industry generally.

The situation has changed considerably from the summer of 1943 when steel production continued to climb throughout each quarter up to the fourth, when it was cut down by a year-end strike. The manpower shortage is now much more acute and machinery and equipment has had another year of intensive wear.

Repair and reconditioning of equipment now requires a longer time and such repair is more often necessary. Recently an eastern plate mill was forced to susrend operations for a week while new motors were installed.

In many districts, maintenance gangs have been drawn into production crews, with the result that repair work suffered. One midwestern mill with 14 open hearths normally averages 13 in operation. Due to slowness in repair work, however, it now is able to operate only 10 or 11.

Lack of manpower to repair open hearths speedily enough to maintain practical capacity operations is illustrated by the experience of Republic Steel's Corrigan McKinney plant. Ingot outSteel mill equipment, which has been pushed to capacity since the beginning of the war, is increasingly showing the strain of maintained production. Repairs and reconditioning of blast furnaces, such as that at left above, and open hearths, right, will be necessary on a large scale during the coming months

put at this works totaled 160,000 tons in April, dropped to 139,500 tons in May, and a further decline to 135,000 tons is indicated for June. This decline has brought about a reduction in slab stocks at the company's continuous strip mill—now producing plates—from 6000 tons on March 1 to slightly less than 1000 tons at present. Ingots have been shipped in from the company's plants at Buffalo and Youngstown, O., to supply raw steel for the continuous strip and sheet mill.

Outside Contractors Employed

For the first time in history, a number of works are hiring outside contractors to assist in repairing open hearths and in other maintenance work.

Republic Steel's No. 3 blast furnace at Cleveland, recently blown out for extensive relining, will be out of service for two months, due largely to the shortage of maintenance and repair workers.

In the face of the difficulties imposed by the shortage of operating and maintenance workers, however, some mills still are marking up new production records. Among the most recent of these is Inland Steel Co.'s feat in producing 322,990 tons of ingots in May, establishing a new record by a small margin. Weirton Steel Co. established new records in its strip steel mill and in mill by producing 129,374 tons of hot-rolled flat-rolled steel and 94,037 tons of cold-rolled flat-rolled steel. Records also were made in the 10-inch hot mill, in the strip steel pickling department, and in the cleaning skin rolling, cutting and finishing departments of the tin mill. These records were

made possible, it was said, because "not meders a single minute of production time has been lost in any of the Weirton mills^{dm} satemus since long before Pearl Harbor."

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Labor's reaction to the invasion news^{thes as to} was varied. Solemn pledge on the part must find of many employes and union leaders to^{dly} men." stay on the job and to redouble their jul." The efforts were mixed with strikes called on untinkable D-Day. At the Palmer coal mine of the H. C. Frick Coke Co. in Fayette coun-

ty, Pennsylvania, 600 miners walked Leader out despite the fact news of the inva-wt M. Lamsion had just been announced. Some State F remarked flippantly that they "were sumed going home to pray".

At Canton, O., nearly 1000 United an the str Steelworkers of America-CIO strikers de- i Mobile fied a War Labor Board order to return batter. T to their jobs at the Timken Roller Bear-a I ing Co.

At Cleveland, about 100 workers at and the Champion Machine & Forging Co. pape an chose the invasion day to strike in pro-tour pled test to a decision by the War Labor has Board.

At Worcester, Mass., approximately through D 3500 strikers returned to the South of an Works of American Steel & Wire Co. then appending June 5 after several days' idleness which the of CIO officials said was an unauthorized wire lost walkout. Production schedules were ally mater badly upset at a time when pressure for the wire for the war program was great.

At Providence, R. I., a strike at the and Brown & Sharpe Mfg. Co. interrupted mutant production briefly but soon was settled.

production briefly but soon was settled. At Cincinnati, between 12,000 and the last 15,000 workers at the Wright A cronautical Corp. ignored the plea to "help the invasion and soon his monkey business". The strike was caused by the transfer of seven negroes



from one department to another. At Birmingham, Ala., a number of coal mines were idle while uneasiness over coal stocks mounted. The southern stoppages brought stinging rebukes from union leaders which were—immediately—ineffective. Typical of the union leaders' statements: "We might as well ruin our organization by stopping these strikes as to have the strikes ruin it. We must find some way to punish the guilty men." "Strikers should be put in jail." The record is "deplorable and unthinkable and speaks for itself."

Labor Leader "Humiliated"

Robert M. Lanier, president of the Alabama State Federation of Labor, perhaps summed up the conscientious abor leaders' attitude: "I know what the man on the street is saying—in Sheffield, in Mobile, in Birmingham, in San Francisco. They are damning the strikers. I agree with them. I am humiliated beyond words. And to think that this great day should find some AFL people away from their jobs in spite of our pledge to the Chief Executive. It is inconceivable."

The strikes which started on or continued through D-Day received the attention of an outraged public which made them appear more important than the number of strikers involved or the man-hours lost would appear to justify. Actually most metalworking plants were free of stoppages and some were quickly ended when news of the invasion was announced.

Throughout the early part of the year, however, while final preparations for the invasion were being made, the strike picture has been a sorry mess.

Bureau of Labor Statistics figures for the first four months reveal idle mandays up 48 per cent as compared with the same period last year. Over the course of the war the figures for the first quarter of each year show:

	No. of New Strikes	Workers Involved	Man-days Lost
1042	. 571	154,343	1,089.639
1943	643	203,998	748,564
1944	1,021	340,000	1,510,000

In the face of this record, the future reactions of organized labor are doubtful. Some observers believe that if the invasion proceeds fairly smoothly and cutbacks in war materiel contracts appear imminent, the unions will intensify their efforts to gain wage concessions before the present labor shortage becomes a surplus.

Industrialists Worried Over Coal Supplies

PITTSBURGH Industrialists here are a little jittery over the coal and coke situation, and statistics show the uneasiness is warranted.

The coal supply right now is inadequate; stocks are declining; and the labor situation is not good.

Although the bituminous industry is producing at a record rate right now more than 12,000,000 tons per week current consumption is also at record levels. Figures for April, one of the lightest consuming months of the year, show a daily average consumption of 1.6 million tons, or a weekly rate of 11,200,000 tons. March figures showed consumption at a daily average of 1.75 million tons, or a weekly rate of almost 12,300,000, while production dropped consistently below 12 million tons a week.

This constant flirting of production with consumption means the industry has been unable to supply sufficient coal to allow consumers to build up coal reserves. That this has been the case is well illustrated by the comparison of days' supply held by various industries:

	Days'	Supply
	May 1,	May 1,
Industry	1943	1944
Electric Power Utilities	. 108	79
Byproduct Coke Ovens	. 39	22
Steel and Rolling Mills	. 37	26
Coal-gas Retorts	. 81	44
Cement Mills	. 50	56
Other Industrials	. 66	40
Railroads	. 37	27

These figures, compiled by the Bureau of Mines, show that in every case except that of cement mills, industries have been digging into their stocks over the past year without being able to replace the needed coal. In the case of cement mills, the apparent paradox is explained by the fact that business has declined to such an extent that only about half as much coal is needed as was required a year ago.

Present, Past and Pending

PLATE SHIPMENTS RISE TO 1,172,211 TONS IN MAY

WASHINGTON—Plate shipments for May totaled 1,172,211 tons compared with 1,141,-197 tons for May, 1943, according to the War Production Board.

AIRFRAME WEIGHT OUTPUT REACHES NEW PEAK

WASHINGTON—May aircraft output exceeded overall schedules by 2 per cent, with 8902 airplanes of all types rolling off the assembly lines, WPB states. While number of units produced is not a new record, airframe weight was at a new high, with a total of 104 million pounds.

DELIVERIES OF MERCHANT SHIPS MAINTAIN HIGH RATE

WASHINGTON—Merchant shipyards delivered 155 vessels of 1,537,915 deadweight tons in May, boosting the year's total to 719 ships of 7,247,557 tons, compared with 712 ships of 7,143,548 tons for the like 1943 period.

PREDICTS POSTWAR CAR WITH WINGS

DETROIT—Speaking at a meeting of the Society of Automotive Engineers here last week on the postwar car, William B. Stout, Research division, Consolidated Vultee Aircraft Corp., said the most startling postwar car will have wings.

WPB SEEKS TO LOCATE USED CRAWLER TRACTORS

CHICAGO—War Production Board is seeking to locate 4000 idle used crawler tractors to supplement the small number of new tractors available and needed for mining, lumbering, petroleum operations and food production.

PACKARD PUSHES PLANT REARRANGEMENT

DETROIT—Packard is pushing plant rearrangement for production of a limited quantity of service parts under terms of a recent \$975,000 facility project approved by WPB, permitting production of about 100 critical part classifications, including crankshafts, cylinder blocks, heads, valves, camshafts, connecting rods, rear axle shafts, steering knuckles and front end suspensions.

Planes and Ships, Guns and Tanien

Metalworking companies' outpouring of arms outstanding industrial achievement. Amount to \$175 billion in 2½ years

WHEN powerful Allied armed forces stormed across the English channel last week for the big push against Fortress Europe, they were backed by the greatest amount and most effective materiel in the world's history.

A tremendous amount of this materiel came from the metalworking plants of the United States, which truly have become the arsenal of democracy in the few years since the war's outbreak.

Take a look at what these American factories have produced since this country's entrance into the conflict.

United States mills have made more than 220,000,000 tons of steel.

American yards have constructed approximately 35,000,000 deadweight tons of merchant shipping. The American Navy has been built up into the most powerful in the world.

Aircraft factories have turned out 180,-000 planes, a feat that would have been considered preposterous in 1940.

Produce Invasion Vessels

Bridge builders and other metalworking plants have turned out thousands of invasion vessels, ranging from huge 400-foot tank landing craft, which cross the oceans under their own power, amphibious vessels, to compact 30-foot beaching craft.

Automobile, locomotive and other plants have turned out tanks by the thousands — tanks which have proved superior to the vaunted Nazi panzers.

Millions and millions of rounds of ammunition from 0.30-caliber carbine cartridges up to heavy artillery shells have been produced by a variety of metalworking companies.

Guns. from pistols and light carbines up to the heavy naval rifles, have been produced in quantity.

Special weapons and equipment, some of which still are military secrets, have flowed from plants all over the land.

Never before has the world witnessed such a vast outpouring of munitions. The achievement of American metalworking shops in providing the materials for the invasion is all the more remarkable because until we stood on the brink of war in 1940 few of these companies had had any experience in the production of munitions. In 2½ years they have produced more than \$175 billion worth.

Pictured on these pages is some of the equipment of which United States industry may be justly proud.



Aplenty Supplied by U.S. Factories



RECONVERSION

Invasion Holds Key to Shift From War Goods

Easing of restrictions on production of civilian items expected, should European phase of war go well. Plans fairly well advanced in some directions for resuming normal manufacturing

TO WHAT extent invasion of western Europe by the armed forces of the United Nations will delay or hurry along reconversion of industry to civilian goods production will remain a question to be answered only by the turn of battle on the beaches of Normandy.

In recent weeks the pressure for industry reconversion has been rising as cutbacks in war orders resulted in idle plants and spot unemployment. As a matter of fact, the production picture has been one of contradictions, acute labor shortages being experienced at some points, and layoffs at others. In at least one instance, that of the Brewster Aeronautical Corp., threatened plant shutdown because of a canceled Navy contract for airplanes resulted in a so-called "stay-in" strike and a demand in congressional quarters that something be done to provide work for plants made idle by shifting war demands.

As a general thing it is thought the invasion will do no more than temporarily hold up plans for reconverting industry to peacetime production, though, speaking in Detroit the day before the invasion, Donald M. Nelson, War Production Board chairman, declared industry's outlook on cutbacks and contract cancellations was entirely out of proportion to the facts; that arms output must exceed its current rate in order to attain next November's scheduled peak.

Admitting that military developments provide a "big element of uncertainty", Nelson said the probabilities indicate a considerable period of intensive war production ahead.

With the invasion an actuality, the "uncertainty" is heightened, if anything. Nevertheless, the feeling persists in informed quarters that industrial reconversion is closer than official Washington will admit. Various straws in the wind have clearly hinted in recent weeks that considerable progress already has been made for turning the wheels of industry back to production for peace. In virtually every industry planning for reconversion day is well advanced and in some lines the switchover simply awaits the signal from Washington.

Supply and demand for basic metal for all essential military and civilian programs are more nearly in balance than

at any time since Pearl Harbor, according to S. W. Anderson, program vice chairman, War Production Board. He warns, however, that in some metal mill products the balance is precarious, because of manpower losses and expanding military needs for certain items.

OCR Allotted More Carbon Steel

Mr. Anderson said the Office of Civilian Requirements had been allotted 240,000 tons of carbon steel in this quarter as against 217,000 tons for the second quarter. A substantial portion of this increase will go into such supplemental programs as in-plant feeding installations; cordwood saw blades for farmers' use; wire garment hangers (which will reduce the demand for critically scarce paperboard for this purpose); side rails as a substitute for lumber in bed frames; heavier cook stoves and a small amount (less than 1000 tons) for the production of steel wool.

While the War Manpower Commission on July 1 puts into effect new drastic regulations affecting the hiring of men with a view to easing labor shortages in critical war production areas nevertheless, it is known the WMC at the same time is preparing actively for the time when wholesale switchover from war to peace production will demand prompt action by the government if widespread unemployment is to be avoided.

Lawrence A. Appley, deputy chairman and executive director of WMC, is understood to be actively in charge of the commission's program for the reconversion period. He is seeking to develop a complete pattern for guiding workers back to peacetime jobs, and while his plans are still in the formative



LAWRENCE A. APPLEY Deputy chairman and executive director, WMC

stage he expects to have a report on the subject in the near future which will outline some of the anticipated problems and go into some detail on the plans for meeting them.

Recent events at the Brewster Aeronautical Corp. have already provided a "test tube" case of what lies before us in the days of conversion from war to peace, stated Sen. James E. Murray in an address last week. The Brewster case provides a solemn warning to those who think that war contracts can be terminated without adequate planning for other types of production, he said.

"I should like to point out a hearing before the Military Affairs Committee on May 30 revealed impending cutbacks throughout the entire aircraft program. These cutbacks may not occur in great volume for another year, and I would not want to give you the impression that the war production battle is over. But I am convinced that Congress must develop a full program for cutbacks in the aircraft industry and other war industries and for conversion to other forms of production," he said.

Despite the apparent sweeping character of the recent War Manpower Commission order under which hiring of all male workers outside of agriculture is to be placed under the control of the United States Employment Service by July 1, to enable a worker anywhere "to take his most useful place on the industrial firing line," it seems entirely unlikely that this order will be permitted to impede operations at small plants in any way.

The storm of protest that greeted taff memorandum No. 42 put out by the War Production Board in April aimed at helping the manpower situation by

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prohibiting companies in critical areas from accepting new contracts, has brought a situation which is highly favorable to small plants. The Field Program Instruction which was sent by the WPB to all Area Production Urgency Committees on May 31 appears to be quite acceptable to all interested parties.

The instruction defines small plants as those employing 50 or fewer wage earners on the West Coast and 100 or fewer wage earners elsewhere. It rules that such a small plant "is at liberty to take on any new contract which it can obtain under existing M and L orders provided that this new contract will not increase its employment." But the rule does not stop there. "If the new work will increase employment,' it goes on to say, "the case must be presented to the Area Production Urgency Committee for determination. This determination is subject to the usual appeals procedure of the WPB."

After explaining that the purpose is to assure the use of manpower in critical labor areas for essential war production programs, the Field Program Instruction of May 31 goes on to say: "Subsidiary to this policy is the additional objective of maintaining full production within an area, without injury to and in support of the essential war production programs.'

With certain minor exceptions, all authorizations of increased material which exceed 105 per cent of the first quarter of 1944, and which require increased employment will be submitted to the Area Production Urgency Committees on WPB-3647 for clearance, through the local WPB office, says the instruction.

Willys-Overland Elects Sorenson President

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Heralding the possible emergence of Willys-Overland Motors Co., Toledo, 0., as a front line producer of small, light, low-price automobiles for the volume market was the election late last week of Charles E. Sorenson, former vice president and production chief of Ford Motor Co., as president of Willys.

Mr. Sorenson has long been an ardent proponent of the low-price, light automobile, and since Willys appears committed to postwar production of such a vehicle, patterned after the Army jeep it is now building, the tieup is a natural.

Ward M. Canaday has been president and chairman of Willys, succeeding in the former post Joseph W. Frazer, onetime Chrysler executive who resigned from Willys eight months ago.

The Willys plants in Toledo are now devoted nearly fully to war work, but ample space is available for reconversion to mass production of small economytype passenger cars such as the Americar, built there before the war.

Observers have pointed out attractive stock offers would prove more interesting to Mr. Sorenson than a large salary.

Postwar Function Stressed

Senator Murray outlines legislative plan to deal with cutbacks and contract terminations at advertisers meeting in Atlantic City. Cites need for lower prices, greater volume of business

"YOUR organization is in a unique position to render vital assistance to our country in the coming months and years when the aid of men of vision and influence will be sorely needed," Sen. James E. Murray of Montana told members of the National Industrial Advertisers Association meeting in Atlantic City, June 5 and 6.

"The surest way to promote employment and increase profits for producers and distributors is by means of lower prices and greater volume of business," he said. "Men who are in a position to influence the thinking of leading business executives should give greater attention to this principle. Men of your profession are in a strategic position to help industry, the government and also protect consumers by standing guard over the ethical conduct of business.

"Above all, I hope that business will undertake to play a leading role on the side of those who want to promote free competition and not stifle it, who want new inventions exploited and not kept off the market, and who want to in-

(Please turn to Page 182)

POSTWAR PREVIEWS

RECONVERSION—Key to switchover from production of war goods to peacetime products is held by success of the European invasion. Feeling persists that reconversion is closer than official Washington will admit. WMC is seeking to develop a complete pattern for guiding workers back to peacetime jobs. See page 66.

INDUSTRIAL ADVERTISERS-Sen. James E. Murray tells the Naional Industrial Advertisers Association that congressional legislation should provide an overall agency to handle postwar problems, headed by a director with the responsibility of dealing with the whole problem of conversion from war to peace. See page 67.

STEEL WAGES War Labor Board panel told that severance pay for workers and similar issues are not industry problems but national postwar problems beyond the legal power of the emergency WLB to consider. See page 69.

HELICOPTER—Bell Aircraft Corp., Buffalo, is experimenting with an improved type of helicopter. Research work is being conducted for its expected military value but due consideration is being given for potential postwar commercial and private uses. See page 80.

PEACETIME AIMS—West Coast industry is giving increasing attention to the problems of postwar employment and industrial development. Study points out opportunities for production of electrical goods in the West. See page 87.

"BLACK" LIGHT—Sensitive inspection tool gives positive indication of defects in metal parts that otherwise would appear as service failures. Anticipated applications after V-Day include testing of metal coatings inspection of welds, etc. See page 94.

METALLIC RECUPERATORS—Science of preheating air for combustion through recuperators will make headway with a reconverted industry conscious of heating costs and decreasing fuel supply. See page 116.

PORTABLE PLANT Reconditioning unit for front-line repair of damaged steel landing mats affords a kind of mobility which argues for later use in heavy construction. See page 123.

NEW BRIGHT ALLOY _____ Nickel-iron alloy with remarkable qualities for electrodeposition may some day find wide acceptance as coating for automobile parts, household appliances and even wire forms due to high strength, ductility and finish. See page 124.

Membership Maintenance Issue Attacked by Industry Spokesmen

Irresponsibility in keeping wartime no-strike pledge cited as basic producers argue against 14 demands of steelworkers' union. Oppose sick leave pay, elimination of geographical wage differentials, shift premiums, severance pay

THAT the steelworkers' union should be denied maintenance of membership and the checkoff because of its political activities and its demonstrated irresponsibility in preventing and curbing strikes was the assertion of Thomas F. Patton, counsel for Republic Steel Corp., before the War Labor Board panel hearing the steel wage case.

Presenting arguments on the matter of political activities. Mr. Patton said that according to President Philip Murray, the CIO has 5,000,000 members. The great majority, like the members of the steelworkers' union, presumably are working under contracts providing for maintenance of membership and check off.

"Dues paid to the national affiliated union amount to many millions of dollars," Mr. Patton said. "A substantial portion of these funds are to be poured into the funds of the political action committee which will use its political influence in the coming national elections.'

Reading from a published report, Mr. Patton said the CIO leaders in their anunal convention in Philadelphia announced that they had earmarked \$700,-000 for political "education" and he quoted from the same publication that the leaders said privately they planned to spend up to five million dollars of local and state funds if necessary to put labor squarely in politics.

"The result will be to place potential financial backing behind some political party, based on forced contributions, to a previously unheard of extent," Patton continued.

This is contrary to the public interest and the fundamental institutions of a democracy, which functions only through the will, freely expressed, of a majority of its citizens.

"No citizen should be forced against his will to contribute, directly or indirectly, to any political party or movement. Yet this is the direct result which will follow if either the checkoff or maintenance of membership is granted in these proceedings.

"The all-important fact is that such contributions are obtained from sources which obtain these funds as a result of a compulsory checkoff, irrevocable for a period of years, from the earnings of millions of our citizens.

"The union is strong and prosperous. A majority of the wage earners in the iron and steel industry appear to be members. Companies representing 82.5 per cent of employment in the industry reported that they checked off \$3,709,975 for 301,417 members of the union in 1943.

"The union does not need union security. In view of the union's political activities it should be discontinued in the interest of preserving the democratic processes of the government of this nation."

Turning then to the matter of union irresponsibility in keeping its no-strike wartime pledge, Mr. Patton said the principal reason for granting union maintenance and the checkoff in the "Little Steel" case was stated as follows by a majority of the War Labor Board:

"By and large, the maintenance of a stable union membership makes for the maintenance of responsible union leadership and responsible union discipline, makes for keeping faithfully the terms of the contract, and provides a stable basis for union-management co-operation for more efficient production.'

"Work Stoppages Increased"

The Republic attorney told the panel that the results of a survey conducted among representative companies of the iron and steel industry in March, 1944, show that over a representative period of war years strikes and work stoppages in the industry have increased, particularly during the year 1943 and the first months of 1944.

"Strikes and work stoppages thus increased rather than decreased, after this board granted union security to the union upon the theory that the union would observe its no-strike pledge.

Answers from companies representing 86 per cent of the industry's employment and 88.4 per cent of ingot capacity disclose that work stoppages and strikes during the period from 1940 through the early part of 1944, and the number of employes involved, were as follows:



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THOMAS F. PATTON

Referring to the celebrated strike of Dec. 24, 1943, which grew out of the failure of the board to meet the union's demands that any revisions in the contracts which the union, by its own action had abrogated, should be retroactive, Mr. Patton said that statements issued at the time by both President Murray and general counsel Pressman "in effect, indicated to the members of the union that they were expected to strike if they did not receive just what they wanted. Mr. Murray even specified the time, midnight of Dec. 24, 1943."

"Although the newspapers were filled in Out at the time with prophecies of strikes," Mr. Patton said, "there is not a shred of evidence that Mr. Murray or any other responsible officer of the union took any affirmative action at that time to prevent or discourage a strike.

John G. Ketterer, Canton, attorney for the Timken Roller Bearing Co., told the panel the union's demand for sick leave pay would add \$37,000,000 in additional labor cost, even if only 75 per cent of the sick leave permissible thereunder should be taken.

Mr. Ketterer based his estimate upon union figures submitted earlier in the hearing which showed 74.3 per cent of the 503,100 workers engaged in the basic production of iron and steel, have continuous service of three years or more, and 15.9 per cent of one to three years.

He said these figures showed 79,993 workers would be entitled to seven days' sick leave a year, representing a possi-

umber of work stoppages and strikes umber of employes involved	1940 34 5,849	1941 485 87,357	1942 352 31,223	1943 993 145,465	Quarter) 168
				- 10,200	10,010

Presenting another table showing that among the strikers was a preponderance of union members, Mr. Patton said that these facts show conclusively that granting of union security had not stabilized labor relations or helped the war effort.

On the contrary, loss of man-hours, tonnage production, and payroll rose in 1943 and is continuing at an alarming rate," Mr. Patton added.

ble cost of \$59.64 per employe and 373,-803 workers would be entitled to 14 days' sick leave, representing a possible cost of \$49,358,004. Seventy-five per cent of this figure would be \$3,018,000.

Mr. Ketterer argued that such a plan would violate the national wage stabilization program by granting a hidden wage increase and that it is not a proper subject for a directive order by the emergency War Labor Board, which, he said, already has a policy that in the absence of a voluntary agreement or "of special circumstances" it will not impose a sick leave program upon an employer. He added:

"Sick leave with pay is in no sense a proper or effective wartime measure, but on the contrary invariably increases absenteeism."

Andrew T. Court, economist with General Motors Corp., arguing on the union's demand for sick leave pay, said that experience has shown such allowances encourage absenteeism and interrupt production. Workers look upon sick leave as an added vacation which too often has nothing to do with their health.

He cited the experience of individual employers who have tried full sick leave plans for factory workers, the opinions of experts in the field of health insurance, and a study of over a million manyears covered by group health insurance. "All of this experience, study and ex-

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per the "All of this experience, study and expert opinion indicates that the union's proposal for sick leave with pay would not improve the health of employes as the union claims, but rather would result in a sharp increase in absenteeism both of short and long duration—on account of alleged sickness. In fact the total time lost from sickness claims might easily be expected to double in the steel industry."

Points Out Cost of Insurance

Demand of the steelworkers for paidup life insurance policies, disability insurance and hospitalization would cost steel companies an average of 5 cents an hour for each worker employed instead of two-thirds of one cent an hour as the CIO union claimed, the panel was told by Frederick G. Knight, Philadelphia, representing the Lukens Steel Co., the Alan Wood Steel Co., and the Baldwin Locomotive Works.

"The net cost to the industry," he said, "would amount to approximately \$106.51 per employe per year, equivalent to approximately \$55,300,000."

Lawrence E. Riddle, general superintendent of Isabella and superintendent of the Duquesne Works blast furnaces of the Carnegie-Illinois Steel Corp., speaking on the demand of the union for shift premiums stressed the necessity for continuous operations in coke, iron and steelmaking. Continuous operations are physically necessary, he said, to protect equipment from damage and maintain it in operating condition, to insure high quality of product, and, most important, to protect workers from extreme hazards which are neither necessary nor warranted. Chief among these hazards, Mr. Riddle told the panel, is the possibility of gas explosions during intermittent operations.

Severance pay for workers who may be made idle by the closing of steel mills is not properly an industry problem but a national postwar problem beyond the legal power of the emergency War Labor Board to consider, Ernest S. Ballard, Inland Steel Co., Chicago, told the panel. Mr. Ballard denied the unions contention that the principle of severance pay was well established in American industry and asserted that the American Newspaper Guild is the only national union to hold such contractual guarantee.

Geographical wage differentials are so numerous and varied that their elimination by government fiat would result in upsetting the entire national economy, D. K. McKamy, attorney for the Tennessee Coal, Iron & Railroad Co., Birmingham, warned the panel.

Mr. McKamy pointed out that such

THE PEOPLE PAY

Profiteering in wartime by a labor union with both economic and political power is just as wrong as such profiteering by a manufacturer or merchant. This was the argument of Clarence B. Randall, vice president, Inland Steel Co., Chicago, in a recent radio broadcast explaining the issues in the steel wage case.

"And as everybody knows, in the matter of wages," he said, "as steel goes so goes the nation. You can't raise wages again in steel and not raise wages in all of our other great industries. Steelworkers cannot be made a preferred group. . . Wages make prices. You can't raise wages without raising prices. . . .

"The steel industry today has but one customer—the American people. We sell you everything we make. You put our steel into ships and tanks and guns and bulldozers and you are winning the war with it. But you have to pay us what it costs."

differentials traditionally have existed between regions, between states, and between towns and cities within the same state.

If they are eliminated in the steel industry, he said, wage and labor policies in all other industries would be disturbed and sharp curtailment in the operation of many plants, particularly in the South, would occur, with resultant unemployment.

Dr. John Van Sickle, chairman of the Economic Department, Vanderbilt University, Nashville, Tenn., argued the elimination of geographical differentials would be a disservice to workers in all sections. He predicted such equalization by government edict would discourage southern industry and cause greater unemployment in the region.

"The customers of the southern iron and steel companies are generally much smaller than those in the North. The orders are smaller. Transportation costs are higher. These and many other handicaps not only remove the advantage of having iron ore, coal and fluxing material located close together but make the cost of delivering iron and steel products greater in the South than elsewere," Dr. Van Sickle said.

Roswell Magill, tax consultant and former Under Secretary of the Treasury, branded as false the union's contentions that the carry-back and carry-forward provisions of the revenue act could be used by the companies to guarantee their incomes.

"There is no guarantee by the Treasury of anything. The Treasury has not underwritten the steel companies' losses and will not repay them. The most that it will do is to redetermine the taxes for past years, if the company has offsetting losses."

Steel Castings Case Next

Upon completion of the case of the basic steel companies, the panel will take up the demands against 14 steel casting companies, probably on June 13. Under its tentative agenda, it will return on June 20 to consideration of the basic steel companies' counter-demands upon the union and such evidence as the individual companies may desire to enter in addition to the general case, which has been presented under the supervision of the Steel Case Research Committee.

Chairman David L. Cole of the panel said he thought all evidence and arguments of the basic steel case and the steel casting companies could be presented by the end of June, after which a hearing on demands against the iron ore companies will be conducted, possibly in Duluth, Minn.

The panel will report its facts to the War Labor Board, before which representatives of the union and the steel companies will summarize their cases before the board reaches any conclusion.

Steel Payrolls in April Greater Than Year Ago

Steel industry payrolls at \$138,860,400 during April were \$5,586,000 greater than in April, 1943, according to a report released last week by American Iron and Steel Institute.

The April payroll represented a sizable decline from the record of \$145,-285,000 established in March, 1944, due chiefly to two fewer working days in April.

The average number of employes declined in April. During that month an average of 573,400 persons was at work, compared with 578,000 in March. In April, 1943, total employment was 633,-754.

Wage-earning employes in April, 1944, worked an average of 45.9 hours per week and earned an average of 119.0 cents per hour. The latter figure establishes a new record. In March, the average work week was 47.7 hours and hourly earnings averaged 115.9 cents per hour. In April, 1943, hourly carnings averaged 111.2 cents and average hours were 42.5.

WINDUWS OF WASHINGIUM

House Appropriations Committee, reporting H.R. 4879, praises war agencies' work and manner in which funds are spent. Bill does not cover War Manpower Commission, Office of Price Administration, and Foreign Economic Administration

REPORTING H. R. 4879, the National War Agencies Appropriation bill for the fiscal year 1945, the House Committee on Appropriations lavishly praises the conduct of various war agencies and the manner in which funds allocated them are being spent. The bill was approved by the House and is expected to be approved by the Senate substantially in its present form.

The bill does not cover requirements of the War Manpower Commission, the Office of Price Administration and the Foreign Economic Administration; these war agencies are to be cared for in other legislation.

The report of the committee states that the peak of the work of the War Production Board, in terms of money and personnel, has been passed. For the fiscal year ending June 30, 1945, the committee recommended \$67,500,000, which compares with \$89,267,720 appropriated for 1944, and not all of which has been committed.

"The responsibility of the board now is to keep our national economy in balance between military and civilian needs and to continue to provide those things which the military need for the prosecution of the war and to prepare for reconversion," says the report, adding, "American production has been one of the outstanding achievements of this war, and the War Production Board has had a most creditable part in that achievement."

The report quotes Chairman Donald M. Nelson as telling the committee that "the job as we see it for the year 1945 is going to be one of extreme complexity. We are now beginning to think about the problems of adjustment of these (military) programs. We are taking that up with members of industry; we are having meetings with them. . . . We do not anticipate production of automobiles for some time, certainly not until the German phase is over, and even then we do not know that we will be able to go into large-scale automobile production, because the items needed to produce automobiles are components of aircraft, landing craft, and so on, in almost every program we have.

"We are trying to think of just as many of those problems as we possibly can, affecting the conversion of the war economy back to civilian. We will have before long charts, some guide posts, and the one thought in my mind is to do it in the public interest rather than in the interest of any one group. We feel this should be continued with the fullest co-operation possible with the Congress as our board of directors, and with the public—they should certainly know what we are trying to do. "We think the big job in the fiscal year 1945—one of the things we are preparing for in our thinking—is the conversion of war economy into peacetime economy, at least partially, and to what extent I am not able to tell you."

Alluding to a subject that is a touchy one in Congress, Mr. Nelson admitted the farm machinery program has not gone as well as he would have liked. But he was convinced that production of farm machinery, which he regarded as just as important as any other part of the military effort, would be a great deal better shortly. Tractor production, he said, now is around 5000 a week. Tillage equipment, he said, now is the most critical.

Report Compliments Board

The report compliments the board on "a fine consideration of the need for good internal administrative management" and states "the board has an organization which is continuously engaged in seeking better methods of transacting its own business, in eliminating unnecessary personnel, in bringing about economies in other operating expenses, and these efforts are commendably sustained by Chairman Nelson who has taken a personal interest in that direction notwithstanding his tremendous responsibility and burdens in all the affairs in which the board is engaged. Committee investigators were sent to the board offices and their report is commendatory and indicative of these accomplishments."

Criticisms, the report says, were of very minor character.

The War Production Board's personnel peak, the report says, was 22,900. By March 31, 1944, this had been reduced to 16,327, and it is estimated that as of June 30, 1945, assuming a continuance of war, the WPB personnel will have been cut to 12,586. The committee fixed the salaries of six vice chairmen or other principal officers at \$10,000; five of these now are at \$8000 and one at \$9000.

The vice chairmen elevated to \$10,000, from \$8000, are Lemuel R. Boulware, operations; Joseph D. Keenan, labor production; Donald D. Davis; and Dr. W. Y. Elliott, civilian requirements. Executive Vice Chairman Charles E. Wilson is to be moved up from \$8000 to \$12,000. John Lord O'Brian, general counsel, will have his salary raised from \$9000 to \$10,000.

Col. Bradley Dewey, rubber director; A. H. Bunker, vice chairman for metals and minerals; Clinton S. Golden, vice chairman for manpower requirements, and William L. Batt, vice chairman for international supply, will continue at \$1 a year.

Referring to the Smaller War Plants Corp., the report identifies small plants "as those which have less than \$2,500,000 production annually" and estimates there are 180,000 of these representing 98 per



INVASION CRAFT: First picture of an LSM (landing ship medium) is released by the United States Navy. Above photograph shows the launching of one of the new craft at the Pullman-Standard Car Mfg. Co. shipyards

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Are we sowing a crop of <u>peacetime</u> FOX MINES IN AMERICA?

In a rocky ravine somewhere on the invasion front, an American soldier lies dead ... victim of an enemy fox mine ... the supreme price of war. But peace, too, can have its booby traps, if we aren't careful now. Are we sowing a crop of "fox mines" for our fighting men to come home

to — the slow explosionless defeat of unemployment, hunger and hopelessness, the breadline and the bonus army?

Not if we think straight ... not if we plan ahead now.

If you are a manufacturer, there is one thing that you can do at once: Have your pro-

duction men and planners consult now with the engineers of the basic machine tool producers. They can help you in planning ahead for the difficult task of reconverting your own skills and machinery to an all-out peacetime production.

One of these engineers is a Bryant man. We urge you to call him today. For his specialized knowledge of internal grinding machinery is important to the manufacture of literally everything that will make this country a finer place: this is victory, a victory that it will be safe for our boys to come home to.



cent of the manufacturing industries. These have approximately 30 per cent of the war contracts. As of March 15, 1944, only 20,689 of these small plants had registered with the Smaller War Plants Corp. for assistance. If the present rate is continued this number should be increased to 37,000 by June 30, 1944.

In recommending an appropriation of \$10,000,000 for the SWPC for the coming fiscal year, the report compliments Chairman Maury Maverick on his aggressive leadership in furnishing assistance to small business. The \$10,000,000 appropriation for the coming year compares with \$12,000,000 for the fiscal year 1944, the reduction having been determined on the basis of uncommitted funds on hand.

In referring to the 1945 appropriation for the War Shipping Administration, the report says that total cargo shipped from United States ports in 1943 was 46,971,000 tons, of which 36,596,000 went in American vessels. This movement was materially increased in 1944. In 1945 the United States will have a total of 4209 vessels, an increase of 33 per cent, with total tonnage of 43,000,-000, an increase of 43 per cent. Whereas the 1944 appropriations were \$2,272,-350,000, the 1945 recommendation, due to carryovers of uncommitted funds, is only \$530,350,000.

Reach Bottom of Barrel

Employers will be under considerable uncertainty as to the status of deferred employes under the Selective Service during the fiscal year, according to the committee's comments in recommending an appropriation for that agency. Estimates of manpower requirements in 1945, based on previous experience, are that some 21,000,000 individual classifications will be made, as against a total of 29,000,000 in 1944. Because the bottom of the barrel now is being reached, says the report, there will be constant review of the classification status of many millions of men periodically.

One of the interesting features of the bill is that whereas the 1945 fiscal year appropriation for the Office of Strategic Services is \$57,000,000, of this amount \$37,000,000 is to be spent for "objects of a confidential character" and need be accounted for solely on the certificate of the director, Brig. Gen. William J. Donovan.

Also of interest is a further reduction in the Office of Civilian Defense appropriation from \$4,700,000 for 1944 to \$1,139,000 for the 1945 fiscal year. This reduction is due to the improved "security situation in the United States."

Another interesting feature is that the 1944 appropriation of \$359,385 for the Committee for Congested Production Areas has been reduced to zero for the fiscal year 1945. The committee felt that the situation now has been eased to an extent where the individual federal agencies, in co-operation with local authorities, can take care of congested area problems.

Because the President's Committee on Fair Employment Practices has been under fire by Congress for a number of months past it is rather surprising to note that the committee has recommended \$500,000 for this agency during the fiscal year 1945 as compared with \$474,933 during 1944. The committee compliments the FEPC on its work and the re-"There has port goes on to explain: been much misunderstanding concerning the purposes and powers of the Committee on Fair Employment Practices. It has no jurisdiction whatever over social problems such as discrimination in restaurants, on buses, or in other public places. Its jurisdiction is confined by the order to

"PROTECTIVE MEASURE"

Conceived during World War I, Holland's steel industry now no longer exists. A German statement revealed that the blast furnaces and rolling mill in the town of Velzen on the North Sea canal, which links Amsterdam with the sea, has been dismantled and carried off to Germany.

The haul included 5000 electric motors, 5000 rollers, miles of cable and four traveling cranes, all of which were "acquired" by the Hermann Goering Works. The German's explained this transfer as a protective measure against destruction by the invading allied armies.'

This mill, considered one of the finest in Europe, was organized by the Committee for the Foundation of a Blast Furnace Steelworks and Rolling Mill. Difficulties encountered during the first world war in obtaining raw materials and halffinished products for Holland's metal industry made the government receptive to the committee's plan. Government authorization was granted in 1918 and in 1923 Holland's first and only steel mill started operations.

discrimination in 'employment in war industries and in government.' It is the belief of the committee that greater experience of the staff of the CFEP plus the increased willingness of employers to co-operate in eliminating discrimination will tend to decrease the case load coming in and permit a more rapid disposal of pending cases." New cases, the report states, are being received at the rate of approximately 400 a month but are being disposed of at a slower rate.

The report also is highly complimentary of the work done by the Co-ordinator of Inter-American Affairs, not only in enlisting the Latin American republics in our total war effort, but in paving the way for solid postwar relationships with those countries. To permit this work to continue the committee recom-

mended an appropriation of \$20,500,000 for the fiscal year 1945. This compares with \$48,735,000 for 1944, the difference resulting largely from expenditures which need not be repeated.

Complimentary treatment also is dealt by the report to the National War Labor Board whose appropriation is upped from \$14,437,300 to \$15,000,000. The board has a backlog of 16,000 voluntary wageadjustment cases representing an arrearage of approximately five months' business. The committee report expressed the hope that this arrearage can be reduced two to three months at most. Under the WLB, the report finds, man-days 🐲 lost by strikes have decreased by 48 per cent compared with the average peacetime year. Also, says the report, the WLB has stabilized wages at substantially the general level of Sept. 15, 1942. "There is no doubt," the report says, per "that the effect of the board's operations has been a great contribution to the prevention of inflation spirals in wages."

Tribute Paid to Research Office

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High tribute also is paid to the accomplishments of the Office of Scientific Research and Development, which is to receive \$120,000,000 in the coming year. That office, since 1940, had made 1982 contracts with industrial and academic institutions with a dollar value of \$292,-000,000 for research on specifically directed problems. Of these 951 have been terminated and the remainder are still in force.

These items include the amphibious truck, airplane equipment for accurately directing bombs through dense clouds, the bazooka and other types of rockets and rocket bombs, devices for calculation of damage wrought by bombing, improved methods of submarine detection and destruction, the electrical director for antiaircraft guns, development of techniques in the manufacture of a new explosive which greatly reduced its cost, a portable field cook stove using a lightless fuel, and a number of important developments in the field of medicine.

Despite recent congressional attacks, the Office of War Information also came through with an appropriation of \$58,-625,367 for 1945 against \$38,222,504 for 1944. The committee went on record with the conclusion that this agency is a vitally important one in winning the war.

In recommending \$900,000 for the Office of War Mobilization for 1945 as against \$138,000 for 1944, the committee cites the importance not only of the work of the Retaining and Re-employment Administration in taking care of discharged veterans, but in particular that of the Surplus War Property Administration. "At the close of the war the United States will undoubtedly have the largest inventory of surplus property the world has ever seen, says the report, and it goes on to say that preparations must be made ahead of time to liquidate this surplus in an orderly man-

Uniform Article for Settling Subcontractors' Claims Adopted

Joint Contract Termination Board's unanimous decision on article will speed payments to subcontractors. . . Article sets forth clearly basic principles procurement agencies will follow in approving subcontractors' settlements

UNIFORM termination article for use in the settlement of claims under fixed price subcontracts has been adopted unanimously by the Joint Contract Termination Board and formally approved by Director of War Mobilization, James F. Byrnes, the joint board reported last week.

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Announcement of the action was made by John M. Hancock, who has been acting as chairman of the Joint Contract Termination Board. Agencies represented on the board are the War, Navy and Treasury departments, Maritime Commission, Foreign Economic Administration, Reconstruction Finance Corp., Smaller War Plants Corp., War Production Board, and the Attorney General.

The joint board's statement declares that it is the policy of the government to encourage the settlement of subcontracts negotiation to the same extent as with prime contracts. In addition, as with the termination article for prime contracts, the subcontract article provides that, if agreement cannot be arrived at through negotiation, settlement

will be made on the basis of a specifically set forth formula.

In essence the formula set forth by the board is the same for both prime and subcontractors. Subcontractors are to receive the full contract price for all completed articles, but get nothing on the portion of the subcontract on which work has not been begun and no costs incurred. On the portion of the subcontract that has been begun but not completed, the subcontractor is entitled to actual costs incurred that are properly allocable to the contract, plus an allowance for profit that is not to exceed 6 per cent of the whole of the costs.

Profit Formula Broken Down

The profit formula is broken down to provide for a 2 per cent top profit for materials not processed, plus 8 per cent profit on the remainder of costs, but the aggregate not to exceed 6 per cent of the whole of costs. This provides for the same 6 per cent maximum profit limit as with prime contracts.

Mr. Hancock described the new sub-

contractor termination article as "a major step in the speeding of payment to subcontractors whenever their war business is canceled, freeing their capital for other war work, and for the speediest resumption of civilian production."

The new subcontract article supplements the uniform termination article for prime contracts, which was made effective on Jan. 8 by Director Byrnes on the recommendation of Bernard M. Baruch and Mr. Hancock. The subcontract article has been made brief, eight paragraphs, so that it can be inserted more easily into the hundreds of thousands, and perhaps millions, of purchase orders and subcontracts that will be affected.

Many business men will be able to print the subcontract article on the back of their present contract and purchase order forms. Others will be able to incorporate it by reference or 'attachment on a single sheet of paper. The mere fact that this uniform article is inserted in a subcontract does not mean that it is a war subcontract or that it is properly part of a claim against the government. In the settlement of the claims the prime contractors, subcontract claims are treated as an element of cost that must be properly allocable to the prime contract to be recognized by the government.

Proposed legislation on contract settlements, which has passed the Senate and is now pending in the House, would give the procurement agencies the discretionary right to settle subcontracts directly. In such direct subcontract settlements, the agencies would follow the principles of the new subcontract article.

United States Plants Build Mobile Power Units for Russia

FIRST of forty 3000-kilowatt mobile steam power units being built by the American Car & Foundry Co., New York, and the General Electric Co., Schenectady, N. Y., for service in Russia underwent inspection at the former company's Berwick, Pa., plant early this month.

The units will be particularly effective in supplying power in areas where the retreating enemy has destroyed electric installations.

The 3000-kilowatt plant comprises seven or eight cars, depending on the type of cooling used. Where water supply is inadequate, a radiator-type of cooling is used, with two cooling cars to the unit. Where water is ample, a cooling tower type is used, and three cooling cars are used.

Other components are two boiler cars and tenders, one turbine car, one switchgear car and one crew car. Each unit on arriving at a designated point can be made ready in eight hours to provide 3000 kilowatts for whatever purpose electric power may be needed.

The boiler cars contain a fire-tube locomotive-type boiler designed to operate at 300 pounds gage, 600 degrees Fahr. The boilers are designed to burn



poor grades of coal, such as lignites. In addition to the forty 3000-kilowatt

units, twenty-three 1000-kilowatt units will be supplied.

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

STEEL FORGINGS: Steel forgings in controlled material forms and shapes must be ordered by distributors under provisions of order M-21-b-1. rather than through the use of form WPB-2444 (formerly CMP-11).

SHIP REPAIR YARDS: A ship repair yard may make allotments of controlled materials for class A products that the yard will use for ship repairs and conversion. Suppliers of ship repair yards usually will get their purchase authority from the yard. However, in the case of manufacturers of Bureau of Ships special mavy products. they will get the allotment directly from the Navy Department; manufacturers of standard maintenance, repair and operation items, or class A products sold through distributors will get their allotments from WPB; and repair shops have the option of getting allotments from yards under CMP regulation No. 9A, or from WPB. Private ship repair yards get their allotments from the Co-ordinator of Ship Repair and Conversion; Army and Navy repair yards; or from the Army and Navy.

SMALL ORDERS: Any one purchase order for any class A product may be placed by the War Department as a small order, using the SO allotment symbol rather than an allotment, where the total amount of controlled materials needed to produce it does not exceed any of the following limits: Carbon steel (including wrought iron), 3 tons; alloy steel, 1200 pounds; copper and copper-base alloys, 300 pounds; aluminum, 500 pounds. Similarly, the War Department may place authorized controlled materials orders where the total amount of such materials required by any one order does not exceed the stated limits.

MINOR CAPITAL ADDITIONS: Rules governing determination of the cost of a minor oapital addition, recently announced for use by manufacturers and other business firms, have been applied to similar determinations which are made by government agencies and institutions. Covernment agencies and institutions are permitted to use the MRO procedure of CMP regulation No. 5A to obtain minor capital additions, the cost of which does not exceed \$100, excluding the purchasers cost of labor. The cost of labor used in construction or installation of a minor capital addition need not be included in figuring the cost of the addition.

CONSTRUCTION: Authority has been granted to the Army and Navy Munitions Board to assign a preference rating on a construction form such as CMPL-593 used under direction 3 to CMP regulation No. 6. ANMB will use this form to grant assistance in obtaining materials to persons engaged in command construction, Corps of Engineers construction, and Civil Aeronautics construction.

Allotment symbol W-6 has been provided for use by the Army and N-O by the Navy for certain construction, or these services may grant their builders or subcontractors permission to use them in placing orders for controlled materials or class A products with which to carry on command construction and CAA construction.

Restrictions contained in the ANMB list of prohibited items for construction work will continue to apply to command construction carried on under this new procedure. Authority to deviate from the restrictions may be obtained only by the Bureau of Service carrying on the project for either the Army or Navy upon specific authorization from the ANMB. A list of construction materials which may

not be used in industrial construction, carried on under the provisions of direction No. 1 to CMP regulation No. 6. has been issued in schedule A to that regulation. Authority to deviate from the restrictions which are contained in the new schedule may be obtained by a person carrying on a construction project at the time he files his construction and facilities application, such as form WPB-617. A specific notation of any exception will be made on the authorization form itself.

Special requests for permission to use restricted items may be made on form WPB-617 applications. If the items appear in appendix II of schedule A and a special application form is prescribed, such special application form should accompany WPB-617 when it is filed.

CMP REGULATIONS

MRO: Other United Nations governments, as well as the governments of the United States and Canada, are eligible to use procedures established under CMP regulation No. 5A to obtain their maintenance, repair and operating supply requirements for use in the United States. Other foreign agencies and institutions than

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Subject	Designations
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Railroads	P-142
Tractors, Track-Laying	L-53-b
Trucks, Hand	L-111
Trucks, Power	L-112
Zinc	M-11-b
PRICE REGUL.	ATIONS
011	

Silver No. 198

those of the United Nations may not use the regulation to obtain MRO supplies. Federal agencies and the national headquarters of the American Red Cross are permitted to use its procedures to obtain MRO for export, if it is for their own use in their own operations.

Quota provisions of the regulation have been modified to bring them into conformity with overall MRO cuota provisions contained in CMP regulation No. 5, governing MRO acquisitions of industry and business. Specific instructions have been issued which must be followed by agencies or institutions seeking increased quotas. (No. 5A.)

L ORDERS

TRACK-LAYING TRACTORS: All products of track-laying tractor repair parts in covered by order L-53-b. During the sixmonth period, July 1 to Dec. 31, 1944 and urin ucceeding year. up to per of the total shipments of repair parts, by hold in the second of the total shipments of repair parts. Shipme any critical part must be divided by the transmatrice on the basis of 65 per cent for the military and 35 per cent for other orders. No shipments of critical may made to dealers for stock. Purchase orders in dealers are to be treated for stock unless accompanied by a statement that the parts are needed to fill orders actually on hand that cannot be filled from stock. The 35 per cent of critical parts for nonmilitary orders need not be broken down according to use.

Repair parts may be purchased from producers and dealers only throuch emergency certification of the purchase order, with certain specified exemptions. Emergency certification specified exemptions. Emergency certification by producers; on sales a horized by WPB through approval of WPB form 1819: sales to producers or dealers in the United States or Canada: and where the order of for fuel filters or oil filters in a quantity than 500 hours' operation.

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Repair parts for export may be sold only on WPB authorization (form 1319). The following are exempted from the authorization requirements: Factory sales to the military; shipments to Canadian dealers; sales to export dealers, since they operate under an assigned quota, applied for on form WPB-1319; and sales totaling not more than \$100.

Quotas of shipments to dealers in the United States and Canada are set at \$10,000 worth of parts in any calendar quarter, or 50 per cent of total shipments during the preceding two quarters, whichever is greater. A 10 per cent overshipment in any quarter is permitted, but this is charged against the quota for the next quarter.

Provisions allocating 65 per cent of deliveries to the military were effective June 2; other provisions of the order, July 3. (L-53-b)

METAL WINDOWS: Metal windows now may be manufactured to fill orders with preference ratings of AA-5 or better. (L-77)

ELEVATORS: Export orders for elevators and elevator and escalator parts may not be accepted by any person without approval by the Foreign Economic Administration of any export license covering the items. FEA will assign preference ratings for the export orders on export licenses in accordance with a delegation of authority from WPB which permits it to do so. Applications for export licenses should be filed with FEA and must include a description of the elevator or parts to be exported. (L-89)

HAND TRUCKS: Concrete buggies and carts have been excluded from provisions of order L-111, dealing with band trucks and other hauling equipment, since this type of equipment is covered by order L-192, dealing with construction machinery and equipment. Use of zinc is permitted for galvanizing purposes in the manufacture of hand trucks, pallets, and platforms. Requirement that manufacturers of hand trucks and other handling equipment file report on their operations on or before the 15th day of each month has been eliminated. Restrictions on the use of ball and roller bearings have been clarified to indicate that they may be used where carburized (carbon steel) rolling elements and unground races are used in the manufacture of hand trucks, platform trucks, dollies, or semilive platforms. (L-111)

POWER TRUCKS: A power truck manufacturer now may produce experimental models in any design and structure, if he can do so without acquiring additional facilities which are capital additions. Such a manufacturer may not produce more than the minimum number of models which are required to determine their suitability for commercial production, operation and application. Nor may he produce larger ones than are necessary to make such a determination. He may produce no more than two units of the same model and capacity industrial power trucks.

Manufacturers may not produce experimental models if they have reason to believe that such action would divert any materials, manpower, technical skill, or other facilities no ded by any person for (1) any defines order, or (2) for any order rated AA-5 or higher or (3) to fill any order specifically authorized by WF

Experimental models which are made under order L-112 may not be offered for sale, nor may they be demonstrated, displayed, tributed, under terms of the order. (L-112)

M ORDERS

COPPER: Acceptance of deliveries of copper precipitates by persons other than copper refiners is now prohibited, except as authorized in writing by WPB. (M-9) ZINC: Permission has been granted by WPB for the use of zinc in the manufacture of certain articles, including those for research, developmental and experimental activities. Restored uses of zinc are in the manufacture of laundry tags and protective edging and comer beading for construction work. (M-11-b)

P ORDERS

RAILROADS: Railroad operators now are permitted to place advance orders for delivery during each of the three calendar quarters following the quarter in which the order is placed for up to 75 per cent of their first quarter 1944 authorization of the following items: Air brakes, power hand brakes, brake beams, couplers and coupler bodies and bolster springs (car). With the exception of power hand brakes (code No. CB), a railroad operator may use the same preference ratings, and to the same extent, as were authorized for the particular item for the first quarter of 1944. For power hand brakes, he may use only a rating of AA-3 for advance quarters, regardless of the ratings authorized for that item in the first quarter of 1944. (P-142)

PRICE REGULATIONS

SILVER: A revised regulation that codifies and supersedes existing regulations and orders applicable to silver has been issued. It provides maximum differentials which may be added to base prices on sales or deliveries by distributors in lots of less than 200,000 ounces and on sales by refiners in lots of less than 25,000 ounces. Requirement for monthly reports from all sellers of newly mined domestic silver in semifabricated form has been eliminated. (No. 198)

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Basic Codification of Renegotiation Rules Issued

New renegotiation regulations have been issued by the War Contracts Price Adjustment Board. They comprise four chapters and, with revisions of the four original chapters, complete the initial basic codification of the first detailed rules to be publicly issued in connection with the renegotiation of war business done by contractors in fiscal years ending after June 30, 1943.

Appointments

Walter C. Skuce, director, Controlled Materials Plan Division, War Production Board, has been appointed deputy director of the board's Production Controls Bureau. Mr. Skuce will continue to serve as director of the CMP division.

Maury Maverick, chairman, Smaller War Plants Corp., has been appointed head of a Surplus War Property Administration subcommittee to study ways and means of aiding small business firms to acquire surplus war property.

V. R. Bates has resigned as chief of the Cold Finished Bar Branch, Steel Division, War Production Board. He will return to his position with Republic Steel Corp., Cleveland.

Samuel W. Anderson, formerly deputy vice chairman for metals and minerals, has been appointed program vice chairman and chairman of the Requirements Committee, War Production Board.

Rules Modified on Segregation Of Excess Iron and Steel Stocks

Certain resellers are exempted under specified conditions from complying with provision of price schedule No. 49 requiring special invoicing of excess stocks. Exemption applies to all subsequent resellers; not to a "holder"

TO RELIEVE certain resellers of iron and steel products of the burden of keeping their excess stocks segregated, the Office of Price Administration has exempted them under specified conditions from complying with a provision in its price schedule covering the resale of iron and steel products which requires special invoicing of excess stocks.

This exemption does not apply to the type of reseller known as a "holder." A "holder" is defined as any person who buys an iron or steel product for use in manufacturing, and now wishes to sell material he no longer has need for. The United States government and its agencies are defined as "holders" when they dispose of surplus materials.

Through amendment No. 23 to revised price schedule No. 49 (Resale of Iron and Steel Products), issued May 9, 1944, and effective as of June 1, 1944, OPA had incorporated in the schedule provisions establishing maximum prices for sales of excess stocks of iron and steel products. Sellers were required to mark every invoice issued in connection with a sale with one of the following phrases: "excess stock," "idle or surplus stock," or "idle and excess stock."

Further, the definition of "excess stock" provided that once iron or steel products have been sold by the holder as excess stock they shall continue to be such through all subsequent sales.

Complaints were made to OPA that these provisions would impose hardship upon certain persons who purchase and resell such material. It was pointed out that a person who maintains an inventory of iron and steel products would be compelled, in order to observe this special invoicing requirement, to keep separate any excess stock which he may purchase. This would result in a waste of critically needed storage space and the imposition of an additional burden upon already depleted working staffs, OPA said.

The new action, also effective June 1, is intended to alleviate this situation. It provides that a reseller other than a holder will be exempted from the special invoice designation requirement if he already has complied with three conditions which the schedule requires him to fulfill in order to be entitled to warehouse price ceilings. Once these conditions have been fulfilled, the exemption applies to all subsequent purchasers and resellers of this material.

In substance, these conditions are: (1) Purchase of material for resale in sub-

stantially the same form as received and its removal, after such purchase, from the holder's location; (2) its delivery, prior to receipt of an order, to premises the reseller regularly maintains for the assembling of iron and steel products for resale; and (3) his performance of the warehousing operation as defined in the schedule.

OPA stated that when these conditions have been met, the necessity for separately identifying excess stock of iron and steel products as such has been removed and it is therefore considered appropriate that resellers other than holders who satisfy such requirements be relieved of the burden of keeping them separate. The new action accomplishes this, continued OPA, by freeing such persons, and all persons who buy from them for resale, from the obligation to specifically mark their invoices indicating the material as excess stock.

WPB Aids Armed Services In Disposal of Materials

War Production Board will co-operate with procuring agencies of the armed services in disposing of property left over from terminated contracts. The board's 13 regional offices will endeaver to find buyers who are permitted under WPB regulations to purchase such surplus materials. Materials available will be listed with each regional office and will consist of raw materials, semifinished goods and scrap and will include steel, copper, aluminum, chemicals, textiles and lumber. Regional offices are arranging now for the movement of about 30,000 tons of surplus steel and large quantities of other materials weekly.

Changes in Hand Service Tool Regulation Announced

Piston ring compressors, valve or clutch spring testers, ring groove cleaning tools and valve spring compressors have been removed from classification of automotive maintenance equipment and designated as mechanics' hand service tools in order L-270 by WPB. The items have been added to exhibit A of order E-6, the list of hand tools made of iron or steel which are subject to the order. Cylinder ridge reamers have been removed from order L-270 and will be classified with other cutting tools under general WPB regulations.

Life lines of machines and MEN!

This is a good picture of four strands of FLEXIBLE HOSE — but no picture at all of their dramatic part in modern warfare to would take moving pictures to tell that story! You'd see water, fuel and oil rushing through them at the height of barde . . . in planes, tanks, ships and combat cars in every sphere of combat.

Truly the wartime function of simple flexible hosing is equalled only by its peacetime potentialities. As the world's largest manufacturers of this product, the four plants of The Weatherhead Company have played a prominent part in the nation's war effort—and are prepared to assume the same role in Peace.

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By A. H. ALLEN

Detroit Editor, STEEL

MIRRORS of MOTORDOM

Exit interview seen as providing excellent opportunity for employers to work out differences directly with workers. Experience has shown many causes of excessive labor turnover can be remedied through constructive action.

NEXT to strikes and absenteeism, excessive turnover of industrial personnel constitutes a critical problem for employers. The number of workers quitting, being discharged or laid off is usually many times the number who leave each month to enter the armed forces. Some of the causes of excessive turnover are beyond the control of employers, but many of them can be removed if the employer determines to find out what they are, and then does everything possible to effect improvements. One means of combating excessive labor turnover is through the exit interview.

According to a recent analysis prepared by the Office of Defense Transportation, the exit interview provides an opportunity to work out many differences directly with the worker. It is also the means whereby the facts about turnover causes can be ascertained. The important consideration is what takes place after the facts are determined. Experience has shown that many of the causes of excessive turnover can be remedied through constructive action by employers. In some instances, the interviewer will be in a position during the interview to make immediate adjustments which will result in retaining the worker.

Briefly, the exit interview (the term is a common one in Washington bureaucratic circles) may be defined as one which takes place between a company official and the worker as soon as possible after the worker tells his supervisor that he expects to quit. It can also be used in those cases where the supervisor starts action to get rid of a worker. A prime consideration is that the interview be held as soon as possible after it is known that the worker is about to leave.

Properly handled, exit interviews can do the following:

1. Furnish the real reasons why workers wish to resign;

2. Help to retain the services of competent workers if a satisfactory solution to their problems can be found.

3. Provide accurate information on turnover so that some or all of the causes can be eliminated.

4. Keep the employer in closer touch with his employes and their problems.

5. Promote good relations with employes who are to be separated involuntarily.

The three-fold purpose of an exit interview may be described as: Getting information, giving information, and making friends. The first involves learning just why an employe is leaving, whether it results from difficulties with supervision, poor working conditions, illness, domestic troubles or whatnot.

The second means the detailed ex-

planation of company policies about which the employe may be confused; or an attempt to set him straight about advancement opportunities, wage increases and working conditions.

The third function—making friends provides the opportunity for improving industrial relations by a personal effort to convince the disaffected employe the company has his interest sincerely at heart. This may often dissuade the employe from leaving, or may lead to some simple adjustment such as transferring him to another department.

Employe Counsellor Logical Interviewer

For companies which have a separate personnel department, the logical persons to do the interviewing are employe counsellors, the ODT points out. Insofar as possible the interviewing should be conducted by a few individuals in centralized locations. In smaller companies, the interviewer should be selected on the basis of his knowledge of personnel problems, but in any event should not be the worker's immediate superior.

The success of an exit interview is dependent upon the person doing the interviewing. He, or she, should be an individual who commands the respect and confidence of the employes, who is tactful and understanding, and who has an intimate knowledge of the company and its supervisory force. Above all, the interviewer should know how to ask the right questions, and to be a good listener.

Both time and effort are saved if the interviewer finds out as much as possible from company records about the subject employe in advance. Helpful will be information on age, nationality, marital status, dependents, health, education, service with the company, previous experience, community interests, specific details of his job, attendance record, foreman ratings, and his reasons for leaving.

Although no two interviews will proceed in exactly the same manner, these general steps may prove helpful to keep in mind:

1. Put the employe at his ease. Talk with him informally about some topic of general interest.

2. Let the worker tell his story. Be a good listener.

S. Question the worker to get complete information on the statements he has made. Draw him out. Get him to tell all.

4. Clear up any misunderstandings the worker may have. Answer any questions he may have raised. Get across any information that may be helpful.

5. Decide upon a plan of action and if possible let the worker know what you propose to do. Be sure he understands any mutual arrangements agreed upon.

6. Terminate the interview. Make a friend. Let the worker know he can come back again when he wants to talk things over. If he is to leave the company, wish him luck and let him know you are interested in his future. Finally,



GETTING DRESSED FOR ACTION: Workmen are shown in a Fisher Body plant placing the tube of a 4.7 antiaircraft gun into its mount. The gun can send a projectile 11 miles into the stratosphere

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keep all the information confidential.

As the interview proceeds, certain questions should be kept in mind in appraising the true situation—Is the job too big for the worker? Could he handle a better job? Does he have a poor attitude? Is he quitting because of some outside reason? Is he quitting because of personal relationships on the job? Can his reason for quitting be remedied? Does he need more training? Should he be shifted to another job?

Naturally, all the foregoing is elementary to the trained industrial relations expert, but these days personnel relationships often have to be entrusted to new and untrained executives, and they may lack appreciation of the finer points of dealing with disgruntled employes. Complete transcript of the ODT analysis of the exit interview may be obtained by writing Otto S. Beyer, director, division of transport personnel, ODT, Washington.

Annual balance sheet report filed by the Ford Motor Co. with the Massachusetts Commissioner of Corporations and Taxation shows net taxable income for 1943 (plus undisclosed dividends) to have been \$86,049,998. Comparable figure for General Motors was \$185,246,-934, for Chrysler \$35,589,637.

Balance Sheet Shows Changes

Ford does not publish any detailed income account, but the balance sheet indicates the following changes over the past years:

	Profit and Loss Surplus	Reserves	Assets
'43	\$669,102,290	\$64,499,196	\$1,009,092,488
'4 <u>2</u>	623,573,392	23,978,096	813,079,879
'41	612,678,531	19,736,920	718,660,357

Indicative of the tremendous volume of war business handled by Ford is the fact that in 1943, \$40,512,100 was added to reserves, compared with a little over 4 millions the year previous. Net profit for the year was \$45,528,898, plus whatever dividends were distributed.

Another recent departure from the ranks of veterans in the Ford dynasty was Ernest G. Leibold, one-time personal secretary to Henry Ford but little heard of in the past 17 years. Mr. Leibold started with Ford in 1910, at the insistence of James Couzens, a Ford partner at that time, who became annoyed when the "boss" mislaid a \$70,000 dividend check in a suit of clothes. Thereupon many of Ford's outside interests, such as the *Dearborn Independent*, housing projects, the Henry Ford Hospital, the Detroit, Toledo & Ironton railroad, etc., were transferred to Leibold's jurisdiction, and he ruled them with an iron-fisted and tight-lipped policy.

General Motors has modified its employes contributory retirement plan, reducing the age at which an employe would first participate for future service benefits from 40 to 30, and raising the oldest age at which an employe would normally first participate from 54 to 59. Furthermore, in the development of provisions for past service benefits, account has been taken not only of past services, but also of compensation received for such services, particularly in the light of the economic conditions existing when such compensation was received. Thirty top executives of the corporation are made ineligible for past service benefits. Both the current and the modified plans are designed to supplement the old-age benefits provided under the social security laws covering the first \$250 of monthly earnings of employes.

Self-lubricating bearings of powdered

HORSELESS CARRIAGE

First automobile made by Elwood Haynes, which has been at the Smithsonian Institution for the past 25 years, will be returned to Kokomo, Ind., for exhibition during the Howard county centennial celebration on July 4.

The date will mark the fiftieth anniversary of the first road test of Haynes' "horseless carriage". The car, along with other treasured possessions of the Smithsonian Institution, was removed from Washington shortly after the outbreak of the war and stored in a midwestern locality as a precaution against damage from air raids.

The car was built in 1894 in a machine shop owned by Elmer Apperson and first moved under its own power at a point on the Pumpkinvine pike, three miles southeast of Kokomo, on the afternoon of July 4, 1894. A marker at that point commemorates the event.

aluminum are being supplied by the Amplex division of Chrysler Corp. A. J. Langhammer, Amplex president, says they are being produced in cylindrical, flange and thrust types, with equipment available to produce aluminum Oilite in irregular shapes and for machine parts.

The powdered aluminum is pressed in dies on the same equipment used to process bronze and iron powders. After a special treatment in furnaces, they are repressed to insure accuracy and finally oil impregnated. Amplex has produced an estimated 25,000 different types of self-lubricating bearings and machine parts from all types of powder.

Reynolds Spring Co., Jackson, Mich., has sold its plastics division at Cambridge, O., to Continental Can Co. according to a recent surprise announcement. Reynolds Spring says it plans to devote its full postwar efforts to the spring division along with other new lines of manufacture now in the preparatory stage, plus an expansion of its production of agricultural implements. Funds from the sale of the plastics department will be used to finance postwar activities.

A lively merchandising battle is shaping up in the agricultural tractor and farm implement manufacturing field bringing with it some significant corporate changes.

Mileposts on the highway of automotive progress over the past 50 years were listed recently by Alfred Reeves, advisory vice president, Automobile Manufacturers Association, as follows (not in chronological order): Four-wheel brakes; ali-steel bodies; independent spring suspension; electric self starting and lighting; high-compression high-speed engines; "floating" power and "no-draft" ventilation; fluid drive and automatic transmission; the low-priced Oldsmobile runabout; low-priced closed cars which brought year-'round sales; Charles E. Duryea's first gasoline car in 1892; Ford model T with its record production; better and less costly pneumat.c tires, particularly those of the balloon type; Henry B. Joy's promotion of the building of the Lincoln highway across the country; standards developed by the Society of Automotive Engineers, saving about \$124 per car; signing of the Federal Aid Good Roads bill by President Wilson in 1916; ample supply of gasoline from oil companies, particularly antiknock fuels; development of heat treated steels and deep drawing sheets; mass production to standards of accuracy permitting parts interchangeability without hand fitting; Ford's minimum wage of \$5 per day for adult workers, or 50 cents an hour against the prevailing rate of 30 cents an hour (average rate in 1943 was \$1.25 an hour); and a record of 82 miles on one gailon of gasoline with a Franklin car in 1917.

Mr. Reeves spoke at a Lansing, Mich., Rotary Club testimonial luncheon on the eightieth birthday of R. E. Olds, June 2. The pioneer, with two companies— Oldsmobile and Reo—perpetuating his name, was hailed as the "father of mass production in the motor industry," in that in 1904 his Oldsmobile company produced on the progress've assembly line system 5000 of the 22,000 cars built that year.

Four great automotive pioneers—Ford, Nash, Durant and Olds—have now passed the 80-year mark.

Hudson Starts Production Of Superfortress Sections

Hudson Motor Car Co., Detroit, has been authorized by the Army Air Forces to announce it has started quantity production in one of its Detroit plants of fuselage sections and wings for the new B-29 Superfortress. Fuselage sections are being built on the Hudson production line which for two years mass-produced rear fuselage sections for the Martin B-26 Marauder bomber. 100



The Harper organization devotes its energies and facilities exclusively to non-ferrous and stainless fastenings. It manufactures bolts, nuts, screws, washers, rivets and specials of Brass, Bronze, Copper, Everdur, Monel and Stainless. It produces nothing in common steel or iron.

Harper offers a large and widely assorted stock of over 4280 different items . . . extensive manufacturing facilities . . . a major department engaged in designing and producing "specials" . . . engineering "know-how" . . . and field service difficult to match elsewhere. All of which

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WING IIPS_

Bell Aircraft Corp. expands production 2½ times in 1943. Building new Superfortress bombers. Latest venture is jet propulsion plane, details of which are still a closely guarded military secret. Experimenting with improved type of helicopter

IN COMMON with all aircraft manufacturers, Bell Aircraft Corp., Buffalo, experienced a banner year during 1943, with its poundage of airframe output expanding 2½ times over the previous year to a total of 22,650,000 pounds, including production of the Georgia division, while gross sales more than doubled to reach \$232,134,000. That figures to roughly \$10 per pound of output, disregarding the effect of including gun mount production which Bell supplies from a new Burlington, Vt., division.

Under direction of O. L. Woodson, general manager, Bell Aircraft began production on schedule at its Marietta, Ga., bomber plant late last year. This plant is the largest manufacturing facility in the Southeast and the problems involved in getting it in operation were enormous. It is one of several plants building the new B-29 Superfortress bomber.

Bell's latest venture, which has been sketchily described in the press, is the manufacture of a new twin-engine jet propulsion interceptor airplane. This work is carried out at the Bell plant in Buffalo proper and no one is permitted to visit the department, or see the airplane. It heralds a new chapter in highspeed, high-altitude aviation.

An improved type of helicopter is an-

other experimental project under way at Bell. This work is being done outside the two main plants of the company in Buffalo, but visitors are shown a color movie of the ship in action, and it appears capable of all the familiar stunts of the original Sikorsky helicopter. Main rotor is about 35 feet in diameter; positioning of the rear torque-balancing rotor is somewhat different from S.korsky's arrangement, and the machine incorporates a special stabilizing device. Research work on the helicopter is being conducted for its expected military value, although postwar commercial and private uses naturally are being given due consideration.

Number of Significant Changes

Visit to the two Bell plants in the Buffalo area, after two years absence, reveals a number of significant changes. Of first importance is the steadily increasing amount of subcontracting of parts and subassemblies, permitting the prime contractor to concentrate on final assembly and testing, and also easing the pressure on employment. Over the past two years, subcontracting on the P-39 Airacobra has been steadily extended until it reached recently approximately 65 per cent of the entire ship. On the new fighter plane, this percentage will be increased still further. While the



Master control board used in the Bell Aircraft airport operations department to control the movement and work on P-39 Airacobra fighters from the time they move out of the assembly plant until they are flown away or shipped

total list of suppliers runs into the hundreds, there are now about 30 principal subcontractors. They include such companies as General Fireprofing, Wurlitzer, Twin Coach, and others which litzer, Twin Coach, and others which litzer, Twin Coach, and others which might be at first glance considered as anything but aircraft subcontractors. Only by dint of constant co-operation and consultation between their engineering organizations and that of Bell has the present comprehensive program been worked out

Result has been that Bell employment in Buffalo has dropped off from a peak of 35,000 to around 26,000, although this will be increased somewhat as assemblies of the new fighter increase. Further result is that a considerable amount of machine equipment in the Bell plants, particularly the Buffalo unit, is now being moved out to vendors' plants.

Mass production of the P-39 airplane has brought a number of changes in production equipment at the Bell Buffalo plant. For example, high-speed routers, formerly used extensively to shape the outlines of stacks of aluminum shapes, have given way to blanking and forming presses. The router is still considered a valuable tool, one which will doubtless return to use in the postwar period when airplanes will be produced in a greater variety of models, with a fewer number of each, but at the moment the automotive-type presses are in the ascendency.

Several stretching presses have been installed in Bell plants, for stretch forming aluminum shapes, but they are favored for specialized jobs only because of the high percentages of scrap resulting from this forming method. Presses, rope drop hammers and Cecostamp hammers perform similar work with less waste.

Make Plastic Drill Jigs

Bell engineers are doing some interesting work with Catalin plastics for use as drill jigs. A separate department is operated on this project and a wide variety of size of jigs has been turned out for production application. The plastic is cast to shape in plaster molds and then oven cured, with steel bushings inserted in a Cerromatrix backing material at the dril holes. Using this system the bushings may be relocated easily by melting out the backing material and not disturbing the plastic body.

Another interesting project completed by the plaster pattern department is the fashioning of a full size plaster mockup of the new fighter fuselage. The mockup required 1500 hours of work by a crew of four, and is made to precision dimensions so that emplates can be taken right off the mockup at various ing required for preparation of production templates.

Showplace of the Bell operations in the Buffalo area is the expansive new plant at Niagara Falls, which since its construction three years ago has had 1

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Here's a Strong Trio For Post-War Success

The triangular team we're thinking about is you, the Armco Distributor, and us.

You have the skill and experience in making sheet steel products; the Armco Distributor will have the sheet metals and delivery service; and we produce a complete range of special-purpose irons and steels.



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But let's take a closer look at the man who helps us help you—the Armco Distributor. He puts a high value on his Armco connection because he knows it enables him to serve you with consistently good results.

He is doing his best to supply limited quantities of sheet steel now. After the war, when steel is plentiful, he again can give you the service and deliveries that will help keep your business going strong.

COATED STEELS FOR EVERY NEED

Besides ARMCO Stainless and other special grades, the Armco Distributor will have the most complete line of coated sheet steels in the industry. These include ARMCO Galvanized PAINTGRIP, Cold Rolled PAINTGRIP, ZINCGRIP, and Aluminized Steel. In addition, he will have High Strength Steels, Enameling Iron, and all the regular commodity grades.





Opportunities when peace comes. If you want to "be ready" when peace comes . . . if you want to have the choice of a wide range of coated and uncoated sheet steels . . . by all means be a member of this result-getting team. Let us help you get acquainted with the Armco Distributor in *your* territory, because you and he and we can go a long way together after the war. The American Rolling Mill Company, 1571 Curtis Street, Middletown, Ohio.



Automatic paint dip machine is used by Bell Aircraft Corp. at its Elmwood avenue fabrication plant, Buffalo. Parts to be painted are hung on a rack which travels overhead on a conveyor and dips automatically into three vats for cleaning, etching and painting and then returns through a dryer

numerous extensions and additions until it is now a most complete assembly facility, with separate buildings for installation and testing of armament, combat modifications, army inspection and acceptance and the like. It is located on a tract of land over one mile square, with an elaborate airport runway system extending northward from the plant building.

Principal unit of the Niagara Frontier division is the assembly building, approximately 1600 feet long and accommodating paral.el assembly lines running nearly the full length, with parts and subassembly bays feeding in from both sides and from balconies. Unique is a parts conveyor system which extends from parts and material storage bins at one end of the building, along one side of the assembly lines, across the building at the far end and then back the full length of the lines on the opposite side and returning to the parts storage. It is an overhead chain system, with hooks carrying trays on which parts and assemblies are moved to installation points along the lines.

Row upon row of parts bins, nearly 20 feet in height, practically fill the storage area. General plan is to keep approximately 20 days supply of stock in these cribs, with a 10 days' supply provided in so-called kits which are loaded on the conveyor system. Thus, the material control system is to have a month's supply of parts backing up the assembly line at all times.

An unusual feature of operations at the Niagara Frontier plant is a master control board on which the entire plant and airport area is drawn to scale, the layout covering a wall space about 24 feet wide by 15 feet high, this in the airport operations office. By means of hooks fastened in the layout board, and small paper tags to represent airplanes, it is possible to locate every single airplane on the property. whether in the assembly, test, or flyaway stage. Telephonic connections to all points in the plant are provided, and before any plane can be moved from one point to another, the control station must be advised.

Control Station Possesses Authority

This department has complete control over dispatching and movement of planes by virtue of having authority over the use of industrial trucks and tractors throughout the plant and airport. Before a tractor can be obtained to tow a plane from one location to another, the control station must approve its release.

The system shows at a glance a moving record of the number of planes completed each day, and traces their progress through testing, outfitting and modification stages. Few airplane manufacturers have gone to the pains of developing such a complete and smoothworking system of determining the hour-by-hour progress of production.

Supplementing the control board is a small table on which are mounted wood forms containing series of adjoining slots, about 1 inch wide. Each slot is marked to correspord to airplanes in various stages of assembly, testing and modification. Small plastic blocks, colored to represent airplanes for various accounts and for various theaters, are placed in these slots, and as fast as the ship in the plant moves from one area to another, its corresponding block is transferred to the next slot. This permits a quick counting of the numbers of airplanes in the various areas, providing production and bott.eneck information much more quickly than by consulting the master layout.

North American Shifting B-25 Bomber Production

Last California-built North American B-25 two-engine bomber will roll out of the company's Inglewood, Calif., plant July 8, as production of this model is shifted entirely to the North American Kansas City, Kans., plant. Inglewood will concentrate solely on the P-51 Mustang fighter plane.

Company officials say no reduction in output of the bomber is involved, since the Kansas plant is scheduled to turn out more B-25s this year than the combined production of Inglewood and Kansas plants in 1943.

Considerable rearrangement of shop departments will be necessary during July at the California plant, and many employes will be transferred to new jobs. Curtailment of the working force may be involved, although it is expected the normal rate of turnover will compensate for any necessary reduction.

Months of engineering planning have preceded the rearrangement and conversion of the Inglewood plant. All major assembly jigs and fixtures for the B-25 Mitchells will be moved to Kansas.

Another recently announced change in the bomber production picture is the discontinuance of shipment of knockdown B-24 Liberator bombers from the Ford Willow Run plant to two assembly plants in the Southwest. Willow Run production, now ahead of schedule and better than 400 planes a month, will be entirely "flyaway" versions.

Shipments of knockdown B-24s have been going to assembly plants in Tulsa, Okla., and Fort Worth, Tex., in recent months at the rate of about 75 complete units every 30 days, but these assembly plants are being converted to newer models, presumably the B-29 Superfortress, and a new attack bomber.

Willow Run production is reported to have been 57 bombers in excess of Army schedules which, unless changed recently, called for around 400 units.

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TEEL

Chrysler Divisions Build B-29 Sections

De Soto Division of Chrysler Corp. now is permitted to announce it is producing large quantities of B-29 sections. Several hundred subcontractors and other Chrysler Corp. plants, including Plymouth, Dodge, De Soto and Chrysler divisions, are supplying major parts and subassemblies for the De Soto B-29 Superfortress airframe assembly operations.



Signal Carps Photo

FLAT-FOOTED FORTRESS

If ever a man-made machine looked like a rough and tumble scrapper, it's the M-4 Medium Tank. It moves in a fighting crouch, plants its flat tracks firmly, whirls its turret swiftly to throw a knockout punch in any direction.

Actively aiding this fast-stepping fighter are its ball bearing equipped turning points that free its revolving turret and rolling axles from friction!

In today's mechanized warfare. Fafnir Ball Bearings assure our tanks, ships, planes and other combat equipment, unhampered speed in getting to battles and accurate aiming of fast blows while fighting them. Fafnirs are engineered to protect each vital turning point from battle ground's sand or mud – from ocean's corrosive salt – from air temperatures which subject our planes to extremes varying up to 150° in a few seconds.

After Victory, these performance-tested Fafnir Ball Bearings will bring to peacetime products the same amazing performance records that have characterized our fighting machines. The Fafnir Bearing Company, New Britain, Connecticut.



MEN of INDUSTRY_



MASON BRITTON

Mason Britton, Lieut. Col. Philip W. Frieder, and Maj. W. P. Tidwell have been appointed to important posts in the Surplus War Property Administration.

Mr. Britton, who has resigned as vice chairman of the McGraw-Hill Publishing Co., effective July 1, will head the SWPA Machine Tool Division. Throughout his business career, he has been closely identified with the machine tool industry in important advisory capacities. He organized the Machine Tool Division of the Office of Production Management (now the War Production Board) and served as head of that division from June, 1940, to Jan. 1, 1942. His services in that connection were recognized by the National Machine Tool Builders' Association when at the 1944 spring meeting in Cleveland a plaque was presented to him, commending his "selfless and untiring service to his country.'

Colonel Frieder, who became chief, salvage section, Army Service Forces, in May, 1943, and who recently has served in an advisory capacity, will be placed on the Army's inactive list June 14 to accept appointment to the post of chief of the SWPA Scrap Metals Division.

Major Tidwell has been appointed secretary of the Surplus War Property Policy Board. On May 30, he reverted to an inactive status from the Army Service Forces which he joined in October, 1942, after five years with Crucible Steel Co. of America.

Arthur S. Klopf, vice president and manager, foundry division, Hansell-Elcock Co., Chicago, has been appointed manager of the iron division, Firegan Sales Co., Chicago, refractories distributor.

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Carnegie-Illinois Steel Corp., Chicago, has announced appointment of George S. Mican as division superintendent of its rolling mills in the South Chicago plant, succeeding Charles C. Hill Jr., who has been transferred to the corporation's engineering department in Pittsburgh. Mr. Mican has been serving at South Works since March 1, 1942,



MAJ. W. P. TIDWELL

as assistant to the general superintendent. Both Mr. Mican and Mr. Hill started their steel careers with subsidiaries of U. S. Steel Corp. in 1919.

Prof. Hugh E. Keeler, Mechanical Engineering department, University of Michigan, has been appointed a member of the American Standards Association's committee on code for pressure piping.

C. B. Pooler has been appointed vice president in charge of manufacturing for Philip Carey Mfg. Co., Cincinnati.

R. T. Dunlap has been appointed vice president in charge of production, Wickwire Spencer Steel Co., New York. **A. G. Bussmann** has been appointed assistant to the president, E. P. Holder. Mr. Dunlap previously was vice president and general superintendent of the Buffalo district. Before joining Wickwire Spencer in 1943, he was general works manager, Vulcan Iron Works, Wilkes-Barre, Pa. Mr. Bussmann previously had been the assistant to the executive vice president of Wickwire Spencer and has been associated with the company since 1930. Before joining the company, he was chief chemist of the Donora Steel works, American Steel &



LIEUT. COL. PHILIP W. FRIEDER

Wire Co. and before that he was president of the Standard Steel & Wire Co., Greensburg, Pa.

Charles J. Symington has been elected chairman of the board, Symington-Gould Corp., New York, and J. A. Sauer has been named president, succeeding Mr. Symington. Mr. Sauer will make his headquarters at Rochester and will be responsible for operations in all plants at Rochester and Depew, N. Y.

George S. Forbes, former assistant purchasing agent, Century Electric Co., St. Louis, has been named chief purchasing agent, succeeding the late G. T. Prosser. W. F. Freese has been advanced from the head of the company's priority division to assistant purchasing agent.

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A. S. Hamilton, district sales manager for Wheeling Steel Corp. at Buffalo, has been transferred to Cincinnati in the same capacity. Joseph S. Borland, salesman for the corporation in the Philadelphia area has been promoted to district sales manager at Buffalo.

J. M. McClintock, general manager, stoker division, Illinois Iron & Bolt Co., Chicago, has been re-elected president



GEORGE S. MICAN



A. S. HAMILTON

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WILLIAM F. LAMOREAUX

of the Stoker Manufacturers' Association. Walter Sormane, sales manager, heating division, Schwitzer-Cummins Co., Indianapolis, was re-elected vice president, and George W. Graham, president, Eddy Stoker Corp., Chicago, was renamed treasurer and to the additional post of secretary.

William Kerber, formerly deputy assistant director of the Steel Division, War Production Board, has been appointed assistant to the president of Hanna Furnace Corp., Buffalo. His headquarters will be in that city where he will act also as special representative of the Great Lakes Steel Corp., Detroit.

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Frank W. Bemis has been appointed sales manager, American Cable and Hazard Wire Rope divisions, American Chain & Cable Co. Inc., Bridgeport, Conn. His headquarters will be at 230 Park avenue, New York.

William F. Lamoreaux has been appointed research metallurgist for Cooper-Bessemer Corp., Mt. Vernon, O., and Grove City, Pa. For the past three years he has been director of research for Meehanite Metal Corp., Pittsburgh.

H. H. Tullis has been elected control-



C. L. KINGSBURY

ler of the American Rolling Mill Co., Middletown, O. He joined the company in 1928 and spent several years on special assignments, directing several important studies in the field of personnel research. He has been assistant controller since 1936.

C. L. Kingsbury, formerly controller of the American Rolling Mill Co., Middletown, O., has been elected director, vice president and general manager, Rustless Iron & Steel Corp., Baltimore.

Allen N. Seares and Howard V. Widdoes have been appointed vice presidents, Remington Rand Inc., Buffalo. Mr. Seares, sales promotion manager for the company since 1937, has been made general manager of the Systems division, and Mr. Widdoes, formerly sales manager of the Systems division, has been named general manager, Typewriter division.

Joseph D. Cousins of J. D. Cousins & Sons Boiler Works, Buffalo, has been re-elected chairman of the Western New York chapter, American Welding Society.

Frank K. Metzger has been elected vice president in charge of sales, Bald-



H. W. TRELEAVEN



FRANK K. METZGER

win Locomotive Works, Eddystone, Pa., and John D. Tyson succeeds him as divisional vice president in charge of the Standard Steel Works division.

William L. Walsh has been appointed district sales manager of the New York and New Jersey territory for the Stanley Works, Steel division, Bridgeport, Conn. Mr. Walsh succeeds Thomas J. Connors, resigned.

I. W. Owings, for several years. deputy chief of the Pipe Branch, War Production Board, has resigned to become associated again with Youngstown Sheet & Tube Co., Youngstown, O.

A. E. Rhoads, since 1938 manager of the Detroit Electric Furnace division, Kuhlman Electric Co., Bay City, Mich., has been elected executive vice president and general manager of the firm.

Jules A. Morland will direct activities of Timken Roller Bearing Co. of South America, Sao Paulo, Brazil, newly-organized subsidiary of Timken Roller Bearing Co., Canton, O., which will handle engineering development of Timken products in Latin America. Two young Brazilian engineers, Murillo Garcia Moreira, 24, of Rio de Janeiro, and Jose Marianno Chaves, 26, of Sao Paulo, have been working at the company's Canton plant to familiarize themselves with the production and application of Timken roller bearings and steel.

Harry W. Treleaven has been appointed manager of the Jersey City steel-service plant of Joseph T. Ryerson & Son Inc., Chicago. He has been associated with the Ryerson company for 35 years and recently has been assistant manager of the Jersey City plant.

Clinton E. Swift has joined Eutectic Welding Alloys Co., New York, as assistant manager of the engineering and research department. Before joining the company Mr. Swift was manager of the Welding division, Ampco Metal Inc., Milwaukee.



H. H. TULLIS



J. B. TYTUS

John B. Tytus, 68, vice president in charge of technical development, American Rolling Mill Co., Middletown, O., died of a heart attack in Cincinnati June 2.

Mr. Tytus pioneered the development of the continuous rolling process of iron and sheet steel and supervised the design and construction of Armco's plant at Ashland, Ky., between 1923 and 1927.

A graduate of Yale University, he joined American Rolling Mill Co. as a member of a crew rolling sheet metal. After several years experimentation, he won the approval of the board of directors in 1921 for a \$7,000,000 appropriation to build a continuous sheet mill at Ashland, Ky. Mr. Tytus supervised the construction and in 1923 the mill went into operation.

In 1935, he received the Gary Memorial Medal for his contribution to the steel industry at the annual meeting of the American Iron and Steel Institute. He became vice president of American Rolling Mill in charge of processing developments in 1927, vice president in charge of operations in 1938, and vice president in charge of technical development in 1943.

William Corse, 66, who maintained an office in Washington for 20 years as consulting metallurgist, died June 3 at Windy Hill, his farm in Westmoreland, N. H.

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John W. Robb, 64, vice president and treasurer, American Car & Foundry Motors Co., died suddenly June 5 at the LeRoy Sanitarium, New York, after a brief illness.

Edward R. Kast, 64, vice president and plant superintendent, Dexter Folder Co., Pearl River, N. Y., died June 3 in New York hospital, New York, after a week's illness. He developed the Kast stitcher feeder for inserting and stitching saddle-wired publications and also developed the Kast insetting machine.

E. W. Christ, 68, vice president in

charge of purchases, director and secretary of Stanley Works, New Britain, Conn, died June 1 while attending a testimonial dinner for F. A. Wooster, retiring divisional superintendent. Mr. Christ had been associated with the Stanley works for 50 years.

George W. Horn, 67, chief structural engineer, bureau of architecture, Board of Education, Chicago, died May 31 in that city. A graduate of Purdue University, he had been associated with the board 38 years.

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Fred J. Blum, 69, director and plant manager, and one of the founders, Armstrong-Blum Mfg. Co., Chicago, died May 23 in Lake Worth, Fla.

Raymond R. Searles, 63, vice president and works manager, Fafnir Bearing Co., New Britain, Conn., died May 27. He entered the Fafnir organization in 1911, becoming vice president nine years later. Mr. Searles held numerous patents for improvements in ball bearings.

-0-Harry B. Davis, 66, treasurer, Steel Sales Corp., Chicago, died suddenly May 27 in Glen Ellyn, Ill. He had been associated with the company more than 25 years.

Allan H. MacCaffray, sales representative, Enterprise Galvanizing Co., Philadelphia, died May 26.

W. H. Purcell, 80, founder and president of the Alliance Machine Co., Alliance, O., died recently. He was one of the founders of Machined Steel Castings Co., the Alliance Structural Co., and the Alliance Mfg. Co. He was a director of the Transue Steel Forging Corp. and the McCaskey Register Co., and chairman of the board of the Alliance First National Bank.

-0-John R. Meehan, 43, assistant to the president, Phelps-Dodge Copper Products Corp., New York, died at the Stamford hospital, Stamford, Conn., June 1.

M. J. Beirn, 66, vice president and general manager of sales, American Radiator & Standard Sanitary Corp., New York, died June 1 at New Rochelle hospital, New Rochelle, N. Y. His home was in Larchmont, N. Y. Mr. Beirn was also a director of the corporation and a member of its finance and executive committees. He was a director of the corporation's subsidiaries. Heating & Plumbing Finance Corp. and the Kewanee Boiler Corp. In 1933, he was a member of the NIRA code authority for the cast iron boiler and radiator industry.

Daniel W. Payne, 77, president and board chairman, Payne Furnace & Supply Co., Beverly Hills, Calif., died at his home in Cheviot Hills, Calif., May 26.

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Charles J. Gresser, 73, formerly pur-

chasing agent of the old United Alloy Steel Corp., later the Central Alloy Steel Co. and finally the Berger division of Republic Steel Corp., Cleveland, died at his home in Canton, O., May 12. He retired from the Berger position in 1932 and since that time has been more or less inactive.

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William P. Laytham, 72, president, William P. Laytham & Sons Co., Paterson, N. J., died at his home in Passaic, N. J., June 2. He had suffered a stroke in his office earlier in the week. Mr. Laytham had long been identified with the New Jersey Foundrymen's Association, serving as president at one time and as member of the board of directors. -0--

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Frederick Moerl, 72, who retired in 1936 as general superintendent of the brass foundry, Pullman-Standard Car Mfg. Co., Chicago, died June 3 at his summer home in Saugatuck, Mich. -0-

B. H. Bristow Draper, 59, president, Draper Corp., Hopedale, Mass., died at his home June 4. He joined the Draper Corp., manufacturer of textile machinery, in 1910 and worked through the ranks to assistant agent, treasurer, and finally president in 1929. He was also a director of the United Shoe Machinery Corp., and served as president of the Grafton & Upton railroad, the Hopedale Coal & Ice Co. and several textile manufacturing firms.

Ira D. LeFevre, 60, comptroller, General Electric Co., Schenectady, N. Y., died June 4 at Clifton Springs, N. Y. He had been associated with General Electric for 41 years and became comptroller in 1935.

-0-

George T. Prosser, chief purchasing agent, Century Electric Co., St. Louis, and associated with the company for 27 years, died recently at his home in St. Louis.

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John Harold Murch, 61, manager, Equipment Division, American Can Co., New York, died suddenly June 1 on a train en route to Cincinnati. Mr. Murch was also assistant general manager of the Amertorp Corp., a wholly owned subsidiary of the American Can Co.

Frederick J. Willits, 59, purchasing agent, Waterbury Farrel Foundry & Machine Co., Waterbury, Conn., died May 27 at the Waterbury hospital. He had been associated with the company for 46 years.

Abe Lutz, 65, owner and founder of the Western Iron & Metal Co., Los Angeles, died at his home in Hollywood, May 28.

Morris D. Lloyd, 80, manager of the hardware division for Beals, McCarthy & Rogers Inc., Buffalo, died in that city, May 28.

TEFIL

Southern California Anticipates More Electrical Manufacturing

Survey shows 11 western states consume 15 per cent of total national production but produce only 2 per cent. Expanded output seen necessary to provide jobs for wartime increment in population. Postwar foreign trade explored

LOS ANGELES

SOUTHERN California industrial and civic organizations are giving increasing attention to the problems of postwar employment and industrial development. The wartime increase in population of more than 300,000 in the Los Angeles area will remain here for the most part if employment can be found, surveys indicate and the need for finding the necessary jobs for aircraft and shipyard workers is giving rise to many discussions and much planning on the part of indusrialists.

Straw in the wind was recent completion of a permanent organization to direct Los Angeles district activities of the Committee for Economic Development. To head this committee a new chairman, Lloyd A. Williams, formerly director of finance for Timm Aircraft Corp. here, and previously assistant controller for Basic Magnesium Inc., was appointed.

Much of discussion during the sixth annual Southern California Industrial Conference, held last month in Los Angeles, dealt with the postwar employment and industrial problems that cessation of hostilities will bring to West Coast industry.

Study by the Los Angeles Chamber of Commerce covering the electrical goods field has just been issued. Previous studies covered opportunities in the iron and steel industries, chemical industries and machinery fields.

The electrical goods field shows the

They Say:

"In 1943, industrial production of the country was much greater than ever before, and national income was higher, too. With an expanded national income has come an appearance of prosperity, but it is a false kind of prosperity purchased at a tremendous price. We are paying in taxes tor less than half of the cost of the war as we go. The balance is borrowed. After the war it will have to be paid back by taxes raised by hard work on the part of all of us."-C. E. Wilson, president, General Motors Corp.

"War is wasteful, and disposition of this enormous reserve of supplies is just part of the war. . . I believe, and I am not talking selfishly, that some of these supplies might be allocated to agencies of government where all the people are concerned-federal, state, county, and city."-F. H. LaGuardia, mayor of New York.

"A country such as the United States, with the capacity

same lack of balance between production and consumption in the 11 western states as was disclosed by previous statistical studies in the other fields.

Consumption of electrical goods in 1939 was five times greater in the 11 western states than western production. This situation existed despite the fact the West was in proportion to its population the greatest buyer of electrical goods in the United States. Sales of electrical appliances in the 11 western states in 1939 totaled 15 per cent of national sales.

In pointing out the opportunities that prewar wholesale purchases of all electrical products combined in the 11 western states during 1939 totaled 10.8 per cent of such purchases in the United States, while during the same period the production of electrical products amounted to 2 per cent of national production.

I to 2 per cent of national products amount- This lack of balance means broad		TE OF PROD	UCTION	I West- s. a.
pportunities in new industrial output	1939 VAL	Los Angeles Industrial	Eleven Western States	939 Pr alue rn State
Industry	United States	Area	o o	
utomotive electrical equipment	\$109 762 000 117.583.000	3 887.000	6,012.000	5.1
arbon products	18 376 000	1vone	718 000	0.4
communication equipment	191 320 000	021,000	3 747 000	2.6
lectrical appliances	41 707 000	D	111.000	0.3
lectrical measuring instruments	41.797.000 SU 049 000	203 000	203,000*	0.5°
lectrical products, miscellaneous	84 828.000	None	0	٥
lectric lamps	470 462 000	6.113 000	13 955.000	3.0 "
enerating, distribution, industrial apparatus	275.870 000	5.080.000	5 616 000	2.0
adios, radio tubes and phonographs	94,305,000		1,530,000	1,6
t-ray, therapeutic apparatus, electronic tubes	17,945,000	939,000	939,000	5.2

•Represents incomplete reporting due to some production so small that data were withheld to prevent disclosure of individual operations, or percentage so small as to be of no significance.

> to produce in peacetime goods and services valued at \$175,-000,000,000, is in grave danger of not finding adequate markets for its products, but not in much danger of inflation."---Alvin H. Hansen, professor of political economy, Harvard University.

> "This issue (contract termination) must be faced in a more practical manner than heretofore. Our small businessmen are still going to have a difficult task to arrive at a satisfactory cash settlement within a reasonably short time. A certificate of indebtedness showing the amount due the contractor for performance of war work, signed by the principals of the company involved and attested by the accountant for the firm, should be sufficient evidence to be used for borrowing purposes on a certain percentage basis at any bank . . . This simple plan would shorten the transition period from war to peacetime products."-George R. Boyles, president, Illinois Bankers' Association.

in postwar years, it is maintained. The table below is from the Chamber of Commerce publication, Southern California Business, and shows opportunities offered for postwar expansion in electrical goods production.

Western States Explore **Export Possibilities**

Observance of Foreign Trade Week, sponsored by the World Trade Committee of the Los Angeles Chamber of Commerce and other civic organizations, held the spotlight recently with many luncheons and meetings. Keynote in these discussions was the relation of postwar foreign trade to the problem of finding full employment after the cessation of hostilities.

In a meeting of the General Contractors Association of America, Southern California chapter, F. J. Connolly manager of the chapter pointed out that postwar public works projects already listed as needed, would cost more than \$1,350,000.000. He advocated that the st te legisl-ture appropriate \$10.000,000 to California cities for making plans, surveys, and buying rights of way ..



NewSpansT

WAR, which made necessary improved land communications "south of the border," particularly in Mexico and Central America, has been responsible for increased bridge construction along the Pan-American highway. These new spans, through 18 countries, are playing an important role in tying the Americas together in closer bonds and accelerating the development, production and transportation of critical materials.

The Corps of Engineers, United States Army, did a great deal of the work of pushing a pioneer road through the gaps on the Pan-American highway in Central America before they withdrew on Oct. 31, 1943, because their services were more urgently needed elsewhere.

Result of the war-expanded bridge and road construction program is that the number of unspanned streams and rivers on the highway route between Laredo, Tex., and Buenos Aires and Rio de Janeiro, has become fewer and fewer. However, much bridge construction remains to be done in southern Mexico, Nicaragua, Costa Rica, and northern Panama, as well as in South America.

The construction program on one of the gaps in southern Mexico—a 145-mile stretch between Comitan and Tapachula—presents such formidable obstacles

Longest suspension bridge in Central America is the Cuscatlan span over the Lampa river in El Salvador, left above. This bridge recently was completed at a cost of \$700,000

Tamasulapa river bridge in Guatemala during construction, left. This bridge was nearly completed before the start of the war the oc

of the

160

17th

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IN IT IT

link Western Hemisphere Republics

Gaps on Pan-American highway being eliminated by co-operative action as war makes necessary improved land communications between Americas. United States has supplied much of the "know-how" and materials for road system

that there is doubt whether this section can be completed before the end of the war, according to Edwin W. James, chief, Inter-American regional office, Public Roads Administration, United States Public Works Agency. Here the highway crosses the towering Sierra Madre range at an altitude of 6500 feet. This project is being undertaken by the Mexican government which believes completion of the section is an "obligation" to the countries of the hemisphere.

Meanwhile bridges are being constructed along the highway route in Costa Rica by the Public Roads Administration of the United States under the inter-American co-operative roadbuilding program.

The new bridges in Latin America are modern in design, well planned as to strategic locations, vital to the economic life of the republics and important to international communication both in war and peacetime.

Of the new highways, the most noteworthy are the international bridges joining ten of the American republics and the \$700,000 Cuscatlan bridge spanning the Lampa river in the interior of El Salvador.

The international bridges cross the boundaries of the United States and

Mexico; Mexico and Guatemala; El Salvador and Honduras; Colombia and Venezuela; Colombia and Ecuador; Brazil and Uruguay; and another such bridge, still under construction, will join Brazil and Argentina across the Rio Uruguay.

Laredo Bridge Best Known

According to Brazilian reports, a second Uruguayan-Brazilian international bridge will be constructed at Quarahy, Brazil, across the Artigas river, connecting with the town of Artigas, Uruguay.

Bridges—both highway and railroad cross the United States-Mexico border at several points, but the much-traveled highway bridge connecting Laredo and Nuevo Laredo is probably the best known. Here the Inter-American Highway begins that leads to Mexico City and points south.

Two international bridges connect Mexico with its neighbor to the south— Guatemala. One is a railroad bridge over the Rio Suchiate providing rail connection between Suchiate, Mexico, and Ayutla.

El Salvador and Honduras are linked by a new international bridge. Formal dedication on Dec. 15, 1943, of the 480foot steel and concrete structure over the

Honduras and El Salvador are connected by a new 480-foot steel and concrete span over the Goascoran river, left below, completed last December

One of the smaller links in the Pan-American highway system is the Maderas bridge in Nicaragua Rio Goascoran marked completion of a new segme t of the Inter-American Highway as well as a connection between the town of San Miquel in El Salvador and Nacaome in Honduras.

The bridge was built by a United States firm as a co-operative project of Honduras, El Salvador and the United States Public Roads Administration.

The United States Public Roads Administration also is constructing two bridges within Honduras.

Colombia is jo.ned with Venezuela by the Puente Internacional Simon Bolivar connecting San Artonio del Tachira, Venezuela, and Cucuta, Colombia. It is on the Simon Bolivar Highway—a secton of the Pan American Highway system—that connects Quito, Ecuador, and Bogota, Colombia, with Caracas, Venezuela.

Colombia also is joined by the Puente Nacional Rumichaca with Ecuador. The bridge crosses the border a few miles south of the Columbian town of Ipiales.

The Maua International Bridge, another link in the Pan American Highway, crosses the Rio Yuguaron and joins the town of Rio Branco in Uruguay with the town of Juaguarao in Brazil.

Work has been proceeding since November, 1941, on a great international bridge across the Rio Uruguay, between Paso de los Libres, Argentina, and Uruguay, and Brazil.

For the construction of permanent bridges along the Inter-American highway, the United States Public Roads Administration entered into a contract with the Frederick Snare Corp., New York city. This contract now covers construction of nine permanent steel or concrete bridges—four to be located in Nicaragua, two in Costa Rica, two in Honduras, and one on the El Salvador-Honduras border.



Start Work on Iron Ore Mines In Venezuela

Bethlehem Steel Co.'s subsidiary expects 16 mining concessions in Bolivar to yield 2,000,000 tons of ore annually

IRON Mines Co. of Venezuela, subsidiary of Bethlehem Steel Corp., Bethlehem, Pa., has started development work on a block of 16 iron mine concessions in the state of Bolivar, Venezuela, South America.

The concessions, which the company is developing at its own expense, are expected to yield up to 2,000,000 tons of iron ore annually at the end of the present construction period. The ore, a hard, high-grade hematite, suitable for use in both blast furnaces and openhearth steel furnaces, will be shipped to the United States for use in Bethlehem's eastern steel plants.

The concessions, known as the El Pao mines, are located in an almost entirely undeveloped tropical jungle about 30 miles south of San Felix, a town situated near the confluence of the Orinoco and the Caroni rivers, about 165 miles from the point on the coast where the Orinoco empties into the Atlantic Ocean.

Before ore can be shipped from the El Pao mines, a port site named Palua must be completed on the Orinoco river, near San Felix. Construction now in progress at Palua is expected to be completed this year. It includes ore storage and loading facilities, a dieselelectric power plant, water works, shops, warehouses, and a complete village for housing employes.

Towmotor Corp. Celebrates Twenty-fifth Anniversary

With a banquet at the Allerton hotel, Cleveland, recently given in honor of its employes, Towmotor Corp., Cleveland, celebrated twenty-five years of service in the materials handling field.

The 800 men and women who attended were presented with a book published by the corporation, entitled, "25 Years— Towmotor". The book tells the story of Towmotor Corp. from the time it was founded by F. W. Sears and his son, Lester M. Sears, down to the present. It emphasizes the important role fork lift trucks are playing in the wartime movement of materials.

Plating Equipment Company Formed in Newark, N. J.

Industrial Hard Chromium Plating Equipment Corp., Newark, N. J., has been formed under the direction of William A. Crowder, president, to manufacture plating equipment based upon entirely new principles of design and operation. The new corporation's manufacturing facilities will be located at 13 Rome street, Newark, N. J.

Mr. Crowder, who since 1937 has also been president and sole owner of the Industrial Hard Chromium Co., Newark, N. J., holds out great hopes for the new company in that its equipment is expected to save hours of job preparation time, do away with complicated anode fabrication, and relieve the need for technically skilled operational labor.

In 1935, Mr. Crowder invented an electrolitic process for depositing 3 per cent nickel, 97 per cent iron alloy at the rate of .030 per hour.

National Bond Record Made By Fellows Gear Shaper Co.

At a ceremony held recently at its plant in Springfield, Vt., Fellows Gear Shaper Co. was given a citation by the United States Treasury for having achieved the national record for per capita purchases of fourth war loan bonds by employes. The average was \$87.35 per employe, the total amounting to \$177,667.

Speakers at the ceremony included William H. Wills, governor of Vermont, and Mortimer R. Proctor, lieutenantgovernor; Orville Poland of the national staff, War Bond Commission, and Fred C. Martin, Vermont State Administrator, War Bond Commission. Edward W. Miller, general manager of the company, acted as master of ceremonies.

BRIEFS . . .

Edward Valve & Mfg. Co. Inc., East Chicago, Ind., recently appointed Herr-Harris Co., Pittsburgh, its representative in the Charleston and central West Virginia territory.

Federated Metals division, American Smelting & Refining Co., Detroit, announces new headquarters for its general aluminum department at 729 Fisher building, Detroit 2.

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Dunn Engineering Co., Detroit, announces removal of its organization to 6341 Lyndon avenue, Detroit 2.



METAL TREATING INSTITUTE: Members of the Metal Treating Institute are pictured at their spring meeting May 19-21 at the Metlab Co., Philadelphia. Left to right, front row, are: H. C. Knerr, Metlab Co.; A. Vard Dennison, B. M. Heat Treating Co.; V. Asikian, Bennett Steel Treating Co., A. M. Cox, Pittsburgh Commercial Heat Treating Co.; Harold Seitz, Commercial Steel Treating Co.; R. G. Sault, Porter Forge & Furnace Co.; L. A. Lindberg, Lindberg Steel Treating Co.; Fred Heinzelman, Fred Heinzelman & Sons; E. R. Aemisegger, Metlab Co.; C. S. Cook, Cook Heat Treating Co.; F. T. Chapman, Metlab Co.; Clarence F. Graham, Metal Treating Co.; W. W. Frank, Metlab Co. Back row: G. A. Richardson, Metlab Co., L. G. Field, New England Metallurgical Corp.; Byron W. Small, Cincinnati Steel Treating Co.; Stewart N. Clarkson, executive secretary, M. T. I.; Stanley Wishoski, Industrial Heating; John Gier, Ferrotherm Co.; A. D. Bach, New England Metallurgical Corp.; Charles U. Scott, C. U. Scott & Sons; Charles G. Heilman, Commonwealth Industries; D. M. Fleming, U. S. Heat Treating Co.; H. L. Miller, B. M. Heat Treating Co.; C. M. Putney, Metlab Co.; Glenn R. Ingels, Cook Heat Treating Co.; Jesse D. Myers, Geo. H. Porter Steel Treating Co.; Fred A. Snow, Fred A. Snow Co.
War Production Board's "Facts for Industry" Data

Μ	lotor Truc	ks and Tru	ick Tracto	r Output		
		Med um			Heavy	
	-9.000-16	.000 Lbs. GV	W°		Lbs. GVW as	nd Over ^o
1943	Civilian	Military	Total	Civilian	Military	Total
Inn		7.019	7.019	106	18,533	18,639
Fab.		6.453	6.453	226	17,327	17.558
Mench		8 268	8 268	284	19.781	20.065
Marcu		9.717	9.717	247	23,026	23,278
April - a construction of the set		12 696	12 696	304	20,000	21.24-
May		14,070	14,070	395	21,263	21,658
,-		10.004	10.004	150	00 1 4 9	00 001
July		16 024	16,024	173	23,140	20.021
Aug		17 809	17,809	162	23.358	20.020
Sept.	10100	16 094	16 094	133	20.121	20.20
Oct	68	17,739	17,807	95	20,050	20,140
Nov.	48	15 072	15,120	142	19,950	20.10
Dec	63	13,847	13,910	442	21,831	22,270
Total	179	154,808	154,987	2,709	249,368	252,077
1944						
Ian	1.985	13 369	15.354	546	21.667	22.21
Feb	1.798	10.440	12.238	968	21,911	22,879
March	3.318	8.854	12 172	1,308	22 376	23.684
April	6,229**	7,038**	13,267°°	1,887**	21,465**	23,355
		Light			Totals	
		9.000 Lbs. G	VW*		-All Sizes-	
1943	Civilian	Military	Total	Civilian	Military	Total
Ion		23 727	23.727	106	49 279	49 38
Fab		23.314	23 314	226	47.094	47.320
Morch		27 544	27.544	284	55 593	55 87
April		23 107	23,107	247	55 850	56 09
Mon		21 217	21.217	304	54.853	55.15
Tuno		20 734	20.734	895	56.067	56.462
Jane		20,101	,			

		Light r 9.000 Lbs. G	VW*		Totals —All Sizes—	
	Civilian	Military	Total	Civilian	Military	Total
		23 727	23.727	106	49 279	49 385
		23.314	23 314	226	47,094	47,320
h	20.00	27,544	27.544	284	55 593	55 877
		23 107	23.107	247	55 850	56 097
		21.217	21,217	304	54,853	55,157
		20,734	20,734	395	56,067	56,462
		20 925	20 925	178	60 097	60.270
		19.944	19.944	162	61.111	61,273
		21 089	21 0 89	133	57,304	57.437
		22 0 16	22 046	163	59.835	59 998
		21 717	21.717	190	56 779	56 9 69
		23,074	23,074	505	58,752	59,257
Total		268,438	268,438	2,888	672,614	675,502
4						
		21,479	21.479	2 531	56 515	59.04 6
		21 095	21095	2.766	53 446	56 212
rh		21 081	21 081	4,626	52.311	56,937
I		19,538**	19,533**	8,116**	48,036**	56,152**

°Gross Vehicle Weight. °°Preliminary.

July Aug. Sept Oct. Nov. Dec.

194 Jan, Feb, Mar Apri

All-Metal Cans as Desi	gned for	Packing	Cranes and	Shovels	Shipmer	nts	(Mi	llions of	Pounds	>	
Months of 1944				Crawles	Truck			Prim	ary— ·	-Secor	ndary—
	China	manto		Mounted	Mounted	Total		1942	1943	1942	1943
	Snipi	nems .	1027	0.074	010	0.000	Tan	64.5	121.3	17.3	37.1
	January	February	1937	2.974	012	3,200	Feb	60.2	111.2	21.9	36.9
Fruits and Vegetables	34.857	40,335	1938	2.260	213	2,473	Mar	68.8	129.2	25 2	40 5
Condensed and Evaporated			1989	2.503	243	2.746	Apr	70.0	133.6	30.0	41.2
Milk	15.364	17.612	1940	3,216	378	3,594	May	74.4	1457	30.0	41.1
Other Dairy Products	4.525	4,825	1941	4,191	835	5,026	June	79.0	1483	31.2	42.9
Meat	14 082	13,611	1943				July	90.0	156 9	33.7	37.9
Fish and Sea Food	3 843	4 605	Ist Ouarter	1.167	370	1,537	Aug.	97.9	162.7	33.9	43.2
Military Bations	6 4 1 1	6.074	2nd Quarter	1.238	485	1,723	Sept.	99.1	1/2.0	07.4	510
All Other Foodr	14 989	16 772	Srd Quarter	1.431	497	1.928	Oct	110.0	189 7	37 4	54.4
All Non-Food	14,268	12,177	4th Quarter	1,455	575	2,030	Dec	120.0	187.2	37.8	55.09
Tatal	108 330	116.011	Total	5 291	1 937	7.218	Total	1.042.2	1,839.8	370.4	527.6

METAL CAN SHIPMENTS

By Manufacturers of All-Metal Cans, by Product to be Packed (Tons of Steel)

Months 1943	Fruits & Vegetables	Dairy* Products	Meats	Fish and Sea Food	Military Rations	All Other Food	All Non-Food	Total for all Products
January February March April May June July August September October November December	$\begin{array}{c} 28 \ 931 \\ 26 \ 817 \\ 29.484 \\ 34 \ 980 \\ 44.013 \\ 84.891 \\ 128,103 \\ 155.294 \\ 126 \ 420 \\ 68 \ 233 \\ 32.818 \\ 36.848 \end{array}$	$\begin{array}{c} 18.829\\ 19.618\\ 25531\\ 28.481\\ 32.191\\ 34.984\\ 80.909\\ 25797\\ 22.993\\ 19.317\\ 16.018\\ 17.367\end{array}$	$\begin{array}{c} 15.863\\ 16.063\\ 15.396\\ 14,099\\ 14.283\\ 13.801\\ 13.920\\ 13.362\\ 10.963\\ 10.763\\ 12.261\\ 13.276\end{array}$	$\begin{array}{c} 4.084\\ 5.492\\ 5.287\\ 5.391\\ 9.890\\ 5.891\\ 9.310\\ 8.977\\ 8.434\\ 7.659\\ 7.149\\ 5.422\end{array}$	$\begin{array}{c} 8.293\\ 6.175\\ 6.046\\ 4.310\\ 2.323\\ 3.209\\ 2.913\\ 2.221\\ 5.485\\ 5.409\\ 5.456\\ 5.438\\ 5.438\end{array}$	9,885 9,215 10,608 11 016 9 709 10,595 10,878 19 080 21 901 14,370 16 355 19,719	8.169 7.522 9721 10.746 10.017 11.382 10.956 11.656 11.780 10.889 10.690 14,428	94 054 90.902 102.073 109.023 122.426 164.753 206.989 236 387 207.976 136 640 100.747 112.498
Total	796 832	202 025	164.050	82.986	57.278	163,331	127,956	1,684,468

*Contains condensed and evaporated milk cans shown separately after December, 1943.

Gray Iron Castings Shipmentst

1943	\$																		Net Tons
Jan.																			721,560
Fcb.		,						4											683,277
Mare	ch																		796,618
Apri	1		,																820.339
May																			800,266
lune																			814,158
July																			712.224
Aug.		Ì																	744.347
Sept																			785 449
Oct.																			786.614
Nov		ĺ			Î		Ĵ			Ì				1			Ì	Ì	760 883
Dec		1																-	792 065
Dec.		1					1			-			1						102,000
	Т	0	t	al	l-	-1	9	4	3										9,217,800

Represents about 93 per cent of industry.

Road Rollers

		1	Shipments	Unfilled Orders (End of Quarter)
193	7		997	
1938	3		1,083	
1939			1.022	
1940)		1,317	
1943	1		2,716	
194	12			
4th	Quarter .		591	1,877
194	13			
lst	Quarter .		513	2 016
2nd	Quarter .		770	1.954
3rd	Quarter .		724	2.824
4th	Quarter .		843	2,302
	-			

2,850 Total

....

	Marine Hardware	Fittings Unfilled Orders
Month 1943	Shipments	at End of Month
Nov.	\$3,902,000	\$23,953 000
Dec 1944	4,257,000	21,162,000
Jan.	4,093 000	22,711.000
Feb.	4,032.000	21,310 000
March	4.492.000	19.801.000

Primary Aluminum Ingot Output

91

Monthly

THE BUSINESS TREND _ Labor Chief "Chokepoint" In Production Outlook

WAR output held fairly steady over the recent holiday weekend. Steel production remained at 98.5 per cent of capacity, while bituminous coal output edged slightly upward and engineering construction advanced sharply. Revenue freight carloadings, truck assemblies and electric power consumption recorded a less than normal dip.

However, crude oil production and manufactured petroleum products are not keeping pace with military and essential civilian demands, necessitating a continued draft on inventory. In coming weeks electric power output is expected to be adversely affected by recent closing down of the last four pot lines at a government-owned

aluminum plant and prospects of additional curtailment expected soon at another plant.

The production outlook in steel is not encouraging for it is felt that neither labor nor equipment can stand much longer the grueling pace. The manpower situation is the chief problem, for during the summer months the men cannot work such long hours, while maintenance work on operating facilities is also delayed because of this factor. Steel requirements over the next few months will be greater than earlier anticipated.

MATERIAL SUPPLY—Supply of and demand for basic metals for all essential military and civilian programs are more nearly in balance than at any time since Pearl Harbor. This balance is precarious for some metal mill products because of manpower losses and expanding military needs for certain specialized items.

Discussing the manpower problems confronting the nation at present, Joseph D. Keenan, vice chairman, War Production Board, recently said the number of male workers available for war production has dropped 1,500,000 since March, 1943, and is 5,410,000 below the March, 1942 level.

COAL OUTLOOK-Estimated deficit in

FIGURES THIS WEEK

coal supplies for the year ended April 1, 1945 is 39 million tons, or about 20 days' supply. At least 30,000 more miners are needed now if industry is to get adequate flow of coal.

April production of both by-product and beehive coke declined 167,741 net tons to 6,176,483, but topped the 5,964,158 net tons produced in like 1943 month. On a daily average basis, however, April output recorded an increase over the preceding month. During April, 110 new by-product ovens were put into operation adding 1420 tons to daily coking capacity.

WAR EXPENDITURES—May war spending totaled \$7, 879,293,621, considerably above the previous high of \$7,725,668,536 registered last March. For the first 11 months of the current fiscal year expenditures amounted to \$79.5 billions, against \$64.6 billions in corresponding period last year. High level of war expenditures is expected to be maintained over coming months.



Foreign Trade Bureau of Foreign and Domestic Commerce (Unit Value—\$1,000,000)												
ExportsImports												
	1944	1943	1942	1941	1944	1943	1942	1941				
an	1,192	730	481	325	300	228	254	229				
Feb.	1,086	719	480	303	313	234	254	234				
March	1,159	988	628	357	359	249	272	268				
April		980	717	387		258	235	287				
viay		1,085	535	385		281	191	297				
une		1,002	648	330		295	215	280				
uly		1,262	650	365		300	213	278				
Aug		1,204	703	460		815	186	282				
sept.		1,233	732	425		285	196	262				
Det.		1,193	802	666		32.9	200	304				
Nov		1,074	787	492	*	317	168	281				
Jec		1,241	873	653		278	\$58	344				
fotal	4	12,716	8,035	5,147		8.369	2.742	3 345				

INDUSTRY Steel Ingot Output (per cent of capacity). Electric Power Distributed (million kilowatt hours). Bituminous Coal Production (daily av.—1000 tons) Petroleum Production (daily av.—1000 bbls.) Construction Volume (ENR—unit \$1,000,000) Automobile and Truck Output (Ward's—number units). °Dates on request.	Latest Period° 98.5 4,144 2,088 4,523 \$106.9 16,950	Prior Week 98.5 4,292 2,052 4,514 \$27.9 18,260	Month Ago 99.0 4,234 2,060 4,519 \$41.9 15,635	Year Ago 98.5 3,926 1,959 3,933 \$23.2 17,215	- ALLAN
TRADE					
Freight Carloadings (unit—1000 cars). Business Failures (Dun & Bradstreet, number). Money in Circulation (in millions of dollars)‡ Department Store Sales (change from like week a year ago)‡ ‡Preliminary. ‡Federal Reserve Board.	860† 22 \$22,112 +15%	870 33 \$21,911 +31%	837 42 \$21,614 - 11%	668 56 \$17,196 + 21%	

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THE BUSINESS TREND





Fabricated Structural Steel

(Inna folis)											
	Sł	ipmer	nts		-Backlogs-						
	1944	1943	1942	1944	1943	1942					
Jan.	30.0	91.9	167.8	113.1	839.1	704.4					
Feb.	37.6	90.8	164.6	117.6	321.0	706.7					
Mar.	34.2	94.0	191.3	106.3	299.8	777.7					
Apr.		86.6	187.2		272.5	772.4					
May		78.9	184.2		220.6	843.8					
June		68.4	182.7		207.1	869.8					
July		56.8	189.9		201.3	808.6					
Aug.		50.2	173.9		195.6	783.5					
Sept.		51.8	169.8		208.1	716.0					
Oct.	1.111	80.1	152.9		274.0	617.7					
Nov.	4.745	42.7	130.4		134.6	566.6					
Dec.		39.6	145.3		113.0	523.5					

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



Jan

Feb.

Mar.

Apr. May

June

July

Aug

Sept.

Oct.

Nov

Dec.

Total

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FINANCE Bank Clearings (Dun & Bradstreet-millions) Federal Gross Debt (billions) Bond Volume, NYSE (millions) Stocks Sales, NYSE (thousands) Loans and Investments (millions) [†] United States Government Obligations Held (millions) [†] †Member banks, Federal Reserve System.	Latest Period° \$7,498 \$188.0 \$52.6 4,393 \$50,240 \$37,184	Prior Week \$8,290 \$187.7 \$59.7 4,611 \$50,319 \$37,232	Month Ago \$9,319 \$187.4 \$42.0 3,398 \$51,064 \$37,834	Year Ago \$7,769 \$140.0 41,813 5,736 \$47,068 \$34,093
PRICES STEEL's composite finished steel price average Spot Commodity Index (Moody's, 15 items)† Industrial Raw Materials (Bureau of Labor index)‡ Manufactured Products (Bureau of Labor index)‡ †1931 = 100; Friday series. †1926 = 100.	\$56.73 250.8 113.6 101.1	\$56.73 250.7 113.3 101.1	\$56.73 249.6 113.2 101.0	\$56.73 246.1 114.3 100.9

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Slack Light

Goes to Work on the Production Line

New and highly sensitive inspection tool provides positive indication of defects that otherwise would show up only as service failures. By preventing these failures, reliability of such critical items as aircraft engine bearings is greatly improved

"BLACK" LIGHT does not make ordinary objects visible nor can you see the light from the light source because its wavelength is in a region where the human eye does not respond, being just beyond the violet end of the visible spectrum. See Fig. 9.

Certain substances, however, possess the ability to transform light waves from one frequency to another. Thus, some materials become visible under "black" light because they reflect light in the visible spectrum when struck by ultraviolet waves from the light source. This ability to absorb light of one wavelength and emit or reflect light of another wavelength is called *fluorescence*.

Applications: One practical application of this phenomenon is in the testing of mine and surface ores for certain minerals. Most metal salts and certain crystalline forms fluoresce in characteristic patterns which make their identification under ultra-violet light a fast and positive operation.

Possibly the most familiar application of this phenomenon is found in the

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fluorescent lamp now in wide use. This lamp depends upon fluorescence of a coating on the inside surface of the glass tube for its highly efficient action.

Another application is to illuminate murals, decorative wall panels, and trim in movie theaters. Using paints that fluoresce under black light activation, beautiful effects are achieved without white light illumination that would reduce visibility of the picture on the screen. Fluorescent materials in aisle carpeting are activated by black lights in the ceiling to guide the patron to his seat.

Sensitive Inspection Tool: A new and increasingly important industrial application is to supplement other inspection techniques to reveal minute pores and cracks which are too small to be found otherwise. Applications of this technique already in use include detection of shrinkage cracks and porosity in castings, detection of cracks in carbide tipped tools and lack of perfect bond between tip and shank, detection of seams and cracks in tungsten rods used to carry electricity into vacuum tubes. Here, any seam in the rod results in a leak in the tube. The method is also being applied to plastics and ceramics.

It permits large non-portable welded structures to be inspected for cracks and pores in the welds, no matter how small the cracks may be. Fatigue cracks in the steel will also be revealed. This latter application is proving valuable in checking turbine blades during periodic overhaul to catch fatigue failures before they occur.

It also is providing assurance against defective aircraft engine bearings.

Checks Bearings: The application to aircraft bearing inspection has been highly developed at the Cleveland Graphite Bronze Co., Cleveland. It now enables the detection and evaluation of defects which can be located in no other manner. And, the application is not confined to laboratory or experimental use. The process has been put on a full production basis as a step in the regular manufacturing process, thus affording a most valuable guarantee that each and every bearing passing the test is as near perfection as possible.

The process is used in the production of main bearings and master rod bearings for aircraft engines. These bearings are silver-lined and steel-backed. Due to the extremely high loadings they must withstand and the fact that a main



bearing failure means an engine failure and probably a disabled plane, every possible means is taken to be sure that each bearing is absolutely perfect. To that end, bearings are X-rayed and inspected under black light, as will be described in detail.

Silver-Steel Bearings: About 65 per cent of bearings and bushings being made for aircraft engines have a steel backing lined with a copper-lead alloy. The balance, or about 35 per cent, are lined with silver deposited by electroplating, it is reported. At one time the silver was centrifugally cast against the

steel backing but it was difficult to eliminate small gas holes at the bond line between the silver and steel. This type of defect was detectable only by Xray examination.

While there has been no proof that these gas holes caused bearing failure, electroplating eliminates this trouble and also overcomes distortion which was a very serious problem in the centrifugally cast bearing because of the extremely close limits required on these precision fit bearings. Xray examination is employed on silver plated bearings to check "blisters", small inclusions, dirt and porosity.

It also is necessary to check the bond between the steel backing and the silver plate. X-ray inspection has not been completely successful in determining lack of proper bond, reports Charles Rogers, chief radiographer, Cleveland

Graphite Bronze Co. Accordingly, encouraged by John Palm, vice president in charge of engin e e r i n g, and Carl Swartz, chief metallurgist, he undertook to investigate the possibilities of using "black" light to supplement Xray inspection on this job and completed his labor-

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Fig. 1—Loading silver-steel master-rod bearings for radial aircraft engines from padded tote box at right into special lead-lined baskets at left for handling through impregnating and cleaning operations. Photos by Birdsall

Fig. 2-Basket of bearings being inserted in degreaser, first step in processing line

Fig. 3—After degreasing, bearings are impregnated in oil bath, allowed to drain on sloping board in foreground, given series of three cleaning dips in tanks in background

Fig. 4—Final cleansing of surfaces is done individually in small container shown here, cleaned bearings being placed on paper at left for drying







atory work on the process late in 1941.

Scheme Employed: The result was the introduction of "black" light inspection as a regular production operation in the plant. Briefly, the system worked out involves cleaning and opening up the pores of the work, followed by sealing up a fluorescent oil in any pores or cracks that may be present. Then surface oil is removed, the work heated to drive out oil that may have been sealed in defects and the bearings examined under black light where the fluorescing oil shows up any defects rapidly and clearly, as will be explained in detail.

Cleveland Graphite Bronze plant No. 4 at 880 East Seventy-second street, Cleveland, has the most highly developed black light inspection line, although the original experimental line set up at the main plant is still in regular operation. The system employed in both locations is identical.

Bearings Processed: Illustrations and description here show operations on the master rod bearing, a unit that is approximately 3 5/16 inches inside diameter and 3 inches long with a wall 0.140inch thick. It is made from low carbon SAE-1010 or 1015 steel. Some bearings employ an alloy steel. Silver is deposited to a thickness of 0.015 to 0.018inch on the inside diameter with some 0.002 or 0.003-inch on the outside diameter. None is plated onto the ends, for the juncture line between the silver plate and steel back seen at the ends is relied upon to reveal poor bond conditions during black light tests, as will be explained. At one end these bearings have many splines, resembling gear teeth. See Fig. 1. Ends are masked during plating.

After plating and prior to black light inspection, the silver inside diameter is diamond bored and ground to an extremely high finish, measurable in a few microinches. Grinding is necessary before black light inspection because no matter how thoroughly cleaned, some machining lubricant is almost sure to remain in the valleys' left from the machining operation to show up and produce false black light indications later.

Loading: The bearings are received in the black light department in steel tote boxes with wood, fiber or corrugated paper liners to separate individual bearings from one another, and to pad the bottom. Every care is taken to prevent marring the highly finished surfaces.

Bearings are handled throughout the impregnating operations in pecial baskets which have lead strips placed in such a pattern on the bottom that the bearings do not contact the steel mesh of the basket at any point. Fig. 1 shows operator loading work from tote box into mesh baskets which are about 18 inches Preliminary Cleaning: First step in

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Fig. 5-Small and large streaks at back are defects as seen under black light

Fig. 6—Black light inspection room where operators examine work under special spotlights using mercury vapor lamps and filters to produce nearultra-violet light that causes defects to show up as bright yellow-green spots due to the entrapped oil fluorescing

Fig. 7—Brighter spots here are obtained by use of a yellow filter when taking the photo, also show defects. Cleveland Graphite Bronze photo

Fig. 8—Continuous still provides flow of clean solvent in the three tetrachlorethylene baths. Unit is electrically heated, operates automatically

the processing sequence is a preliminary cleaning to remove all dirt and dust and to open up any pores and small cracks. This is done in a vapor type degreaser shown in Fig. 2, using tetrachlorethylene. The tank is about 3 feet square and 4 feet deep. Three electric heating elements under automatic control maintain the tetrachlorethylene bath at its boiling point of about 249 degrees Fahr.

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While vapor in the tank is much heavier than air and so tends to remain in the tank, covers are used and the tank opened only to insert and remove baskets of work. Bearings are not immersed in the bath but are placed just above the liquid level where the hot vapor condenses on them and streams off, carrying all dirt and soil with it. At the same time, the units are heated to around 240 degrees Fahr. since they are allowed to remain in the degreaser for about 15 minutes.

Efficient Layout: Movement of work in the department is over a path roughly resembling a circle. After loading on tables crosswise the start of the cleaning line, an electric overhead hoist traveling on a monorail is employed to move the work from bath to bath down the processing line. Thus the girl operators are

Fig. 9—Portion of spectrum involved in black light inspection is indicated at 3650-mark able to handle the work hour after hour with minimum fatigue.

And the layout of the department is such that after moving down the cleaning line, bearings end up on a table which is rolled into the darkened "black" light inspection room and from there out to the incoming point for routing back into the remaining production line operations. These involve only deburring and packing for shipment, as this inspection is done at the very end of the regular production line.

Impregnation: Hot work coming from the degreaser is immersed in a bath of penetrant, a treated Pennsylvania type crankcase oil of medium viscosity being used as this oil penetrates well, is highly soluble in tetrachlorethylene and fluoresces brightly to give strong indications. Several other oils could be used, in fact some systems of this type employ an oil containing an organic dye to fluoresce more brilliantly. Water soluble oils are also employed in certain installations, cleaning then being accomplished under water sprays.

A portion of the oil tank can be seen in the foreground of Fig. 2. Tank is about 3½ feet wide, 6 feet long, but not as deep as the degreaser. Work is allowed to remain in the oil until it reaches room temperature or something under 100 degrees Fahr. Oil temperature is kept under 100 degrees by circulation through a water-cooled heat exchanger.

As the bearings cool in the oil bath, minute cracks and pores tend to close up tightly, trapping a certain amount of oil in them. This trapped oil subsequently is employed to indicate the location, size and extent of the defects.

Final Cleaning Cycle: But before that can be done, all oil must be completely removed from the surface, since any remaining will produce false indications under black light. This job is started by letting the work rest on the sloping drain board shown in foreground of Fig. 3. A good portion of the oil runs off here. Drain board is about 8 feet long so it can accommodate several racks at a time, allowing a long drain period.

Next the racks of bearings are immersed in succession in three tetrachlorethylene baths seen beyond the drainboard in Fig. 3. All the work is handled by girls, using an overhead hoist on a monorail track that extends over the line.

Baths Purified Continuously: To assure utmost efficiency and continued effectiveness, a unique system is employed to remove impurities from the solvent on a continuous basis. The electrically heated still shown in Fig. 8 is located between the outside building wall and the line of tanks shown in Fig. 3. Its output of 12 gallons per hour is pumped into the bottom of the last or third tank in the series.

About 10 inches down from the top of this tank, an outlet hole is drilled to allow the cleaning liquid to run into the second or middle tank. These are not really separate tanks but a single unit of welded steel with two partitions. In a similar manner, a second hole bored in the side next to the first tank and several inches lower than the first hole allows the tetrachlorethylene to flow on into the first tank. From here, it flows into the still.

This system provides a continuous change of cleaning fluid, pumping the clean liquid from the still into the last (*Please turn to Page* 156)





measuring up to 36 feet long are readily formed on shop-built press

ONE of the most difficult metal fabrication problems is that of forming heavy plates in large sections, which have the advantage of assembly with a minimum amount of welding. An interesting development in plate fabrication which has been the outgrowth of this problem, is illustrated in a new and novel press designed and built by Fort Pitt Bridge Works, Canonsburg, Pa.

This press lends itself especially to quantity production orders, where there is a requirement involving a large number of pieces of a given section. The expansion of the shipbuilding program has required extensive developments in this field.

The problem which resulted in the development of this machine was that of making four bends parallel to the length of a plate 36 feet long and in its bent form, 5 feet wide. This operation forms a dish in the center of the plate through its length which varies from 6 inches in some sections to as much as 12 inches in others.

The press built by Fort Pitt Bridge Works is capable of bending plates longitudinally up to 36 feet. The difficulty in obtaining component parts without resorting to high priority ratings made it clear that it would be necessary to build the press almost entirely from used equipment. The company thereupon with some difficulty located and rented six used jacks which could be supplied immediately. The same thing held true with respect to the hydraulic system. Pumps and accumulators were not available, so hydraulic equipment was located which was not in use, and

By R. L. HARTFORD Pittsburgh Editor, STEEL

some of which had not been used for many years and, in one case, was more than 50 years old. With considerable ingenuity these parts were finally assembled into an efficient machine, which has helped materially in satisfying some of the emergency requirements for large formed plate sections.

The heart of this unusual machine is six 500-ton hydraulic jacks equally spaced under a heavy platen, making the aggregate capacity of the press 3000 tons. Actually, only about 2000-ton capacity is being used at the present time in formation of plate. Principal difference between fabrication of the section on this press and on a brake is that the action here is a combination of time, power and motion. There is no impact involved. The press action is slow, resulting in no change in grain structure. Bends are generally made in one operation, which cuts down handling considerably and enables the operator to handle between 15 and 20 tons per hour of some of the heavier sections.

The motion of the press is similar to that of a stamping press with considerably slower action and without the use of forming dies. The bending process produces a sliding action on the press such that the plate being formed is not gripped immovably until the last few seconds of the operation. This means that the pressure on the actual bend never exceeds the elastic limit of the plate.

In its construction the press is extremely simple. It consists of a heavy

Fig. 2 (Right)—Plate forming press built in the shops of the Fort Pitt Bridge Works is in the form of an inverted box in which the upper platen performs the function of the bed in a conventional press and the lower platen is movable. Plates enter the press at the right end and are removed after forming at the left. Formed plates nested at lower left indicate close tolerances obtained

Fig. 3 (Right, opposite page)—Six 500-ton hydraulic jacks located beneath the press provide the motive power used in supplying a 300-ton push in forming



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structural box-like framework with the long axis horizontal. The upper platen is fixed rigidly to the framework and the lower platen is mounted on the six hydraulic jacks which are distributed equidistant over the length of the platen. The blocks, which perform the function of die blocks in an ordinary press but which actually are not die blocks, but merely sections of ordinary low carbon steel, are fastened to the upper and lower platens in such a way as to perform the required bending operation. By varying the size and shape of these blocks, it would obviously be a simple matter to make many desired forms.

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A heavy tonnage has already passed through this machine and no cracks or splits have yet occurred. The fact

that there is a sliding action between the plate and the forming blocks probably accounts for this. These points are lubricated with heavy grease, and it has been necessary to replace these side pads only once in the first year of operation. An auxiliary of the fabrication operation which is of unusual interest is that because the extreme pressure is exerted only in the last few seconds of the operation, with the plate rigidly held in place, there is action similar to that of a stretcher leveler but exerted across the side of the plate rather than its length. This results in a fabricated plate which has a greater degree of flatness than current rolling mill practice can produce.

Because of the unusual length and

Fig. 1—A formed plate has been removed from the press. A cable puller removes the formed plate and at the same time draws an another plate between the platens

weight of some plates to be fabricated, the handling became a problem. A continuous line through the press provided the answer. A cable puller located at the end of the conveyor system on the output side of the press is fastened to the fabricated plate by means of chain grips. The opposite end of the fabricated plate is fastened by means of chain grips to the succeeding plate which is placed on the conveying table at the input end of the press. The action of the cable puller in taking the finished plate out of the press brings the succeeding plate into position for fabrication.

Fabrication tolerances are held very close with regard to straightness, flatness and width. In forming some deep bends, the forming dies must be changed with every change in dimension. Obviously it would be a difficult operation to remove two heavy forming blocks, each 36 feet long, in order to provide a deeper draw. To avoid this the actual forming blocks are built up in laminated form by means of a number of thin filler plates, each of which is approximately 1 to 2 inches thick and 9 feet long. The end of each filler plate is keyed so that it may be fastened to the succeeding filler plate, and in this way a long section, 1 to 2 inches thick, can be removed from the press at one time. This 1-inch plate if removed from the top section and inserted in the bottom section would decrease the depth of the bend by a full inch, and conversely if removed from the bottom and added to the top, it would result in a bend 1 inch greater in depth. By means of this interchangeable block system, the press can be converted to alternative dimensions in a relatively short period of time. By sliding the plate back and forth, plates up to 461/2 feet have been perfectly formed.





Multitooth carbide-tipped cutters have attained a state of development which insures their beneficial use in peacetime for

Carbide Milling of Steel

By H. A. FROMMELT Director of Research Kearney & Trecker Corp. Milwaukee

LIMITATIONS of tungsten carbide as introduced to industry in 1928 made it inevitable that further developments make possible the use of this cutting material not only for cast iron and nonferrous materials but also for steel.

The possibility of machining steel with a carbide became a reality with the introduction of tantalum carbide in 1931. Its success in the machining of steel with point tools indicated that some form of carbide, still to be developed, would be introduced successfully to machine steel with a multitooth cutter. At about this time, industry's experience with negative angles in the single point tool machining of nonferrous materials, such as bronze, was translated to the machining of steel. Tantalum carbide accompanied by negative angles successfully removed metal from steel jobs where single point tools could be used.

This quite naturally led to experimentation with a flywheel cutter on milling machines in the machining of steel. Such cutters were successful, at least with some restrictions in their application, but indicated definitely that the milling of steel with multitoothed cutters would become a possibility. Machining operations, however, were left to the commercial development of a new carbide which appeared about 1938 in the form of tungsten titanium carbide. It was at this time that a multitooth cutter employing negative angles successfully milled steel at considerably higher rates of feed and speed than was hitherto possible.

At present, the carbide milling of steel is regular production procedure. Its peacetime use and application is assured and, while it may never replace to a great extent the older cutting mate-

^oPrepared from data presented by Mr. Frommelt before the Westinghouse Electric & Mfg. Co.'s Machine Tool Forum. rials such as high-speed steel, it is safe to assume at the present stage of development that the majority of steel machining operations will in the future be benefited by carbide-tipped multitooth cutters.

Carbide milling of steel as here discussed is variously referred to as "hyper milling" "negative rake milling" and "negative angle milling", but the term is used also in this discussion because the distinctive feature of this milling process on steel is the use of carbide tipped cutters. Other characteristics, while important, are a consequence of the application of carbide to this procedure.

As indicated, use of carbide for the milling of steel is the outstanding characteristic of this technique. A steel cutting grade, usually of the tungsten titanium series, is necessary and as such is provided by all carbide manufacturers. Such carbide tip application has been limited up to the present largely for such milling cutters as face, half side, shell, end mills and slotting and slitting cutters. Inherent difficulties in the application and grinding of tips have thus far prevented its use in form cutters and such special applications as hobs. For the present it is not advisable to consider the complete substitution of carbide for high-speed steel.

Negative Angles: Technique of milling steel with carbide is presently limited to the use of negative angles both in the rake and the helix. This is not true if we included the lower brinells and semisteels where positive angles are quite effective. But for reasonable cutter life under every day shop conditions, negative angles—both rake and helix seem to be necessary to the success of this procedure. These angles are shown in the accompanying line-drawings, Figs. 1, 2, 3 and 4.

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As indicated in Fig. 5, cutting pressures with a negative angle are applied

Fig. 1—Helix angle with respect to direction of rotation Fig. 2—Positive and negative rake angle with respect to direction of rotation Fig. 3—Positive and negative helix angle with respect to direction of rotation Fig. 4—Cutting operation while using positive rake angle and indicating how tip is directly stressed

Fig. 5—Cutting operation while using negative rake angle and indicating how tip away from cutting edge is under greatest pressure

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To Help You Identify Stainless Steels The Corporter Method of Identifying Stainless Steels...

Even in the best regulated plants, steel stocks sometimes do get mixed. And if the stock happens to be Stainless Steel, you know the troubles a mix-up can cause in heat treating, machining, stamping, welding or other fabricating operations. So it's important to you to have a quick method for identifying Stainless that may become mixed in stock.

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To help you meet this problem, the Carpenter Laboratories have developed a new and simplified chart for identifying various types of Stainless Steel. The chart diagrams and explains the nitric acid test, magnet, Here is one of the 11 tests used in the Carpenter Method of Identifying Stainless Steels.

Idealification Tests

Specimens are placed in a solution of muriatic acid (one part water, one part muriatic acid) at a temperature of 180° to 190° F. After a five minute immersion, Type 303 can be identified by a coating of beavy black smudge.

spark, hardness, and muriatic acid tests, sulphur spot and nickel spot tests, and the stabilization test, and shows when and how to use each one. By closely following the instructions on the chart, it is possible to check the identity of Stainless Steels which may be in question.

This chart can be used in your laboratory, to help your stockroom, warehouse or production department check on mixed stocks. Its convenient size makes it easy to use right on the testing table. To obtain a copy, simply send us a note on your company letterhead, indicating your title. Your request will receive prompt attention.





to the tip away from the cutting edge an amount approximately equal to the chip thickness. In the use of positive angles, as indicated in Fig. 4, the cutting edge, which is the weakest and least supported portion of a carbide tip, is directly stressed by the cutting forces. It would seem, from these simple illustrations, that the use of negative angles in milling the harder and more difficult materials are necessary. At any rate, the development up to the present time is built largely around the incorporation of negative angles, both rake and helix,

TABLE I

Test No. 1

Operation: Face milling rack segment Material: Steel forging Hardness: 202 bhn Machine: No. 3 vertical Spindle motor: 10 h.p. Surface feet: 750 Speed: 1074 r.p.m. Chip load: 0.010 Feed: 42 i.p.m. Cutter Data Dimensions: 21/2 inches diameter No of teeth: Four Angles: 7° n.r.—7° n.h.—15° Operation Results -15° lead Spindle horsepower input: 834 h.p. No. of passes per grind: 150 Total cu. in. metal removed: 234 Cu. in. per spindle horsepower: 0.6 Tolerances: ±0.001 Finish: 30-40 microinches

TABLE II

Test No. 2

 Operation: Face milling test billet

 Material SAE 4640
 Hardness: 270 bhn

 Machine: 2408 Simplex
 Spindle motor: 20 b.p.

 Speed: 205 r.p.m.
 Surface feet: 536

 Feed: 20 i.p.m.
 Cutter Data

 Dimensions: 10" diameter
 No. of teeth: 12

 Angles: 7° n.r.—7° n.h.—15° lead
 Operation Results

 Spindle horsepower input: 33 h.p.
 No. of passes per grind: 30

 Total cu. in. metal removed: 375
 Cu. in, per spindle borsepower: 0.9

 Tolerances: ± 0.001
 Finish: 50 microinches

TABLE III

Test No. 3

Operation: Face milling tractor links Material: Annealed forging Hardness: 185 bhn Spindle motor: 71/2 Machine: Special duplex Surface feet: 418 Speed: 200 r.p.m. Feed: 31 i.p.m. Chip load: 0.0129 Cutter Data Dimensions: 8" diameter No. of teeth: 12 No. of feetn: 12 Angles: 7° n.r.—7° n.h.—15° lead Operation Results 12 Spindle horsepower input: No. of passes per grind: 125 Total cu. in. metal removed: 663 Cu. in. per spindle horsepower: 1.43 Tolerances: ± 0.0005 Finish: Superior to h.s.s. cutters



Fig. 6-Rack segment with dimensions. Amount of metal milled from one face is indicated

Fig. 7—SAE-4640 test billet showing amount of metal milled from one face Fig. 8—Tractor link. Amount of metal milled from two sides is indicated

into carbide-tipped cutters.

High Surface Foot Rates: This technique is marked by use of relatively high surface foot rates. Friction and abrasion are carbide's worst enemies. Peripheral speeds ranging from 500 to 1000 feet per minute apparently lessen the abrasive effect of the carbide tip while in the work. There are indications that

TABLE IV

Test No. 4 Operation: Milling slot in test billet Hardness: 207 bhn Material: SAE 4130 Machine: No. 2 Spindle motor: 3 h.p. Surface feet: 750 Speed: 470 r.p.m. Chip load: 0.005 Feed: 19 i.p.m. Cutter Data Dimensions: 6" No. of teeth: 8 Angles: 0° rake-7° double negative helix **Operation** Results Spindle horsepower input: 5.7 No. of passes per grind: 450 Total cu. in. metal removed: 675 Cu. in. per spindle horsepower 0.612 Tolerances: ±0.001 Finish: 20-30 microinches

TABLE V

Test No. 5

TABLE VI

Test No. 6 Operation: Milling slot in wing hinge Material: SAE 4340 Hardness: 402 bhn Machine: Simplex Spindle motor: 15 h.p. Speed: 264 r.p.m. Surface feet: 552 Feed: 13 i.p.m. Chip load: 0.0041 Cutter Data Dimensions: 8" diameter No. of teeth: 12 effective Angles: 15° n.r.—0° helix Operation Results Spindle horsepower input: 18.5 No. of passes per grind: 85 Total cu. in. metal removed: 183.4 Cu. in. per spindle horsepower: 5.7 Tolerances: ±0.0005 Finish: 20-30 microinches the lower surface foot rates (in the neighborhood of 400 to 500) are advisable for heat-treated steels that brinell in the neighborhood of 375 to 425. The untreated steels, both carbon and alloy, on the other hand, are being milled successfully at surface foot rates as high as 800 to 1000. Where it is necessary to obtain a high finish (in the neighborhood of 15 to 20 microinches) a high surface foot rate and a relatively low chip load are necessary.

Chip Load: Experimental work indicates definite advantages in high chip loads. It should be pointed out that a high chip load and good cutter life are related as cause and effect; the thicker the chip, the farther from the cutting edge will the cutting forces be applied. This assists in preventing breakdown of the cutting edge and increases cutter life. A high chip load is also closely connected with a higher cubic inch of metal per horsepower removal. Some of these results of a high chip load may be apparent from an examination of Fig. 5. Here, obviously, the thicker the chip the less effect the cutting forces will have on the unsupported and relatively weak cutting edge.

Feed Rate: Since the feed rate is dependent on the three factors of chip load, number of teeth and revolutions per minute, the use of high peripheral speeds and high chip loads will result in a high rate at which the work piece is being fed into the cutter. These feed rates naturally will vary in different applications and will depend, among other things, upon the amount of power available. Horsepower consumed in carbide milling of steel is relatively high. Experimental and research work shows the increase of cutting forces necessary to remove metal with negative angles amounting to as much as 15 per cent to 20 per cent. Discussion of high horsepower consumption, however, is with regard to the rate of applying these cutting forces. Since the peripheral speeds are 5 to 10 times higher than those commonly employed with high-speed steel cutters, the rate of applying these cutting forces, and therefore, the horsepower consumption is increased proportionately.

Coarse Pitch Cutters: Since the feed rate depends upon the three factors of



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THE CINCINNATI PLANER COMPANY Planers...Vertical Boring Mills...Planer Type Millers CINCINNATI. OHIO. U.S.A. chip load, number of teeth and surface feet per minute, the current practice limits the number of teeth employed in milling cutters. This pitch varies in different localities and among designers, but a "rule-of-thumb" that seems to strike an average of current practice throughout the country can be expressed by the diameter in inches plus two. Thus, a 4-inch cutter will have six teeth, a 6inch cutter eight teeth, etc. Fundamental reason for employing coarse pitch cutters is the necessity for restricting horsepower consumption to within reasonable limits. There seems, however, to be a further necessity for using fewer teeth in certain applications where a large chip accommodation space is necessary, due to the width of the cut or the length of time the carbide tip is in contact with the workpiece.

A face mill 8 inches in diameter having 10 teeth is one which may be considered as typical of this condition.

Flywheel Effect: Because of the coarse pitch cutters so representative of current practice in carbide steel milling of steel, flywheel effect seems essential. Attempts made to build such effect in cutter bodies is not, however, considered either good design or effective in the elimination of undesirable impact loads. To eliminate the latter, which result from large cutting forces and coarse pitch cutters, a flywheel should be installed by special setup, or prefer-ably, should be built into the machine. There are a number of definite indications that flywheel effect is necessary in some categories of carbide steel milling to increase cutter life and to eliminate excessive depreciation of equipment.

Typical examples are described in following paragraphs to point up what has gone before.

Face Milling Rack Segment: In this operation (see Test No. 1, Table I) a steel forging which brinells at 202 was milled with a 2^{1/2}-inch diameter cutter on a vertical milling machine, the amount of metal removed, the face width and length of surface milled is indicated on the accompanying sketch, Fig. 6. It is interesting to note that this is a regular production operation converted to carbide which resulted in an increase

Fig. 9—Slot is milled lengthwise in SAE 4130 test billet Fig. 10—Strut pad shows size of cut to be milled from four contact faces Fig. 11—Dimensions of slot milled lengthwise in wing hinge are

shown above

TEST BILLET SAE, 4130

of the feed rate from 4½ inches per minute to 42 inches. The spindle speed was increased from 54 to 1074 revolutions per minute. Number of pieces increased from 100 to 150 and finish of 30 to 40 microinches is an appreciable improvement. Production was increased approximately 10 times and other benefits were noted.

Face Milling Test Billet: This operation, not a production but a test run, (see Test No. 2, Table II,) indicates possibilities of face milling a billet 52 inches long and 3 inches wide, requiring 33 horsepower. It will be noted (see also Fig. 7) that the depth of this cut is $\frac{1}{2}$ inch and feed rate 20 inches per minute. Material is SAE-4640 alloy steel of 270 brinell hardness. In a cutter life test 375 cubic inches of metal were removed; the number of cubic inches per horsepower equals 0.9.

Face Milling Tractor Links: This operation, Fig. 8, was performed on a special Duplex milling machine, spindles of which are powered by a 7.5-horsepower motor. Conversion to carbide face mills resulted in feed rate increase from 11 to 31 inches per minute; the revolutions per minute from 57 to 200. These 8-inch cutters have wedged solid carbide blanks instead of brazed tips. Number of cubic inches removed with this type of cutter is 663, compared with 365 for the brazed tip milling cutter operated under the identical conditions. (Note data in Table III.)

Milling Slot in Test Billet: This material, SAE-4130, with hardness of 207 brinell was slot milled, Fig. 9, at surface foot rate of 750 and feed rate of 19 inches per minute, equivalent to a chip load of 0.005. This 6-inch diameter cutter with 8 teeth has angles of zero-degree rake and 7-degree double negative helix. (See Test No. 4, which appears in Table IV.)

Milling Pads On a Douglas C-47 Strut: The size of the cut in this operation, which is indicated in the accompanying sketch, Fig. 10, is $0.150 \times 3\frac{1}{2} \times 4\frac{1}{2}$ inches. Pads are heat treated to approximately 400 brinell. Feed rate is 13 inches per minute, equivalent to 0.005 chip load; peripheral speed is 552. The 8-inch diameter face must me teeth, whose angles are 7 degrees negative helix. Lead angle on cuts is 15 degrees which, as will be noted later, apparently give the best cutter life. Resulting finish is as good as 20 microinches. (See Test No. 5, Table V.)

Milling Slot in Wing Hinge: Dimensions of the slot milled in this wing hinge are indicated in Fig. 11. This is an interrupted cut, detrimental to the life of carbide tips. The SAE-4340 material is heat treated to approximately Conversion to carbide-420 brinell. tipped cutters resulted in increasing feed rate from 1/2-inch per minute to 13 inches per minute. Spindle speed stepped up from 25 to 264 revolutions per minute. The 8-inch diameter cutter has angle tips of zero degrees helix and 15 degrees negative rake. Outstanding feature of operation, a regular production run, is gain in cutter life from 11 hinges per grind to 35. Tolerances are much closer-for parallelism, 0.0002-inch is maintained; for width, 0.0005-inch is maintained. A 20 to 30-microinch finish is a conservative estimate.

Conclusions: Carbide milling of steel is not only a possibility but an actuality on the production line. Considerable experimental work remains to be done regarding optimum angles. Present indications point to advantageous use of a combination of 7-degree negative rake and 7-degree negative helix for general milling purposes in face and half-side milling operations. In slotting, results indicate that a zero-degree helix and 15degree negative rake is an effective combination for difficult workpieces.

Relationship between cutter diameter and face width of workpiece should be at ratio of about 8:5. Where smaller ratio is used, resulting chip confinement can be eliminated by increasing peripheral speed to throw chips clear. A carbide-tipped face mill cannot be used in a confined cut where arc of contact between tip and workpiece is 180 degrees. Chip load can be reduced by increasing peripheral speed as suggested, by use of a very coarse pitch cutter or by employing a flycutter for adequate clearance.

If brazed tip cutters are used, extreme care must be used both in brazing and grinding. Cold treatment at 120 degrees Fahr. below zero is helpful in relieving brazing strains. Solid wedged carbide blanks in slotting and face mill cutter bodies show definite advantages in prolonging cutter life as much as 200 to 300 per cent, as well as reduced cost of cutter maintenance.

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FABRICATION ECONOMIES

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Fig. 1—Operator is shown repairing break in the galvanized coating on a piece of service equipment. Powder is mixed with water which is brushed on exposed area after it has been cleaned. Acetylene torch is being used to melt the coating material which will form a bond with the base metal

Repairing damaged areas in CALVANZED COATINGS

By F. D. McBRIDE President American Solder & Flux Co. Philadelphia

REPAIR of galvanized coatings on iron and steel products has long constituted a difficult problem both from the standpoint of maintenance and production work since there are few materials which may be applied to provide sufficient protection for exposed areas. In fact, no adequate substitute has been found for zinc as a protective coating for steel as far as the general run of applications is concerned.

After iron and steel have been galvanized, the zinc coating often becomes impaired. For example, the hull plates of battleships are galvanized but become abraded during the construction or subsequent repairs and a simple method for repairing such breaks must be employed since it is entirely impracticable to redip the sections involved.

Of course, the average industrial plant is not usually confronted with problems of the above dimensions, but there are many instances where gulvanized products are damaged during fabrication, such as in welding, forming, riveting and threading. Galvanized articles also are damaged at times in transit. In addition, operators of hotdip galvanizing equipment find that despite closest supervision over procedure, inspection reveals occasional skips or breaks in the coatings on regular production items.

The overall problem, therefore, involves making effective repairs without resorting to redipping the entire piece which is impracticable in the case of maintenance and prohibitive from a cost



Fig. 2—At the left is shown a welded joint between two sections of galvanized tubing. At the right, the area uncovered by the welding operation has been repaired standpoint in production work, especially where large items are involved.

It is a well-known fact that corrosion of iron and steel occurs as the result of an electrochemical reaction between the surface coating and the base material itself. A tiny break in a tin-coated surface will quickly result in the undermining of the coating since tin exhibits an electronegative polarity with respect to iron. Zinc, on the other hand, is electropositive to iron and no action takes place.

In developing a suitable repair matetial, it is necessary to find one which remains positive electrochemically with respect to iron and steel, but at the same time has a melting point lower than that of pure zinc (787 degrees Fahr.) so that there will be no danger of burning the galvanizing surrounding the damaged area. The composition must also retain its protective ability for a long period and it must be inexpensive. Further, a flux of the proper type is required for use with it.

Reference to the literature on corrosion reveals some divergence of opinion as to the manner in which tin protects iron from corrosion. Some claim it protects by covering the underlying iron with a continuous film and thus prevents the corrosive agents from reaching the

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iron. Others claim its protective action is electrochemical but differ in opinion as to whether it is anodic or cathodic to iron. In the matter of protection by zinc, however, there seems to be unanimity of opinion. This metal protects the underlying iron because it is anodic to the iron and undergoes sacrificial corrosion thus protecting the metal on which it is coated.

In this connection we find some interesting references. For instance, in the Bureau of Standards Circular No. 395, November, 1931, page 176, we are told that if zinc is added to tin in varying proportions, a marked change takes place when the eutectic alloy is formed. This eutectic contains 7.9 per cent zinc and 92.1 per cent tin. It has the same solution potential as pure zinc. This is true of all tin-zinc alloys with 8 per cent or more of zinc. Alloys with less than 8 per cent zinc exhibit solution potential varying from that of zinc to that of tin. In other words at the eutectic ratio, the polarity of the alloy reverses, so that with 8 per cent or more of zinc the alloy will protect iron anodically while with less than 8 per cent of zinc it will offer the same protection as tin-whatever that type of protection may be.

Another 'reference to this particular eutectic alloy is found in *The Tin Re*search Institute Review for July, 1941, page 2. Here we find mention of an alloy containing 8.5 per cent zinc, a small amount of nickel and the balance tin. In addition to admirable physical properties, this alloy is said to be resistant to the corrosive action of sour milk (which contains lactic acid).

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In order to investigate the possibility of protecting steel and iron with this alloy, studies were made with tin-zinc alloys of various compositions. These were coupled with iron in an electrolyte prepared from tap water which was exposed to the atmosphere for several days to allow it to dissolve carbon dioxide and other atmospheric gases. A strip of sheet iron was immersed in the electrolyte to serve as one electrode while the alloy under test served as the other.

A sensitive galvanometer connected in the circuit served to show whether current was developed and in which direction it was flowing. Alloys tested ranged from no tin and 100 per cent zinc to no zinc and 100 per cent tin. The readings on the galvanometer for alloys containing 8 per cent or more zinc were practically the same as that obtained with pure zinc. As the zinc content was decreased so was the potential difference between the alloy and the iron decreased until finally a complete reversal of polarity took place, the alloy with low zinc content behaving like tin.

Fig. 4—Damaged area in this galvanized sheet has been repaired by the process described in Fig. 1



Other tests, simulating actual conditions and covering a period of several years, were carried out. Sheet iron panels were coated with various alloys and exposed to the weather in an inclined position. Periodic examination showed that alloys with less than 8 per

cent zinc content corroded to the same

degree as tin-coated panels. Alloys with

8 per cent or more showed practically the same resistance to corrosion as pure zinc. Standard salt spray tests revealed the same results, alloys with 8 per cent or more zinc holding up for over 500 hours without failing while those with less than 8 per cent failed.

Inasmuch as the high price of tin makes the straight 92.8 per cent tin-zinc combination somewhat excessive from a cost standpoint, it has been necessary to add less expensive lead. However, lead itself is unsatisfactory since it tends to increase the porosity of coatings and thus to reduce the protection afforded to the iron or steel underneath. Moreover, lead has a negative potential in relation to iron. On the favorable side of the ledger, a lower melting point is provided since the tin-lead eutectic (63 per cent tin-37 per cent lead) melts at 356 degrees Fahr.

Lower Melting Point with Lead

As previously indicated, zinc should be present to the extent of at least 8 per cent when the percentage of lead is 1 per cent or less. However, it has been found that lead may be added to the alloy in increasing amounts, provided the zinc content is increased at the same time, without impairing the quality of the material as protective coating. An alloy of tin-lead-zinc has been developed which will remain anodic to iron or steel. It forms a firm bond with the base metal as well as with the surrounding galvanized coating. In addition, its melting point is well below that of the galvanizing. A composition of this type may contain both a tin-zinc eutectic with a melting point of 384 degrees Fahr. and a tin-lead eutectic melting at 356 degrees Fahr.

It is therefore apparent that the composition starts to melt somewhere between these two temperatures. It becomes completely liquid at about 660 degrees Fahr. which is also well under the melting point of the pure zinc used

(Please turn to Page 152)





FURTHER EVIDENCE that arc welding is speeding output of vital equipment is confirmed by A. A. Young, welding engineer, Alfred B. King & Co., New Haven, Conn. His report reveals how the Charles Dickgiesser Co., metal fabricator, Derby, Conn., effects savings in metal and production time as a result of the adoption of arc-welded type of construction for producing range finder shields for the Navy.

According to the data received by the Lincoln Electric Co., Cleveland, this design eliminates angles at all joints and permits exceptionally sturdy construction with a saving of about 200 pounds of material per unit in addition to reducing fabricating time by approximately 8 hours per shield.

Another advantage was the elimination of burlap weather stripping formerly applied to the joints as protection against leakage. It was found that the welded joints presented an absolutely tight seam, while those made previously were not satisfactory even though red lead was used with the burlap as a method of caulking.

The complete unit consists of the top

and sides with two semiround pieces extending horizontally from the sides, (see Figs. 1 and 2), and a cross carriage beam, which in the final assembly, is bolted to a pedestal carrying the rotating and drive mechanism for the shield itself. This arc-welded beam is composed of ¹/4-inch and 1-inch plates and weighs 240 pounds. The pedestal arrangement enters the interior of the shield through the circular hole in the platform, or floor of the shield, which is made up of heavy angle iron, cold formed and welded.

The component parts of the shield proper, most of which are press-formed, must be accurately joined. A tolerance of 1/32-inch for example must be held in fabricating the shield platform. An interesting method is employed to overcome shrinkage of this part. After a little experimenting it was first determined where heat should be applied and to what degree. The piece was first placed on a heavy plate and subjected to pressure longitudinally by applying clamps, preheating with a torch, then applying more stretch with heavy clamps. The butt joint weldments, made with 3/16-inch size electrode for high tensile steel, were then allowed to cool before removing the clamps,

A simple method of reinforcing the front plates and doors of the structure was effected by welding two horizontal and two vertical pieces of 1/4-inch by 2-inch flat stock on the inside of the front plate, using single pass fillet welds. These strips are adequate reinforcement. The same size flat stock is used as a reinforcement or stiffener for the doors. These pieces are fillet welded at an angle across the outside of the doors as shown in Fig. 1. As a further precaution against the weather, a drip strip is fillet welded immediately above the two doors. Mild steel electrode, 3/16-inch in diameter, was used for all fillet welds.

Tack Welding Checks Distortion

After completing the welding of the individual piece, the subassemblies are welded into one composite structure using a 3/16-inch mild steel electrode. Distortion was minimized by first tack welding the parts, then running a continuous fillet bead, both outside and inside, for the corner joints. All assembly tacking was controlled from leveling plate surfaces which were an essential factor in the welding procedure. Positioning was accomplished by means of small hand manipulated fixtures where feasible, while some of the larger sized pieces were positioned by using a portable truck crane.

In order to facilitate quick removal and replacement of the shield in case of emergency such as damage due to shell fire, the shield is connected to the platform by means of flat head countersunk bolts. The all-welded shield can thus be lifted off the platform without disconnecting the entire range finder and mechanism.

Fig. 1—Rear view of arc welded range finder shield showing reinforced doors

Fig. 4—Interior of completed shield ready for installing on cast pedestal which carries range finder mechanism

Fig. 2—Elimination of angles, evident in this front view of the shield, was made possible by welded design

Fig. 3—Intrically constructed cross carriage beam of range finder consisting of heavy plate cut, shaped and welded to form complete subassembly





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Layout of tool control system in the Fisher Body Division at Grand Rapids, Mich., which facilitates maintenance of high production sharpening of precision cutting tools, conservation of tools and reduction in lost man-hours and machine-hours

A TOOL CONTROL system, designed to increase the efficiency in grinding, inspection, storing, maintenance, salvaging, and disbursing of cutting tools has been installed at the Grand Rapids, Mich., stamping division of Fisher Body Division, General Motors Corp. The system has made it possible to maintain high machine production, to raise consistently the quality of the finished product and decrease the amount of scrap and deviations, as well as to increase the life of cutting tools.

The system was an outgrowth of the known fact that cutting tools will last much longer and perform better if they are inspected and sharpened regularly. To accomplish this a plan was evolved whereby sets of tools would be scheduled to the machine according to the operation to be

This mechanical conveyor in the Grand Rapids, Mich., plant of the Fisher Body Division carries filled tool sets from the bank stock area, where they are placed after grinding, to the disbursement crib for storage until needed on a job

.... saves on grinding and handling, improves plant operating efficiency by reducing scrap and deviations, raises quality of finished product

performed on those machines. The tool sets comprise the entire compliment of tools necessary to complete the operation.

The length of time which a set of tools remains on a job was determined by an actual performance check which governs the replacement cycles upon which the tools are scheduled to and from the machines.

Grinding and disbursement cribs, along with the tool bank storage, are centrally located within easy reach of all machine areas. Dispatching of all tools to and from machines is controlled by the production scheduling department and deliveries are made by routed trucks which also maintain a regulated schedule.

Tool sets, returned from the floor, are inspected upon receipt. Damaged, broken, and worn tools, along with those which need sharpening are removed and a tool replacement slip bearing the code numbers of the tools is placed in the box. The containers then pass along a conveyor to the bank stock area. Perfect replacement tools are added to the set after which it is passed along the conveyor to the disbursement crib for storage until needed.

Dull tools, after being removed from the sets, are ground and honed, rigidly examined, sealed and replaced in the bank stock to await future use. The tool control system has enabled the division to maintain high production sharpening of precision cutting tools as well as to conserve tools and reduce lost time in man-hours and machine-hours on production operations.

Spring-Lock Fastener Catalog Available

The ESNA spring-lock fastener, newest addition to the line of aircraft fittings produced by Elastic Stop Nut Corp., Union, N. J., is fully described in a catalog prepared by the company to show specifications, sizes available and detailed tests. A copy of the booklet may be had by writing to the main office at Union.

The fastener is composed of two parts, both installed permanently on the fixed as well as removable part of the airplane's cowling or other assembly, thus avoiding any possible chance of losing either part. Its stud end is placed in position with body of fastener. When the two parts are shoved together, the stud cam-slot makes contact with the spring cross-bar section. Stud is then turned less than a quarter turn, so that stud cam picks up spring cross-bar, pulling it down until it has passed the crest of the cam and snapped into locked posi-





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CARBON and ALLOY STEELS





DRAWN STEEL

Using a Punch ENGRAVING TOOL 20

By ROBERT MAWSON

ONE of the machine shops which I visited recently was confronted with a manufacturing problem and solved it in a rather unusual manner.

This company received an order to make 3500 index disks, a detail of which is shown in Fig. 1.

Making the blanks caused no particular trouble. The company bought cold-rolled steel sheets of the required thickness and had one of the neighborhood plants, which had a metal working shear, cut these sheets to an approximate round size. The machine shop took these rough blanks, machined the 1.250-inch hole in the center and then, placing a number of blanks on an arbor, turned the outsides to the correct diameter.

The blanks were now ready for the graduations. As this machine shop had no engravers the owners called upon several companies which did mechanical engraving to have this work done. However, they were informed that owing to the volume of business each of these firms had on order and, further, due to the large quantity of the part in question, they were unable to take this job and complete the order in time to meet the promised date of shipment.

The shop thus had the blanks but no way to produce the necessary graduations. The shop superintendent drew upon his own ingenuity and improvised equipment at hand to do this work.

The plant had several sizes of drop presses—500, 1000 and 1500 pounds capacity. They had also a number of punch holders and die blocks which had been made for these machines. At the time these blanks had been finish turned, one of the 1500-pound presses was not in service, so the superintendent took one of the die blocks made a casting with a flat surface for this press. Inserted in the center of this face was a short locating



plug to be a snug fit in the 1.250inch hole of the part. One of their punch holders was also machined to the dimensions shown at A in Fig. 2. The engraving punch "B" Fig. 2, was made from a good grade of tool steel, turned to the diameter of the center hole. The three holes were drilled and countersunk for flat headed screws and two dowel holes machined. These holes, screws and dowels were transferred to part "A" in the usual manner.

Section "B" was now laid out with guide lines for the several graduations with "land" on each side of the graduations, see Fig. 3. The material between these "land" lines was then machined to a depth of 7/32-inch. The land, as in Fig. 3, was next milled also to the same depth.

The next machining operation was forming the sides of the projections with a milling cutter of a proper contour, leaving a few thousandths of an inch on each face for final grinding. This view of the projections is shown in Fig. 4. The punch was next hardened and quenched in oil and then water. The final operation was grinding the sides of the projections to obtain good line surfaces.

For the several machining operations when forming the engraving projections, the piece was held in a rotary milling attachment on the table of a horizontal milling machine. To perform the engraving, the blank was placed on the pin in the die block and, with the punch in position, one drop of the press makes all the graduations on the blank. It was then only necessary to stamp on the blank the several numbers called for on the drawing.

This rather unusual method of engraving enabled this machine shop to complete the order on time and at a low production cost.

Fig. 1—Part to be manufactured, showing markings wanted Fig. 2—Tool used for making the markings Fig. 3—First machining operation on punch face Fig. 4—Section of finished punch

Broach Stator Cores For Satisfactory Results

Removal of burrs and slight irregularities in stacking of stator cores for small electric motors is now being accomplished by broaching the narrow opening of the slots in each part. It is said to offer definite advantages over other methods tried. For example, filing tends to open up the end section of the slots and not clean up the center. Cores worked in this manner are suitable for winding with the finest wire; width openings can be held to the proper size and maintained throughout their length; eost is considerably less and time required is about one-fifth the filling time with better quality resulting.

The operation, as carried out at a General Electric Co. plant, requires starting by hand a broaching tool with a lead and one set of cutting teeth. Tool and stator are then placed in a holding fixture with a cap for each end which fits tight to prevent flaring of the end punchings. A small power broach is then used to force the tool completely through the core, letting it fall into a padded receptable to prevent breakage of the tool.

The broach tool is "floating" with respect to the ram of the broach because of the "skew" or angular pitch of the slots.

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24 and 30 inch GRAPHITE **ELECTRODES!**

WENTY-FOUR and thirty-inch graphite electrodes for electric furnaces are now an accomplished fact. They are the first of such large sizes ... and another in National Carbon Company's impressive list of "firsts" in carbon and graphite electrode development.

Long experience and extensive technical knowledge enabled National Carbon to make these new electrodes. This same experience and knowledge have brought about other outstanding developments in the highly specialized field of electrode

Niagara Falls

making-for example, a special dense type "Acheson" electrode first made in 1922... the first 18-inch graphite electrode, in 1927... the introduction in 1928 of graphite nipples to improve the joints of carbon electrodes... the first tapered graphite nipples, in 1932... and the first 20-inch graphite electrode in 1938.

While electric steel furnaces large enough to require the 24 and 30-inch graphite electrodes do not exist, the electrodes for them are here right now ... ready for industry.

San Francisco

NATIONAL CARBON COMPANY INC.

Unit of Union Carbide and Carbon Corporation

ELECTRODE SALES DIVISION, New York 17. N.Y.

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By JOHN H. LOUX Engineer Salem Engineering Co. Salem, O.

DURING peacetime the consumption of fuel oil for all industries in the United States averages approximately 1,500,000 gallons per hour. The bulk of this oil is burned in equipment that does not employ heat-saving devices.

When we consider that 20 per cent of this fuel could be saved by proper methods of recuperation, we are brought to the staggering realization that 300,000 gallons of fuel oil are being wasted every hour. This, in terms of crude oil, would amount to 1,200,000 gallons, which if converted to gasoline, would be sufficient to supply all of the present day A-card users in the United States with 4 gallons of gas per week.

After the War, when business returns to a competitive basis, the need for heat-saving devices and greater efficiency in heating, and in all operations, will increase. In the manufacture of high-grade steel billets, rated at \$50 per ton when ready for the mill, the fuel costs up to this point amount to approximately \$2.50 per ton, or 5 per cent of the total cost of the product. If these fuel costs were reduced by 20 per cent through recuperation this figure would become \$2 per ton, or 4 per cent. The total cost of the product would, therefore, be lowered 1 per cent. On a highly competitive product this 1 per cent could be the determining factor in successful operation.

The simplest heat-saving device is known as a recuperator, or heat exchanger, wherein heat is taken out of the flue products and put into the air that is to be used for combustion. The preheating of combustion air creates a higher flame temperature, permits more perfect combustion, and results in more uniform heating throughout. Recuperators, when properly employed, will show a fuel saving up to 28 per cent.

Recuperators, made by Salem Engineering, are of metal, and can be used for air or gas. These metallic recuperators incorporate the needle principle, which has raised the standard of preheating performance to a new high level. These needles are on both the inside and the outside surface of the element and permit maximum heat transfer with a minimum of back pressure.

Fig. 1—Constructional view of recuperators Fig. 2—Cross section through element showing inside and outside needles Fig. 3—Arrangement of section is in the section of the section is in the section of th

Fig. 3—Arrangement of recuperator for horizontal flow of waste gases





Preheating of air used for combustion affords higher flame temperature, more perfect combustion and more uniform heating of product. Fuel costs involved in bringing billets to proper temperature may be lowered by the exchange of heat

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Since the tips of the outside needles assume almost the same temperature as the hot waste gases flowing over them, and since the inside needles assume the temperature of the air which is being preheated, it follows that the resulting temperature of the body of the heat exchanger will be the mean temperature of hot waste gases and preheated air. This condition maintains an even temperature throughout the body of the element and eliminates the possibility of cracks that would ordinarily develop in an irregularly heated element.

This particular element is made approximately 4 feet long, with a head 6 inches wide by 9 inches high. Ordinarily, the element is cast of a high-chrome material to withstand temperatures up to 1800 degrees Fahr. Where lower temperatures of free gases are encountered, the element is made of cast iron.

Two types of recuperator element are manufactured—one, a low-pressure type and the other a high-pressure type. The low-pressure element has normal flanges on the end and takes the form of a rectangular socket, all four sides of which are machined.

These elements are assembled in banks. Alloy bolts fasten each element to the adjacent one and an asbestos rope seal is placed in the groove provided along the edge of each element. This seal is substantially tight up to 20 inches of water gage.

The entire bank assembly is then surrounded by a supporting framework and the air ducting securely fastened to it.

The high-pressure element is made with an oval face into which have been screwed eight % per cent diameter studs. By incorporating metallic joint rings with the element, this type of exchanger may be bolted securely to the air ducting. This element may be operated safely with air pressure up to 100 inches water gage.

Ordinarily the recuperator elements are installed as close to the outlet of flue gases as is possible. If the flue gases leave the furnace above 1800 degrees Fahr., it is necessary to dilute them with air and reduce their temperature to below 1800 degrees Fahr. This is accomplished by special dilution air blowers. Automatic temperature control equipment is provided to admit proper quantities of dilution air.

When low B.t.u. fuels, such as blast furnace gas, are used a combination recuperator for preheating both gas and air is provided. The section for preheating air is placed nearest the

Fig. 4—Recuperator for installating above the furnace Fig. 5—Recuperator installed at side of furnace

Fig. 6—Samples of recuperator materials heated for 100 hours. A, normal cast iron exposed at 1472° Fahr.;
B, cast iron exposed at 1832° Fahr.; C, Liesconit exposed at 1832° Fahr.







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hot flue gases so that the air will receive the higher preheat. The gas heating section is placed directly in line so that the waste gases leaving the air preheater pass immediately through the gas preheater.

In order to obtain the maximum preheat of either air or gas, at least two passes through the recuperator are generally required.

In order to determine the proper type of material to use in the manufacture of these elements, an extensive test was run, using three sample pieces shown in Fig. 6. The pieces may be designated as A, B, and C.

All of these pieces were heated for 100 hours. Test piece A was normal cast iron, and it was exposed at 1472 degrees Fahr. Test piece B was also made of cast iron and it was heated at 1832 degrees Fahr. Test piece C was made of the material that is now being used in these recuperators, known as Liesconit, and it withstood the temperature without a sign of failure at 1832 degrees Fahr. The analysis of test piece C was approximately 30 per cent chromium, 2 per cent nickel and 1.50 per cent carbon.

The most important evidence of the satisfactory performance of this material lies not in the results of this test, but in the many installations in which these recuperators have proved themselves successful throughout years of service.

One of the most outstanding installations of metallic recuperators in this country is in the Pittsburgh district. At one plant, there are two large continuous skelp heating furnaces each employing three recuperators to preheat combustion air to 1100 degrees Fahr.

Fig. 7—Combined air and gas recuperator

In this particular case the recuperators serve two purposes. First, they conserve fuel by taking heat out of the waste gases and putting it back into the combustion air. Second, they serve to preheat the air so that it is possible to increase flame temperature and thus speed up the heating operation. The discharge end of these skelp heating furnaces operates at temperatures up to 2850 degrees Fahr.

Each of these skelp heating furnaces is over 100 feet long. The waste gases are taken off at three vertical offtakes with about 30 per cent of the gases going into each recuperator. The furnace gases rise into these offtakes, pass through horizontal crossovers and enter the recuperators. Dilution air is fed into the gases at a point several feet ahead of each recuperator. This air prevents the gases striking the alloy elements and from reaching a temperature above 1800 degrees Fahr.

In this particular installation, the recuperators each are made in two banks and the air makes two passes. The banks of elements nearest the hot furnace are made of alloy, while the elements in the other bank are made of plain cast iron.

The total maintenance on all six of these recuperators over a period of four years has been to replace one bank of cast-iron elements.

The postwar possibilities of this heatsaving unit are obvious inasmuch as the equipment becomes more important from the standpoint of heating costs as the fuel supply decreases.

"Second Mile" Revised

"Will postwar engineering be hoor or a profession?" is the pertinent question asked and answered by William E. Wickenden, president, Case School of Applied Science, in "The Second Mile-A Resurvey, 1944". The new booklet is a reprint of his famous address before the Engineering Institute of Canada in 1941 entitled "The Second Mile" This was so popular that the Engineers Council for Professional Development persuaded the author to revise it with the particular object of presenting the engineering profession to the young engineer. Text has been shortened and style modified to make it more appropriate and appealing and the section. "Does an Engineer Need His Profession", containing the answer to the first query, was added. Copies of the new edition may be obtained from the Council whose address is 29 West 39th street, New York 18. Price is 10 cents per copy, 5 cents in small lots and \$3 per hundred

Metal Hardness Test Findings Published

"Symposium on the Significance of the Hardness Test of Metals in Relation to Design," a 58-page reprint of material presented at the forty-sixth annual meeting of the American Society for Testing Materials in June, 1943, is now available to any interested firm or individual at 75 cents per copy.

The symposium includes notes by J. M. Lessells on the indentation hardness test, with conversion tables and a short selected bibliography. There are technical papers on present types of hardness tests by S. R. Williams, and on fundamentals of hardness testing by S. L. Hoyt, followed by interesting discussion contributed by other authorities.

Especially noteworthy are the tentative hardness conversion tables for steel showing relationship between diamond pyramid hardness, rockwell and brinell values, ASTM designation E 48.

This is the second of a series of symposiums being sponsored at periodic intervals involving critical discussion of the significance of various tests of metals. Copies may be obtained from ASTM headquarters, 260 South Broad street. Philadelphia 2.

Industrial relations department of Allis-Chalmers Mfg Co. has published a special booklet for employes in the armed forces which not only collains benefits provided by the company for its servicemen but also sets form their rights under the soldiers' and sailors' Civil Relief Act. In addition to explaning many things that inductees should do before entering the service, the book has a back cover pouch containing pubcation forms for the company's military bonus and change of address cards.





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ould oak ★ Lectromelt furnaces of the top charge type, quickly charged by drop bottom bucket, reduce the charging time and the furnace heat loss between melts. This savings permits more rapid heats and greater tonnages of necessary war steels and irons.

Top charge Lectromelts are constructed in capacities from 100 tons down to 250 pounds. Let our engineers help you with your melting problems.



Lectromelt composite electromechanical electrode arm with power operated clamp for gripping the electrodes and conducting the current from the secondary anti-skin effect cables to the electrodes. Another Lectromelt design feature is the electrode clamps, multi-part multi-contact water cooled type (Moore patent).

Pittsburgh Lectromelt Furnace Corp.

PITTSBURGH, PENNSYLVANIA

Welded Tubular Jigs cut losses from injuries

PREFERENCE for the utilization of steel tubing in the construction of platforms, railings, assembly jigs and similar plant equipment is generally based on the high degree of rigidity and the high strength-weight ratio obtained in tubular structures. A frequently mentioned incidental advantage is the decreased hazard that is characteristic of the round tube section, due to the absence of sharp edges and corners. A quantitative study of this safety feature of tubular structures in industrial plants is included in a prizewinning paper submitted in the James F. Lincoln Arc Welding Foundation competition by Richard H. Holmes, service and design en-gineer of Douglas Aircraft Co., under the title, "Arc Welded Tubular Jigs."

An investigation was conducted over a three months' period in a large aircraft plant, with about the same number of men on each case during the same daylight hours. On an average, for every 10,000 manhours applied on assembly procedure on structural steel jigs, including fabrication, there was a loss of ap-



proximately 200 man-hours attributed to head, hand and other injuries obtained on the jig. For every 10,000 man-hours applied on assembly procedure on arc welded tubular jigs, including fabrication, there was a loss of approximately 60 man-hours attributed injuries from the same causes. A saving of 140 man-hours in every 10,000 is a considerable saving in the course of a year.

The savings in man-hours possible to the combined operations of 30 aircraft plants are suggested by the following figures:

One man can work 40 hours per week at 50 weeks per year = 2000 hours; 1000 men per shift on assembly jigs in one plant by 2000 hours = 2,000,000 man-hours per year; 2,000,000 man-hours per year by two shifts = 4,000,000 manhours per year per plant. At 140 man-hours saved in 10,000, the result would be 56,000 man-hours saved per plant; 56,000 man-hours per plant by 30 plants equals 1,680,000 man-hours saved by the use of arc welded tubular jigs. At a dollar an hour per man this would amount to \$1,680,000.

By extending the scope of application of tubular structures to plant equipment other than assembly jigs the total possibilities of savings to industry would naturally be magnified many times.

(Left) — W or k er demonstrates possibility of injury to head or shin with jig of conventional rolled steel sections

(Below)—Tubular jigs like this one offer a minimum of sharp edges and corners



Color Scheme Important As Aid to Production

The proper relation of color tones in the factory can have much to do with the productive effort of the plant as a whole and with productivity of individual workers, according to color authorities. Pleasing tones in decoration of walls and ceilings and strictly utilitarian application of color for safety precautions around machines and marking of their controls for ease of operation are believed to have had good psychological effect on the war effort generally and tangible results in higher output.

Use of proper tones in painting an automatic riveting machine, for example, can mean less fatigue on the part of the operator and, therefore, less chance of accident. The understanding of the relationship of light to color can mean a steadier and better operation of nearly all kinds of machines, with less chance for spoiled materials. While pleasing color tones in restrooms and lunchrooms can mean improved employer-employe relations—tending toward reduction of absenteeism and labor-turnover—the most vital use of color is that in conjunction with machinery.

Faber Birren, color consultant who recently completed a color co-ordination scheme for Henry Disston & Sons Inc., Philadelphia, saw manufacturer, including everything from assembly and personnel departments to an employe sun lamp room, maintains that too much color may be visually and psychologically distracting to people working with materials which are neutral in shade or colorless, since it would handicap their attention to the job and thereby lower efficiency. He says physical and emotional relief is obtained through a "change of pace" in color throughout the plant. Each specification must be tailor-made to accord with lighting, operation of machine, distance from walls and many other factors which only an expert can properly evaluate.

Application of Overfire Jets Subject of Booklet

Application of overfire jets for the elimination of smoke and reduction of fuel waste is discussed in a treatise on the subject prepared by Richard B. Engdahl, research engineer, Battelle Memorial Institute, Columbus, O. and published by the institute's fuel research laboratory as Technical Report No. VII. The booklet, "Application of Overfire Jets," gives the correct method for installation, as well as an explanation of the principles which apply to both hand-fired and stokerfired plants. There are instructions on how to choose the right size of tube for introducing air, how far apart tubes should be, where they should be placed in the furnace wall and how to build them for best results. Research on which booklet is based was sponsored by Bituminous Coal Research Inc.

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WHEN war came to the U.S., we faced a bottleneck in forging and machining to produce bofors and heavy guns for tanks, airplanes by the conventional method. Had it not been for Timken Roller Bearing Co.'s development of a new way to make gun barrels from seamless steel tubing, serious shortages in arms would have occurred at a critical time.

TOCCO Induction Heating plays a vital part in this new method (see sketches), affording accurate, localized heating, essential for uniform upsetting of the tube to form the gun breech. Speed of heating practically eliminates scaling, minimizing wear on dies.

By this speedy method, Timken Ordnance Co.

produced more heavy gun tubes per month than England turned out in two years up until April 17, 1942. In less than 2 years, the plant added 80,000 75 m.m. and 40 m.m. gun barrels to Allied strength and did this at a saving of \$12,000,000 over the former method.

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Four TOCCO Inductors, powered by two 200 K.W. TOCCO JRS. heat the entire output. End of 75 m.m. tube (7" o.d., 238'' i.d.) is heated for a length of 18" to 2350° F. End of 40 m.m. tube (434'' o.d., 114''' i.d.) is heated for 15'' length to 2350° F.

Find out how the speed, economy and uniformity of TOCCO can aid your war production and post-war strategy. "Results with TOCCO" free on request.



Portable Reconditioning Plant Repairs Battle-Damaged

Steel Landing Mats

IMPORTANCE of speedy construction of airplane landing fields in remote and entirely unsuitable locations is one of the requirements of modern warfare. A solution to this problem is provided by use of heavy bulldozers to clear the area, the actual hard level landing surface being furnished by steel landing mats laid by hand using interlocking steel "planks" about a foot and a half wide and 10 feet long. An airfield can be cleared, leveled and covered with a steel mat in a matter of hours.

Continued operation of such fields in battle zones is dependent upon the rapid and easy repair of damage caused by bomb and shell. It is usually impractical to return damaged planks to the original manufacturing plant for reforming and refinishing, so it has become necessary to develop a means for reconditioning on the spot.

To fill this need, engineers of Butler Mfg. Co., Kansas City, Mo., have developed and are furnishing the portable reconditioning plant shown in accompanying illustration. It is a well-engineered setup, designed so it can be shipped by air to battlefronts when necessary. It consists of two main units—a reforming press with attached independent gasoline engine drive, and a series of processing tanks for cleaning and painting the straightened planks. It is operated by unskilled labor.

Steps for Reconditioning

Press and engine are mounted on a common base, facilitating shipment as a single unit. A heavy duty V-belt drive is used. Conveyor sections are provided at both feed and runout side of the press to facilitate operation. A power feed automatically puts 300 planks per hour through the press which operates at a rate of 77 strokes per minute. Dies are arranged so they gradually taper the plank to its original shape, the 60-ton press being equipped with special straightening and forming dies.

Tank treating setup includes five compartments as shown, each long enough to take a plank and wide enough to accommodate the loading fixture on which 10 planks are racked for simultaneous handling through the cleaning and painting line. Over the tanks is a special handoperated monorail system with hoists for lifting and moving the loaded racks in and out of the baths. Planks are mounted in rack using the loading shelf shown in the illustration.

Two outside compartments at the beginning and end of the line are heated, making a complete self-contained processing line. Four vent stacks can be seen extending from the heating units. Two of the burner-blower units can be seen on the left of the tank at floor level.

The six essential steps in reconditioning the steel landing mat planks are as follows: (1) The damaged plank is prestraightened on a bench by hammering to By G. ELDRIDGE STEDMAN

planks are bundled for storage or shipment on special bundling tables.

Output of plant is considerable for a rack of 10 planks can be processed every 7 minutes for an average of 85 planks per hour.



Five-comp a r t m e n t processing line includes built-in heating equipment, mechanical handling system and compartments for cleaning, rinsing, paint dip and dual baking at far end of line. Planks are loaded onto rack using shelf at extreme left. Note blowerburner units under. neath racked planks and four vent stacks

within 6 inches of its normally flat condition; (2) plank is then run through power-driven wire-brush cleaning rolls to remove dirt and scale. Next (3) it is power fed through the straightening and reforming dies of the press.

It then (4) receives a final wire brushing; (5) 10 planks are loaded on each rack, work then going into two consecutive hot cleaning and rinsing solutions. In the third tank, the planks are dipped in paint (6) and then placed in either the fourth or fifth compartment for baking at 350 degrees Fahr. Reserving two compartments for baking affords double the time allotted for other steps. After baking,

Attachment Removes Chips from Machines

As a result of employe suggestions at the Glenn L. Martin Co., Baltimore, an ingenious compressed air attachment for removing chips from extrusion milling machines has been developed. With the new attachment, twin jets of air are directed on each side of the milling cutter by means of copper tubing. The air current carries the chips into a duct attached to the machine, and they pass from the end of the duct into a mobile receptacle. BEGINNING about 1880, literature has periodically mentioned electrodeposited alloys of nickel and iron. These alloys vary in composition, properties and the means by which they are produced. While showing some individual differences, all are basically similar. The deposits themselves are shown to be brittle in character and for the most part rough and dark in appearance, and their physical properties such as to limit their application to specific technological uses.

In the laboratories of Harshaw Chemical Co. some new and interesting diselectrochemical means. The electrodeposit corrodes preferentially and on long exposure of unprotected surfaces the alloy takes on a yellowish tone, whose intensity is a measure of the iron content of the alloy. Examination of the deposits after long exposure discloses that the base metal has not been attacked but that the surface of the alloy has weathered and has been uniformly attacked over its entire surface. Exposure of as little as 0.0001-inch of deposit on SAE-1010 steel has shown that 6 months outdoor exposure results in no attack on

New Nickel-Iron Alloy

for **ELECTROPLATING**

Extensive research develops "bright" deposit of fine crystal structure, high in tensile strength yet ductile, with good corrosion resistance and simplicity in application. Labeled "new composition of matter" due to many unusual properties

coveries have been made which may place the nickel-iron alloy deposit high up on the list of decorative and technologically useful electrodeposits. Workers there have been able to devise means by which a nickel-iron alloy can be deposited by a very simple technique and which alloy has such new and unusual properties that it can well be regarded as a new composition of matter.

In appearance the alloy is silvery white and inherently of such extremely fine crystal size as to be, to all intents and purposes, a "bright" deposit. Physically the alloy is harder than a

Physically the alloy is harder than a similar electrodeposit of nickel or iron as one would expect from the crystal size. Preliminary experiments indicate that the tensile strength of the alloy is very much higher than the tensile strength of electrodeposited nickel or iron. The deposit is much more ductile than the attendant crystal size would seem to indicate. Bonding of the alloy to the base metal requires the same technique as used in nickel plating.

The electrodeposited alloy has one very interesting characteristic which may be its most important. Due to the manner in which the deposit is formed and the means by which the texture and composition is controlled, the deposit is slightly anodic to normal steel. In the field of protection against corrosion, this factor may turn out to be extremely important. A deposit is provided which has excellent wear, or erosion resistance, being hard and at the same time ductile, and which will at the same time protect steel against atmospheric corrosion by

By A. H. Du ROSE and P. R. PINE Harshaw Chemical Co. Cleveland

the base metal, and that as little as 0.00025-inch will withstand a year's normal exposure to the atmosphere.

In view of this outstanding performance, it is entirely likely that many uses will be found for this new electrodeposit and in fact many uses have already been found. For example, if as little as 0.00001-inch of the alloy is plated on steel and the whole subsequently plated with tin and the tin subsequently melted, a tin plated stock results which is measurably superior in resistance to corrosive influences than either present-day hot-dip tin or to present-day electroplated tin, wherein the tin is plated directly on the base steel. It has been shown that equal corrosion resistance can be supplied with only a fraction of the thickness of coating that must be applied with ordinary electrodeposits.

In other examples it has been shown that steel previously plated with the alloy and used as a paint base gives much better performance.

Since the deposit is dense and smooth, it makes a good base for other flash coatings of other metals such as cadmium, zinc and lead. In certain cases, the composite coatings may be heat treated to an advantage.

Due to the hardness and yet ductility of the iron-nickel deposit, it has surprisingly good spring properties. For instance, if a coil of soft wire into the shape of a coil spring and then plated with 0.0005-inch to 0.003-inch of iron-nickel, the result is a spring which has reasonably good elasticity. NSM

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The alloy has been applied to stee which is subject to extreme conditions of corrosion and erosion in moistureladen atmospheres, and has been found to show very promising results, being superior to nickel plate of much greater thickness and vastly superior to the softer metals, those on the order of cadmium and zinc.

Other technological uses have been considered, such as its possible application as a wear-resistant bearing surface and for use in building up worn or undersized parts.

The deposition of the alloy can be performed in ordinary electroplating equipment in use in other electroplating processes, so that no special apparatus or technique is required.

The composition of the alloy can be closely controlled through very wide ranges. Iron concentration of the bath is the determining factor rather than current density. This is unusual in alloy deposition. It is possible to keep the composition within the 5 per cent limit over very wide ranges of current density. Compositions of 5 per cent iron and 95 nickel to 45 per cent iron and 55 per cent nickel are easily produced, although the preferred range lies from 10 to 30 per cent iron and 70 to 90 per cent nickel.

Current density can be varied from 15 amperes per square foot to 500 amperes per square foot, depending on bath composition. On wire, current densities of 800 amperes per square foot have been used with complete success. The temperature of the bath as normally operated should be from 120 to 140 degrees Fahr.

Current efficiency is about the same as with the nickel solution and, depending upon bath composition and pH of operation, will vary between 92 and 98 per cent.

The pH range varies with the composition of the solution and is usually operated between 1.0 and 2.5.

Throwing Power: The throwing power of the alloy bath is in general superior to that of a nickel plating solution of similar composition.

Anodes: Experience dictates that nickeliron alloy anodes are the most suitable means of control of the composition of the electrodeposit. The alloy will be found to reach equilibrium at the same composition as that of the anodes and by this means control of the composition of the deposit is easily maintained. One of the real obstacles to the further development of the nickel-iron alloy electrodeposit was the difficulty in producing anodes of suitable corrosion characteristics. The Harshaw laboratories have now overcome this barrier and look forward to real success in the development of the entire process.

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The Diamond "D" Friction Clutch 1 H.P. to 470 H.P. at 100 R.P.M. Rugged — compact — safe — easy to operate, adjust and mointain,

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Milling Machines

Designed and built by Cincinnati Milling Machine Co., Cincinnati, the tracercontrolled hydromatic line of milling machines has the same basic structure as the company's standard hydromatic line of heavy duty production-type milling machines. However, a sensitive tracercontrolled vertical movement of the spindle carrier is provided. Accurate duplication of master profile templates is obtained automatically, and automatic table cycles, synchronized with spindle carrier vertical movements, reduce the effort of operation to that required to load and unload the work-holding fixtures.

The automatic, hydraulic tracer mech-

tion before the table can move at the rapid traverse rate, and conversely, in the lowered, or cutting position with the tracer roller engaging the master profile template before the table can move at the feed rate. A selector valve provides for disengagement of the automatic tracer control and permits the use of the machine for heavy duty production-type work. Automatic table working cycles, combining feed and rapid traverse of the table in both directions, are retained when tracer control is disengaged.

Table feeds are hydraulic and are infinitely variable under the control of a single throttle-type lever. Since 2-way feed cycles are supplied as standard on these machines, cuts may be taken in



anism, mounted on the spindle carrier, controls the vertical position of the spindle carrier during the cutting stroke of the table. A roller on the end of the tracer valve mechanism engages the master profile template attached to the work-holding fixture. As the table moves, the roller moves along the top of the template and any vertical movements of the tracer valve, imparted by the roller, are automatically duplicated in magnitude by the spindle carrier. Contact pressure between roller and template is very light since the roller only has to shift a hydraulic valve.

Table and spindle carrier movements are synchronized automatically in such a way that the spindle carrier will always be in its uppermost. or retracted, posieither or both directions. When operating the machine by hand controls, table feed or rapid traverse movements in either direction are selected by a single 4-position directional control lever. The spindle is mounted on four antifriction bearings with the front bearings carrying the radial and thrust loads. The rear support bearings are sleeve-mounted to permit normal expansion and contraction on the spindle.

Hoist Drive for Cranes

A new electric hoist drive for cranes, featuring an exciter which embodies a cross-flux principle, is reported by General Electric Co., Schenectady, N. Y. The new drive system not only automatically "weighs" the load so that it is hoisted and lowered at the maximum safe speed, but also prevents the handling of dangerous overloads. Safety features inherent in the fields and circuits of the system enable it to provide this degree of control without the use of mechanical relays or similar devices.

Although the system is not designed for use in all types of hoists, the highgrade heavy duty indoor cranes in steel mills and heavy machine shops may be considered typical applications for which the drive is believed to be suitable.

The equipment consists of a generator, a cross-flux exciter, and an ordinary constant voltage exciter driven by an induction motor, or if preferred, by a synchronous or a direct-current motor The hoist motor is of the type which is standard for high-speed crane-hoist installations except that it has a nonstandard main field for a variable separate excitation.

The cross-flux exciter is designed and connected to a system so that an increase in load on the hoist either motoring as in hoisting, or regenerative as in lowering, reacts on the field of the exciter causing it to strengthen the hoist motor field and simultaneously weaken the generator field, the degree depending on the magnitude of the load.

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Bending Rolls

Thomas Machine Mfg. Co., Pittsburgh, announces a completely redesigned line of bending rolls which are built of electrically welded rolled steel plate, and capable of rolling angles, tees, flats, rounds, squares, pipe, beams, channels and special shapes of almost unlimited variety. The new machines are of allsteel construction and have cast steel bearing housings welded into place. The bearings are bronze bushed and lubricated with high pressure fittings.

Arcs, spirals or circles can be formed on the new machines. They are available in four sizes, comprising rolls for bending angles 2×2 , 3×3 , and 4×4 inches in the vertical type machine, and for bending angles up to 6×6 inches in the horizontal type. Weights for the four sizes range from 3500 to 35,000 pounds.

The vertical type benders have horizontal shafts and bend material in a vertical plane. The motor and reduction gear unit is mounted on an extension of



(All claims are those of the manufacturer of the equipment being described.)