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		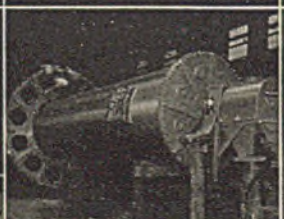	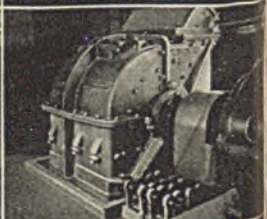
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CHEMICAL & METALLURGICAL ENGINEERING

ESTABLISHED 1902

APRIL, 1943

S. D. KIRKPATRICK, *Editor*

A PLETHORA OF PLANS

SEVERAL months ago our British contemporary, *The Chemical Age*, remarked that "the world is suffering just now from an epidemic of planning." For this malady, the editor cited two possible reasons: one was fear, and the other vainglory. To these, as far as we are concerned over here, we would add the good old American motive of vote-getting—a periodic plague that usually visits us in the year preceding presidential elections. Right now it threatens us with hallucinations of grandeur in a strange new postwar world in which all of our economic and social, as well as scientific and technical problems will have already been solved for us.

Planning in times of panic has always proved empty and disappointing. It was the great friend of American liberty, Burke, who said, "No passion so effectually robs the mind of all of its powers of acting and reasoning as fear." The same famous statesman also recognized that the vainglorious incentive to planning is equally bad. He put its origin in these oft-quoted words: "Those who have been once intoxicated with power, and have derived any kind of an emolument from it, even though but for one year, can never willingly abandon it." This undoubtedly accounts for part of the flood of postwar plans that were released from the White House during the past few weeks. Others, we suspect, may have had their origin in the peculiar pleasures that certain people derive from planning the lives of other people.

Whatever their source or reason, chemical engineers and executives will do well to study all of these proposals, particularly as they affect industry. The present administration has shown its hand, in a sense, in the 80-page pamphlet of the National Resources Planning Board entitled, "Post-War Plan and Program," and in the huge 640-page volume on "Security, Work, and Relief Policies." The former gives us a more or less complete blueprint of a postwar America in which business and industry will operate under extended governmental controls. This need not necessarily be achieved through nationalization of industry, as in Russia, because essentially the same objectives could be reached merely by the government exercising its proprietorship rights as No. 1 stockholder. The Defense Plant Corporation, as a subsidiary of RFC, already owns $14-billion worth of capital goods. This includes more than a third of the metal-working industry, half of our synthetic ammonia capacity, most of the synthetic rubber and aviation gasoline plants, as well as dominating shares in the new aluminum and magnesium facilities. To operate these industries, the President's postwar planners would set up "mixed corporations" in which the government could participate in selecting the areas and the particular units that are permitted to stay in business, in providing labor with its proper share in the management of these enterprises, and in developing new processes and improved products "by maintaining free access to the use of both old and new materials unhampered by the misuse of the patent system." All through the report you can find subtle implications of needed reforms which the planners believe can only be attained through such a drastic making over of our national economy.

Others have already pointed out that while the NRPB program is not state socialism in the Russian sense, it does bear a very close resemblance to the system the Nazis have long been using in taking over control of German industries. Nothing is said of that in the report, of course, for it might lessen the vote-getting possibilities of the plan.

One eloquent voice, however, has already spoken out in vigorous protest against bureaucratic attempts to transplant totalitarian methods to America under the guise of postwar reform. In his statesman-like address on "The Road to Realism," which Eric A. Johnston, president of the Chamber of Commerce of the United States, delivered at Columbia University last month, this young and aggressive leader warned that an America that goes totalitarian, even if under politer labels than in Germany, Italy or Japan, will in itself become

a menace to world peace, "because the specific character which has made America great and influential will then be lost." He asks us to remember always that "a strong, prosperous and, above all, truly free United States can only be built on the free enterprise economy, the superior levels of existence, and the unsullied democratic institutions that have given us world leadership."

All of us are willingly submitting to governmental controls and forms of regimentation that are necessary for the winning of the war. But when that is accomplished most of us want to look forward to something that more nearly resembles the America for which we are fighting, rather than the countries and systems we are fighting against.

INDUSTRY'S MAINSPRING

FAR too few members of Congress know what it is that makes industry tick. Fortunately some do. One of these is Senator Hawkes of New Jersey, former president of Congoleum-Nairn and prior to that an executive of the General Chemical Company.

"Reward for effort" is the mainspring that makes industry go, according to this Senator. This conclusion, which he constantly presents to his senatorial confreres, deserves more attention than it has ever had before. We might even hope that some of those with New Deal leanings will eventually learn this lesson.

One does not need to assume that human nature is altogether selfish to understand that lack of reward often causes lack of effort. Human nature is more ambitious than selfish; and this is not ambition for money alone. Dollars are but one measure of achievement and of the other fellow's recognition and compliment. As the postwar plans of industrial enterprises are formulated there must be such reward of effort or we will have much less achievement than is good for the public. It is important that the leaders of industry make this clear.

COTTON AS A FOOD

DID YOU ever eat cotton on your bread? Did you ever use cotton as a substitute for meat? Our guess is that the answer to the first question is "yes" and that shortly the answer to the second also will be "yes." Actually, cotton may prove to be one of the important food crops this year.

An acre of cotton provides more edible oil and edible protein than an acre of any of the competitive crops such as soy-beans or peanuts. Where there is a bale of cotton grown per acre, this 500 lb. of lint brings to market also the seed that includes about 150 lb. of edible oil and about 400 lb. of edible protein. Even if we have to throw away the lint cotton we could still get from the acre about 550 lb. of food as well as the linters, cottonseed hulls, and other byproducts.

The shortage of edible oils and of meat substitutes makes the edible products from cottonseed important prospective components of our diet for next year. The shortening, or margarine, or salad oil which we get here may be an important part of the fat for American families before 1944 has passed. And the meal, properly processed, will contribute important protein supply to stretch the meat in our diet more nearly up to comfort levels.

There are practical agricultural reasons why Uncle Sam may have to boost cotton production for these food requirements. In many parts of the South there are plantation operators who have experience, seed, fertilizer, tools and land, together with a willingness to use them for raising cotton. They have neither experience nor machinery available for the alternate crops of peanuts and soybeans. For these reasons, the cotton growers argued with vigor and some effectiveness that cotton is potentially an important food crop.

Chemical engineers will play quite a part in utilizing the crops so produced. Greater capacity and new techniques are needed to some extent. Preparation for this essential service in making food from cotton is desirable . . . NOW.

LET'S USE ALIEN PATENTS

THE ALIEN PROPERTY CUSTODIAN is making every effort to secure industrial interest in the immediate use of patents and patent applications which have been taken over from their alien owners. Any American enterprise can have royalty-free use of patents or applications, unless exclusive licenses are already outstanding with other firms.

New licenses will be granted on a non-exclusive basis after the payment of a nominal application fee. The primary purpose is to have wartime use of these patents to serve any possible allied purpose. But licenses will extend for the life of the patent, and thus usually go into the postwar period. Thus, American development of foreign ideas and patents is sought as an aid for future readjustment and rehabilitation.

About one-sixteenth of all unexpired patents are available in this fashion, both those owned by enemy aliens and those owned by aliens in occupied areas. The research and development departments of many companies will want to look into this matter to see what they may use with advantage to themselves and to the country.

MORE AMMONIA FOR FERTILIZERS

APPARENT surplus of ammonia above military need gives new impetus to its more extensive use in fertilizers. This possibility has great importance at a time when crop shortage may cause serious threat of hunger.

Fortunately, the fertilizer industry can make use of almost any amount of ammonia allotted to it. It would even welcome the anhydrous ammonia and ammonia liquor that cannot be distributed directly to agriculture without some carrier. Present superphosphate plants can use this ammonia direct on superphosphate, perhaps in amounts larger than ever before so applied. By increasing the acid used in

making the superphosphate it becomes practical to use much more ammonia during ammoniation. In other words, the extra ammonia simply becomes ammonium sulphate in the superphosphate. This does not in any way increase the probability of reversion or loss of availability of the phosphate.

There remain some technical and a few major economic problems to be solved. It is not going to be easy to get the surplus ammonia delivered to the superphosphate plants at the time and in the location where it can best be used. Some important, but not difficult, changes in manufacturing technique will be needed. But cooperation of the Army and the industry to accomplish the important result is going to be stimulated by the urgent need of the maximum quantity of this fertilizer for growing food this year.

WASHINGTON HIGHLIGHTS

POSTWAR COMPETITION may be affected by certain spheres of influence now being established by wartime allotments of responsibility between British and American enterprises. For example, the British are given the full responsibility for buying and transporting certain types of goods from certain areas of the world for themselves and the United States as well as for the other United Nations. This is a necessary wartime assignment. But American enterprise must realize that when the postwar period begins great advantage will accrue to those who have continued their wartime activities in such areas, as compared with their competitors from other nations. American enterprises cannot waste energy now in attempting to compete with British anywhere on any goods. But they can and should think through the program which will enable them currently to maintain friendly relations and later to reestablish business activities which will be essential for the logical development of our foreign trade.

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GOVERNMENTAL QUESTIONNAIRES asking for needless details are to be eliminated or condensed to only the most essential inquiries. Washington is taking seriously the complaints of burdens previously imposed on industry; but the problem is far from solved. Chemical companies will do well to work vigorously through the appropriate trade association on any remaining statistical questionnaire of doubtful sort. Cooperative arrangements on such matters can usually be made by the trade association executives with much better effect than is reached when a single company files its request or protest. The Manufacturing Chemists' Association has already done a commendable job in this connection.

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SMALL BUSINESS has had a bad time of it the world over. O.W.I. in an interesting five-page review cites some of the terrible things that Nazi leaders have done to small enterprise in Germany. We wonder whether the same agency intends to study the comparable damage done to small business in America. We doubt it. Some of the damage is unavoidable as the world progresses to bigger units which can work most effectively in times of war. But we are inclined to believe that many small enterprises would have much better chance to survive if relieved of many of the needless burdens imposed by well-wishing but bureaucratic officials.

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MERE SIZE does not assure or prevent the getting of contracts from Uncle Sam for manufacturing war goods. But many small companies find it impractical to bid against big ones because the government business requires activity on such a huge scale. A few have pooled their efforts for bidding in groups in order to get the mass effect that is essential. With the aid of the Department of Justice and under far-sighted leadership this can sometimes solve the problem, as it has for at least one small group in an allied industry. But it has taken that group about a year to develop a legal plan acceptable to the Department of Justice and sufficiently quick-moving to get government business. It is much easier for a small enterprise to find a job that it can do by itself in some lines of activity than it is to develop pool bidding in this fashion. Currently, however, we suspect that effort should be made along both lines.

•

POTASH production in the United States made an all-time high record last year. Domestic production, combined with a mere trickle of imports, gave adequate supply for every necessary use. The prospective allocation of potash, scheduled for the first of April, is merely precautionary. It insures that even though farmers try to get as much fertilizer as they may wish to buy this Spring, there will not be undue shortage in the chemical field.

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COLLEGE TRAINING in chemical engineering is being seriously damaged by the Army. Regardless of the number assigned for this training, the results are likely to prove unsatisfactory. The young men participating in the "Specialized Training Program" will neither be trained nor educated as chemical engineers. This seems inexcusable. The Navy plans are far better. They believe in more thorough college education, even though taken rapidly and, necessarily, in an abbreviated period. The Army classes are "neither fish nor fowl nor good red herring." We suspect that many young men will find this out and will get themselves transferred to active military work instead of trying to become "90-day wonders" in the chemical engineering world. An additional and regrettable influence arises from the fact that unless the boys are in uniform on the campus they will find it difficult to avoid the appearance of being slackers. That's unfortunate, but seemingly unavoidable.

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ENOUGH SULPHURIC ACID will be available for fertilizer manufacture, for explosives, and for other industrial purposes, despite the huge new demands necessary to increase aviation gasoline output. Worries of acid users were justified for a while. But they can now be generally forgotten. Improved technology at government and private plants is stretching materially the available supplies of acid without sacrifice in quality of product or speed of manufacture, of explosives, for example. Chemical engineers both in and out of the government organization deserve compliment for their achievement.

•

LINSEED OIL is to be used for food to some extent. This is significant in two ways. It shows how serious is the shortage of food oils and it furnishes a warning of impending serious shortage of all kinds of drying oil. The experiments which make possible this use demonstrate that linseed oil can be a satisfactory component of an oil mixture which is to be hydrogenated for shortening. That fact in itself may have additional chemical engineering significance in the future.

Loading Gun Powder to Fight the Nazis

BRIG. GENERAL R. E. HARDY
Chief of Ammunition Branch, Industrial Division, Ordnance Department, U. S. Army

Chem. & Met. INTERPRETATION

The measures that have been taken to protect the new plants loading gun powder into bags are worth consideration by safety engineers in all process industry plants. There was a time when explosions devastated these entire plants. Each one of the explosions increased the knowledge concerning their origin. Today, the danger factor has been reduced almost to the vanishing point. In fact, statistics indicate that a modern explosives plant is almost as safe as the home.—*Editors.*

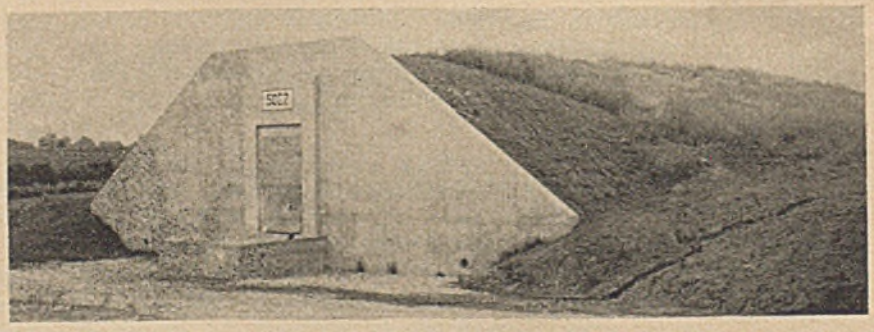
IT HAS BEEN NECESSARY for the Ordnance Department of the U. S. Army to build from the ground up an entirely new industry for the manufacture of munitions. This consists of many large factories scattered all over America costing billions of dollars. They are in full production, and their products are successfully blasting away at the Axis. Among these are several bag loading plants for gunpowder. In the larger sizes of cannon, the projectile and propelling charge of powder are loaded into the guns separately. It is these bags of powder that are prepared in bag loading plants.

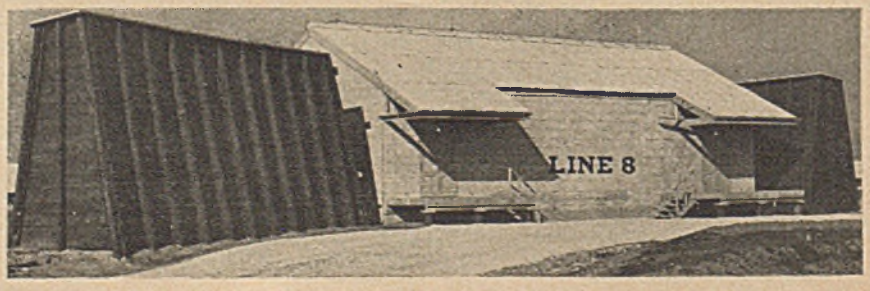
Women predominate in this once extremely dangerous occupation. Today the danger factor has been reduced almost to the vanishing point. The history of accidents at plants manufacturing explosives, and the appalling number of deaths resulting therefrom, makes sad reading. But each one of these explosions increased the knowledge concerning their origin. This article will describe one particular bag loading plant notable for two things; first, the way it was built and, second, its high factor of safety. Not long after Pearl Harbor one of the big tire manufacturers was approached by the Ordnance Department and eventually given a contract to erect and operate a bag loading plant. Its staff of engineers was sent to one of the Arsenals to learn an industry entirely new to them. As time was short, the industry's flowsheet was broken down into parts and each engineer set about mastering some one of the sections. After a short training period, these engineers designed and built a plant, laid out the production lines, purchased the equipment and installed it. They got the plant into operation on the exact date scheduled by the Ordnance Department. The time consumed was only about six months.

Into this gunpowder bag loading plant, the largest of its kind in America, was incorporated all the safety experience accumulated throughout the years in many explosive plants. Probably, in no other plant in the world are 6,500 employees and the product they make so thoroughly scattered over 5,000 acres. The employees are divided into small groups and these groups are broken down into ones, twos and threes and segregated from each other in concrete cells with only a minimum amount of powder being allowed in each cell. In this way, punishment for the carelessness of one is confined to that person, and not more than one or two others. But even here, extraordinary precautions are taken to make their work fool proof even against gross carelessness.

Sparks constitute the greatest hazard in gunpowder plants and sparks originate from two sources, one, striking steel or iron against itself or something else and, two, static electricity. Being struck by lightning is almost negligible as the possibility of an

Igloos is the term applied to the storehouses in the powder storage area. Below is shown a completed propellant unit magazine and barricade. This area is laid out like a small city with streets and avenues all plainly marked





A typical bag loading house with one covered walk leading to the canteen and the other to the storage magazine. Note chutes for quick exit from second story

average structure being hit is only about once in 30 or 40 years. But the possibility of a nail in a shoe, or a dropped knife or any other steel object striking a spark, or the discharge of static electricity from the finger to a door knob looms as a constant possibility throughout the unprotected plant.

Therefore, the first thing the personnel does when coming to work is to remove all their clothing and don uniforms without pockets. This is accomplished in a big "change house" divided into two parts. On one side are the lockers in which the employees place their street clothes, on the other side are the lockers containing their uniforms, in between are inspectors who make sure that no one carries anything into the plant except the uniform and shoes issued. The workers then enter buses and are distributed among the eight bag loading lines.

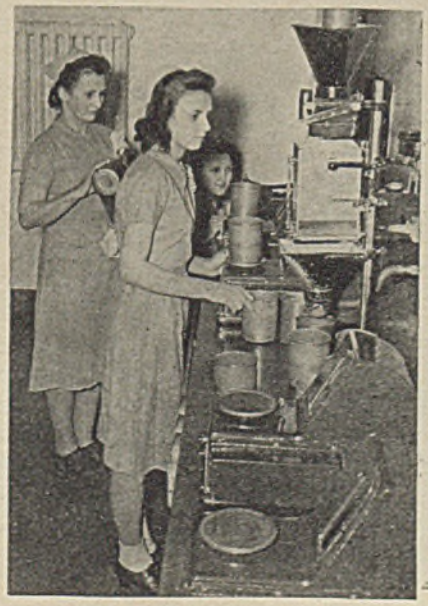
As stated, that part of the plant where gunpowder is handled is divided into sections, each section being known as a bag loading line. Each line consists of several parts, a canteen and rest house, two bag loading buildings and 2 or 3 temporary storage magazines each separated and barricaded from the other. Careful analysis of all data obtained from explosions from gunpowder and other explosives in the past has disclosed the extent of the area of destruction for varying quantities of each. Therefore, the distance from canteen to the loading buildings and from the latter to the magazine are carefully apportioned to the amount of powder in each, and in addition, earth barricades are erected between them so that an explosion in one could not affect the other.

As a further precaution, the bag loading house itself is divided into small rooms with thick concrete walls between them and light glass doors opening to the outside. Only one, two or three persons are allowed in a room and only a small amount of explosive. When three are allowed, they form a team, one filling cups with gunpowder and weighing the charge, the second check weighing and pouring the charges into bags, and the third closing the bags on a sewing machine. The weight of these charges must be absolutely accurate, for variations spell misses on the firing line and misses can lose a battle. A corridor runs down the center of the building, and the filled bags are passed through chutes to boys with trucks, who collect and move them to the packing room and storage. The gunpowder stocks within the building are kept in small hoppers, a hopper to each room. Except for the black powder area, these hoppers are filled from a room above, and zinc chutes lead from these to the ground for a hasty exit. Black powder for primers is more "touchy", smaller amounts are used, and only one or two persons are allowed to a room. The small hoppers here are located in an adjacent room and the spouts extend through a thick concrete wall.

Safety precautions to prevent sparks are exceedingly thorough. Door knobs, hinges, locks, tables,

Routing filled bags to packing department. Corridor of a bag loading house. Girls check bags and push them through chute

A girl fills cups and weighs charge, second checks weights and pours charge into bag, a third closes bags



The 16-in charge of powder arrives on this line in a container. It is weighed and powder put into silk bag

cups, tools, in fact every metal object, is of copper, bronze, zinc or some other non-sparking metal. Even the needles, shoes, etc., of the sewing machine are of bronze while the motors that operate them are located outside with an operating shaft to the inside. The possibility of a charge of static electricity built up in the body of an operator grounding itself by jumping to one of these parts and causing a spark is also prevented. Each one of these metal parts and objects is attached to wires or metal strips which run into the ground and the entire area is covered with a grid of underground cables to which these wires and strips are attached. Moreover, this grid system terminates in a nearby river, thereby making the electric ground complete. Even the floors of the rooms are of conductive material and also are grounded. The chutes from the rooms into the central corridor are bronze lined, and have bronze doors on each side of the wall through which they extend. Both doors can never be opened at the same time. The fluorescent electric lights are protected by explosion-proof fixtures. Just outside of each room is a shower which can be turned on by the pull of a lever. Inside is a water sprinkler system which operates automatically if the temperature rises sharply, as for example, from a fire.

While there is always a small amount of static in the air, it builds up to the point where it will spark spontaneously as during an electrical storm. This constitutes an extra hazard, so a storm detector (static detector) is installed on the grounds which will detect the approach of a storm long before it arrives. When a storm is in the making, it automatically sounds an alarm and everybody immediately leaves the building and vicinity and retires to the canteen until it is over.

Explosions devastating entire plants are no more. The possibility of another Halifax Harbor holocaust as during World War I, where 1,800 died almost instantly and 8,000 went to hospitals, or another Black Tom are remote. In fact, statistics show that an explosives plant today is almost as safe as the home.

Igloos is the term applied to the storehouses in the powder storage area. They are small concrete buildings partly below the ground level with sloping roofs above ground, and completely covered with dirt and sod. There are many of these scattered over many acres of ground, and the distances between are great enough so that if one should blow up, the explosion would not effect any of the others. This area is laid out like a small city with streets and avenues all plainly marked. These roads are improved and surfaced for fast motor transport. The improved roads in this area, together with those in the other areas, total 75 miles and all are surfaced with asphalt. In addition, there are 13½ miles of standard gage railroad for the prompt collection and removal of these lethal charges to the various theaters of war.

The inert area contains the big bag making plant, the administration building, two large modern cafeterias, and two change houses. The bag plant is one immense building with sawtooth roof construction and vast numbers of fluorescent lights to provide maximum light. Fifteen hundred sewing machines are placed in rows. These are individually motor driven. Cloth for the bags is laid out on long tables, some almost 200 ft. in length, by laying machines. There are 250 thicknesses of cloth to a table and on the top thickness are stenciled the bag shapes. These shapes are then cut out by operators with electrically driven cutters and the pieces passed to the printers. The printing presses stamp the lot numbers, types of charges, etc., and the pieces are then distributed to the sewers. Close to 30,000 sq.yd. of cloth are turned into bags and then filled every day at this one plant.

There is also a modern dye plant where cloth for igniters is dyed red and some cloth is dyed green for ease in distinguishing two types of charge. There is also a modern laundry where more than 130,000 lb. of wash is handled every month. In addition, there is a hospital, two completely equipped fire stations, warehouses, testing laboratory, and so forth.

At a bag loading plant exhaustive measures are used to prevent sabotage such as non-climable fences surrounding the entire area; guard patrols 24 hours of the day, on foot or in cars, with two way radio sets; frequent changing of all guards; wearing of identification badges of different colors to indicate particular areas where workers are employed.

The two big cafeterias and the various loading line canteens are modern in every respect. Foods and drinks are served hot and in the same variety as is found in the average restaurant. They are sold to the employees at cost. As no money is allowed in the explosives area, coupon books are used. Water is from wells with a distribution capacity of close to a million gallons a day.

Not only has the Ordnance Department had to build from the ground up an entirely new industry for the manufacture of munitions, but this organization with its six manufacturing arsenals is responsible for conversion of factories to production of guns, cannon, tanks, scout cars, etc. Also it has had to supply blue prints, etc., to train industry.

Gaging and weighing powder charges for 16-in. cannon. Note the new explosion-proof fixtures for protection of the fluorescent lights. Safety precautions to prevent sparks are exceedingly thorough

Problems Involved In Moving a Plant

E. C. DUNHAM *Productora de Artisela, Obregon, Mexico, D. F., Mexico*

Chem. & Met. INTERPRETATION

Moving a plant, "lock, stock and barrel", several thousand miles, from one country to another, involves many problems. The author proves that such an undertaking is practical. His experiences should be useful to others faced with a similar project.—*Editors*

DURING THE PAST 15 YEARS several groups of business men in Mexico have been interested in producing viscose rayon. This interest culminated in May, 1941, when Count Naoselli organized the Mexican company Productora de Artisela, S. A. He came to the conclusion that it would be economically practical to produce rayon in Mexico, provided, first, a start was made with a unit of 5,000 lb. daily capacity with the possibility of adding other units if and when desirable, and, second, that the project be placed in the hands of an experienced engineer.

In June of last year I signed a contract with the Productora de Artisela, agreeing to install and operate the plant until it turned out high quality rayon. The equipment was purchased from the Hampton Co., manufacturers of rayon in Easthampton, Mass. It had produced 4,750 lb. of viscose rayon daily by the pot method of spinning and the package method of finishing.

To transfer the equipment out of the country it was necessary to obtain a permit from the Department of State at Washington. As a result of President Roosevelt's "Good Neighbor Policy," both the American and Mexican governments gave every possible assistance toward the success of the new venture, the first viscose rayon yarn plant in the Republic of Mexico.

Dismantling of the equipment in the Massachusetts plant commenced June 16, 1941, and was completed four months later to the day. Then came the problems of packing and shipping. Shipment was to be made entirely by rail to Mexico City, D. F. Freight cars were selected in which the equipment could be most easily loaded and in which it would best fit. It was also necessary in selecting cars to take into account the necessity of having the required weight in each car. The varied sizes and types of equipment, spinning and twisting machines, steeping presses, storage tanks, etc., made it advisable to place a variety of objects in every car. The United States and Mexican customs demanded a detailed packing list of the contents of each and every carload in the shipment. In addition, each item had to be evaluated.

When the last car had started out on its long journey southward, I selected two engineers to assist me to install the machinery in the plant in Mexico, start up and get the plant in successful operation.

On reaching our destination, Villa Alvero, Obregon, arrangements were made to install the equipment. The buildings are concrete and steel. Walls are lined on the inside with brick. The fume and boiler stack also is concrete, reinforced with steel. The chemical building is three stories and basement and the spinning area is one story. Both of these buildings are new. The finishing, drying, winding, office, and other departments, are housed in a one-story building which had previously been used for other purposes.

Work on the installation began late in November with all Mexican labor. Such work was new to this country, consequently no experienced laborers were available. It was necessary to train them to install chemical piping, to burn lead, to do sheet metal, carpenter and electrical work, and the like. Cranes, hoists and other machinery that is customarily used in the United States for handling and installing heavy equipment was unknown south of the Rio Grande. We had to depend entirely on handling, carrying and erecting every piece of equipment, regardless of weight, by hand.

In so far as the design of the buildings would permit the equipment was arranged for greatest convenience and simplicity, and the most foolproof operation. These precautions were assumed to be essential because of the use of inexperienced Mexican operators and supervisors.

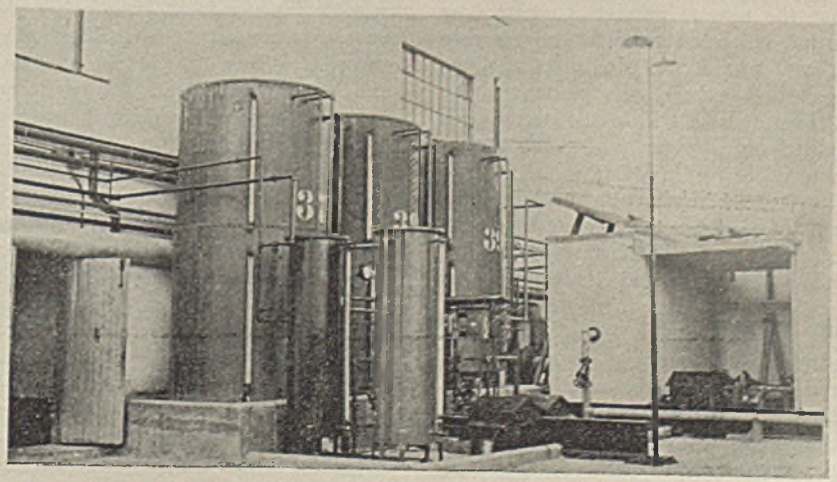
The warm climate made it possible to install some of the equipment out of doors, on the ground and roofs. This proved to have many advantages. Diesel engines are used for power, with an emergency connection to the city power line. Low-pressure steam is supplied by oil-fired boilers. Ample water for all purposes is obtained from a well, and the portion used for processing softened.

It was found to be necessary to purchase all new piping, sheet metal, wood, electrical connections, and a portion of the lead. The drive motors were rewound so that they would be suitable for use with the electric current standard in Mexico. New belts were used for the drives that were not direct-connected.

When we neared the end of this phase of the undertaking, I brought four additional engineers down from

(*Continued on page* 107)

On roof of spinning room are located steeping caustic system and setting bath supply and filters



High-Frequency Electric-Field Heating For Non-Metallic Materials

THEODORE R. OLIVE *Associate Editor, Chemical & Metallurgical Engineering*

Chem. & Met. INTERPRETATION

Induction heating of conducting materials, such as metals, has been used to a large extent in recent years, but no comparable process existed for non-conductors until the advent of short-wave diathermy. A few years ago a similar process was developed for the heating of industrial non-conducting materials, employing a high-frequency electric field. The method is already coming into use in certain industries such as plywood manufacture. Since it produces heat directly in the material, without heat transfer from a source of high temperature, it appears to offer important advantages in many processes where heating is at present difficult.—*Editors.*

Use of a high-frequency electric field for the production of heat is not an entirely new idea, for physicians have been employing it for a number of years in the so-called diathermy method of raising the temperature of parts of the human body for treatment of various disorders. Applied industrially, however, for the heat treatment of non-metallic industrial materials, the idea is of quite recent origin, and now offers a means of eliminating the factor of heat transfer in many problems where conventional heating methods are inadequate for rapid temperature rise or for the introduction of uniformly distributed heat energy throughout a material.

Like medical diathermy, industrial electric-field heating produces heat directly in the material being treated. Energy is not transferred to the material as heat, but in the form of a rapidly alternating electric field, so that the normal barriers to heat flow do not enter the problem and the rate of heat production can be as high as desired. Furthermore, the uniformity of heat release within the material is limited only by the uniformity of the material and of the field in which it is placed. In many applications production of a field of remarkably even intensity is accomplished without difficulty. The principal limiting factor here is the geometry of the system employed. As long as it is possible to introduce the material between electrodes that are substantially equidistant at all points, and plane, or with curvatures of large radii, a uniform field can be achieved.

The history of the new development goes back to 1936 when the Thermal Engineering Corp. of Richmond, Va., a concern interested in the processing of tobacco, was searching for a method of evaporating moisture from tobacco without removing it from the hogsheads in which it is stored and shipped. It was obvious that any method involving heat transfer would be slow and uncertain and means were sought for producing the heat directly in the tobacco, without transfer of heat from the exterior. The solution of the problem was to make the tobacco the dielectric in a condenser subjected to a rapidly alternating potential and thus to take advantage of the usually undesired condenser losses. In order that these losses should be high enough for the desired heat release, however, an extremely high frequency of alternation was necessary, up in the millions of cycles, and beyond the range of mechanical methods of generating alternating potentials. The obvious solution was to turn to the methods of radio transmission, and the resulting equipment involved a high-frequency electronic oscillatory system fundamentally similar to a radio transmitter, but generally more powerful.

So successful were the early results that the method began to attract attention as a means for killing insect infestation in grains and cereals, and for the setting of glues and resin cements in the manufacture of plywood. At this juncture the Thermal organization was taken over by the Girdler Corp. of Louisville, Ky., and the development of processes embodying electric-field heating, and the manufacture of the equipment, are now in the hands of the latter concern's Thermex division.

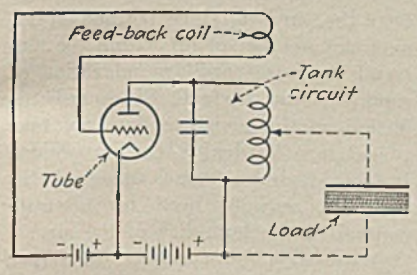
It is not difficult to visualize the mechanism of heat production in a high-frequency electric field, but it should not be confused with the high-frequency induction heating that is often used in the heating of metals and other good conductors of electricity. In induction heating the metal or other conductor, for example, a crucible containing alloy steel, or a metallic processing kettle, is placed within a coil subject to a rapidly alternating current, and thus becomes the secondary of a step-down transformer in which extremely high current values are produced. These eddy currents flowing through the conductor are then dissipated as heat. Use of too high a frequency, of course, tends to confine the secondary eddy currents and hence the heat production to the surface of the material, which is ordinarily not desired, and hence is avoided by use of medium-range frequencies within the scope of mechanical alternators. An exception to this is the new high-frequency induction process for the polishing of electrolytically deposited tin plate. Here it is desired to confine the heating largely to the surface, within the thin flash deposit of tin, so that electronically produced high-frequency primary current is required. Similar requirements are met in the case hardening and brazing of small parts. The equipment used for these last mentioned processes is therefore not dissimilar to that used in the Thermex process for non-conducting materials, except in the method of energy transfer to the material.

The Thermex process makes use of molecular distortion for heat production. When energy is stored in a condenser, it is stored not in the plates or electrodes, but in the dielectric between the plates. It can be considered that part of of the storage takes the form of distortion of the molecules of the dielectric, under the electrical strain to which they are subjected. Once the condenser has been discharged and the strain removed, the molecules return to their original shape, but only with a loss of some of

the energy of the condenser in the form of more rapid motion of the molecules, and hence a higher temperature. This is probably caused by frictional effects between the molecules or groups of molecules. When the condenser is part of a rapidly alternating system which is charged first in one direction and then in the other, the molecules change shape at each reversal and it is possible to dissipate a great deal of energy in the form of heat in the material. Thus, within limits, the higher the frequency, the greater the heat production.

Units employed in the Thermex process are built in heat output capacities from about 500 watts (1,700 B.t.u. per hour) to 300 kw. (1,000,000 B.t.u. per hour). Since the average overall efficiency of power usage is about 50 percent, input wattages for such equipment are approximately double the outputs, and range from 1.0 to 600 kw. There is no practical reason, however, why larger units could not be built if they were required. The equipment is quite compact and in the smaller sizes can be housed in a single cabinet containing all necessary tubes, transformers and condensers. With the exception of one or more blowers for cooling air, and a number of motors for condenser and transformers control in the largest sizes, there are no moving parts.

Since heat transfer rates do not have to be considered in this process and the only important approximation involved is the heat lost by radiation from the material being heated, the energy requirements for each heating problem are easily and accurately determined, and the rate of heating can be closely predicted. Knowing the weight and specific heat of the material and the desired temperature rise, the total B.t.u. required (except for radiation) is calculated and converted at the rate of 3,413 B.t.u. per kilowatt-hour to the necessary energy output of the heating equipment for the entire heating cycle. Introducing the factor of time in which the heating is to be accomplished fixes the necessary rate of energy output, thus permitting an estimate of radiation and correction to allow for this factor. An absolutely accurate estimate is not needed, since the equipment is controllable over a considerable range of output to permit adjustment of the rate of temperature rise.



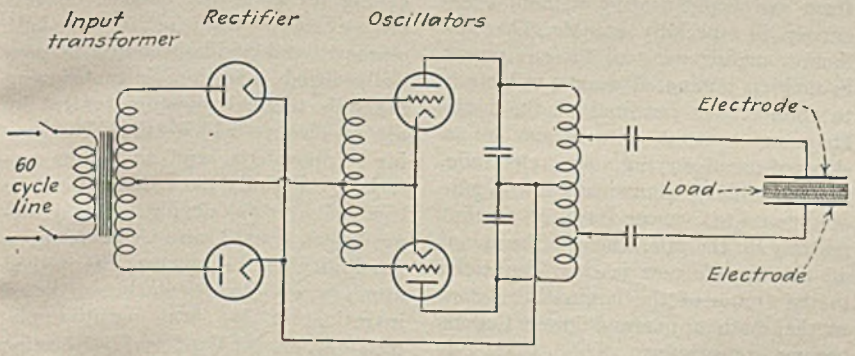


Fig. 1. Left—Simple oscillator circuit Fig. 2. Below—Simplified diagram of single phase electric-field heating circuit, showing similarity to two circuits of the type shown in Fig. 1

The power expended in heating the dielectric of a condenser depends upon the voltage, the frequency, the capacity and the power factor of the dielectric material, or

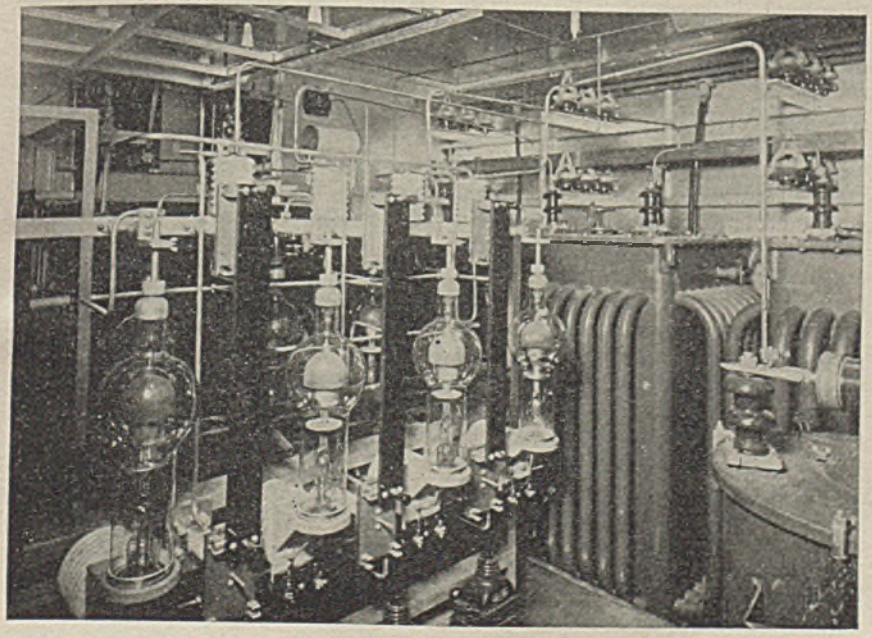
$$W = E^2 \times 2\pi \times f \times C \times P.F.$$

where W is the energy dissipated in watts as heat in the dielectric, E is the voltage across the electrodes, f is the frequency of alternation, C is the capacity of the condenser formed by the material being heated, and $P.F.$ is the power factor of the material. From the equation it is clear that since the capacity C and the power factor $P.F.$ are constants for any given material heated and a particular set-up of the equipment, the energy input can be controlled by altering either the voltage or the frequency. This means that it is possible to use relatively low voltages, for ease in insulation and safety to personnel, and still achieve high heat release by the use of high frequency. For example, the heat release with 1,000 volts and 10,000,000 cycles per second frequency is the same as with 10,000 volts and 100,000 cycles. Within the normal range of frequencies used, the overall efficiency of the equipment remains substantially constant.

Without going into too much detail regarding the electronic hook-ups that are being used in the Thermex process, it will be worth while to describe a typical system briefly and rather diagrammatically:

The circuit used is an oscillator, which is an electron tube hook-up designed to serve as a generator of alternating current of frequency depending on the tuning of the circuit (see *Chem. & Met.*, March 1942, page 103). An oscillator is usually operated on direct current and gives an alternating current output which can be of any frequency between a few cycles and many million cycles per second, depending upon the characteristics of the system. A simple circuit as shown in Fig. 1, employs a single high-vacuum amplifier tube which

Fig. 3—Interior view showing rectifier section of a 600-kw. Thermex electric heating unit



acts as an energy switch in maintaining an oscillation of current in what is known as the "tank" circuit. This is a parallel arrangement of a coil (inductance) and a condenser (capacity) connected in series with the plate and filament of the tube. An initial impulse of current in the plate circuit charges the condenser in one direction, after which the condenser discharges through the coil and recharges itself oppositely. As it again discharges and recharges in the initial direction, another impulse of plate current is allowed to flow, sufficient in magnitude to supply any losses which took place in the tank circuit. The timing of the plate current impulses in phase with the oscillations in the tank circuit is accomplished by a feed-back of energy between the plate circuit and the grid of the tube, so as to increase the tube conductivity at just the right time in the cycle. The process is comparable to the simple mechanical analogy of a watch escapement, which feeds energy to the oscillating balance wheel at the right instant in the cycle to maintain the oscillation.

When an oscillator is used as a source of alternating current power, as in high frequency heating, it is necessary to take off some of the current oscillating in the tank circuit. This can be done by making the tank circuit coil the primary of an a.c. output transformer, or as shown in the Fig. 2, by taps on the tank circuit coil which make the coil an auto-transformer. In any event, the energy supplied by the tank circuit to the output circuit is made up by added energy drawn from the plate circuit of the tubes.

In Fig. 2 is a hook-up diagram of a typical Thermex circuit, considerably simplified as compared with an actual circuit. However, it will serve to illustrate how the circuit works. The alternating current input to the system is brought in at line voltage through a master circuit breaker to a center-tapped transformer where the voltage is stepped up to values between 1,000 and 10,000 volts. The transformer output is then rectified by means of full-wave mercury-vapor-tube rectifier which supplies direct current to the two-tube push-pull oscillator circuit shown. The latter, it will be noted, is substantially similar to two of the circuits of Fig. 1, coupled together. The oscillator generates a frequency of in the range of 1,000,000 to 10,000,000 cycles in the tank circuit and power is taken from this circuit for heating the material by placing the latter between electrodes to form a condenser which is connected into the tank circuit by taps on the tank circuit coil. Except for small units, which may be operated on a single-phase supply as shown, the customary arrangement is to use three-phase power, which requires a separate circuit similar to that shown for each of the three phases.

From what has been said it will be evident that high-frequency electric-field heating offers a means of heating materials for such purposes as bonding, drying and carrying out chemical reactions, under adverse circumstances of heat conductivity, and where uniform and rapid temperature rise is desired. Where transfer of heat from an external source presents no problems, the Thermex process probably will not compete with ordinary methods, since its overall efficiency from power to heat is about 50 percent as compared with the 100 percent of available heat from electric resistance heaters, or the 70 to 80 percent generally obtainable with fuel heating methods. But in other applications where low heat conductivity of the material represents a serious limiting factor, the new method deserves the fullest consideration. It is capable of heating all known non-metallic solids, and most liquids, generally more rapidly and uniformly than by any other method. Extremely accurate control of the temperature and rate of temperature rise are possible and the heating can be stopped instantly, without overshooting due to the storage of heat in the surroundings.

PRESENT APPLICATIONS

At present the Thermex process is being used chiefly in the manufacture of resin-bonded wood, a case where poor thermal conductivity of the material, coupled with the need for uniform and rapid heating without overcuring, is especially notable. The customary arrangement of the equipment in making laminated wood products is to connect one terminal of the high-frequency output transformer to a sheet of metal serving as one electrode, the sheet being sandwiched into a pile of glue-coated veneer sheets at a point midway up the pile. The other terminal of the transformer is then connected to the frame of the laminating press, so that both upper and lower platens become electrodes. The press is grounded to assure the safety of the personnel. Many layers of veneer, up to a total thickness of 2 ft. or more can be heated simultaneously, either to produce two single heavy slabs, or for making a large number of thinner panels of laminate.

Not only ordinary plywood, but also the new impregnated super-compressed variety known as compregnated wood can be made in this fashion. It is also possible to laminate heavy planks for keels, beams and girders or, by omitting several veneer plies over a part of the area of the slab, to form a slab of varying density and strength, suitable for certain kinds of beams and for airplane propellers.

In addition to the production of flat objects, it is also possible to form compound-curved laminated objects, such as wing and fusilage parts for airplanes. The electrodes need not be of heavy metal. Thin sheets of any conducting material can be used, for example, metal foil glued on to a wooden mold, or a mold or form of any material sprayed with metal.

Successful experimental results have been achieved with numerous possible uses of the Thermex process, aside from laminated products manufacture. The poor heat conductivity of granulated cork, for example, is no bar to the formation of thick resin-bonded slabs of that material, when the heat can be produced directly in the cork. Cellulose can be similarly bonded, or dried. Rubber can be cured, and all kinds of plastics molded. Rayon cakes, slabs of soap, clay articles, fabrics, felts and other textile products can be dried quickly. One factor of importance in drying applications where soluble materials are present is that segregation of salts can not take place near the surface, since thermal gradients can not be set up within the material to cause capillary migration of liquid to the surface. Since redistribution of the moisture does not take place, case hardening can be avoided in the drying of such materials as ceramics, without need for accurate control of the humidity of the air.

A possible improvement in paper drying would be to eliminate the latter part of the dryer, perhaps one-half or more, and wind the paper in partially dried condition, later bringing the rolls to final moisture content by use of electric-field heating. The drying of powdered and crystalline materials, especially those that can not be tumbled during drying without degradation, would also seem to be a possibility in many cases. The method appears to be particularly worthy of investigation for heat sensitive materials where the danger of overheating due to thermal gradients in ordinary drying is an important factor. The method is equally suitable where operation under vacuum is desirable.

The characteristics of high-frequency electric-field heating which have been discussed here suggest numerous possible uses other than those that have been mentioned. The method is of such recent origin that there are doubtless many other uses which have not been considered but will occur to those faced with particular problems. In other words, a new tool is now available for the solution of industrial heating problems, but a full understanding of its potentialities will come only as a result of the thinking of many people.

The process described here was largely the development of Paul D. Zottu, chief engineer of the Thermex division of the Girdler Corp. The writer is much indebted to Mr. Zottu for assistance in the preparation of this paper.

Postwar Planning Within Business Concerns

W. S. LANDIS *Vice President, American Cyanamid Co., New York, N. Y.*

Chem. & Met. INTERPRETATION

Postwar industrial planning, to be realistic, should get down to the brass tacks of production and distribution. Unfortunately most governmental plans are too indefinite to offer much practical help to the individual engineer or executive concerned with his own or his company's future. Dr. Landis has some suggestions that will help clear the decks for action. —*Editors.*

POSTWAR planning may fall within the four categories: (1) International, (2) National, (3) Divisions of industry, (4) The corporation unit.

International planning is beyond the scope of this paper, although it does have certain influence on the corporate unit. Those companies in which foreign business is an important part of their activity must take note of the trend in international planning. If the pound-dollar is to be stabilized in international trade, foreign business should be relatively free and unrestricted. If international plans do not include stabilization of the pound-dollar, then foreign trade will be conducted on a bilateral basis. The two systems have quite naturally different influence on the program of the corporate unit.

The trend of national planning is also of interest to the individual company. One speaks of planning for full postwar employment. An understanding of what this statement is intended to convey is very necessary. Are the plans to include maintenance of employment at the level anticipated for the remainder of the present year plus placement of the disbanded military establishment, or is there to be a sensible view of some satisfactory level of employment, a level which might be characterized as normal? Without going too much into details, normal might be represented as about the employment condition existing between 1924 and 1928. Some two to three million people, casual workers, students, unemployables, retired, and miscellaneous, were not then in regular employment.

Does this national planning provide for return to the home of the many women, who for patriotic reasons, are now working in war factories? Does it contemplate re-opening of our schools, colleges and universities for a continuance of higher education, all of which will help to make way for the placement of the disbanded military organization? To contemplate any higher degree of employment than some such normal will lead to serious economic difficulty.

Also does national planning include relief from the unsound tax system to which we are now subject? We in industry know that capital must be supplied in proportion to employment, and if our system of taxation does not permit accumulation of this capital in proportion to the increase of workers we are expected to employ, we reach an impasse. Planning must be consistent in its over-all aspect.

Postwar planning is now a common topic of conversation but there usually exists only a vague idea of what is expected of the individual corporation. Public discussion is in such broad generalities that a great many people fail to grasp the application to their own personal problem. There are great differences of opinion among the spokesmen in the field of international planning. Certainly no one can find rhyme or reason in the statements issued from Washington regarding national planning. It is, therefore, not surprising that the businessman, straining his organization to turn out war materials or wondering how he is going to operate his plant tomorrow with the changing restrictions on labor and materials, is mystified as to where he might begin the planning in his own organization. The literature is as vague as it is vast.

This subject was approached more than a year ago, purely from the standpoint of personal association with a unit of the manufacturing industry. There were certain factors developing back as far as 1940 that merited consideration. By 1941 these had developed to a point where they were becoming critical. In 1942 we actually began to organize planning for the postwar period in a small way, utilizing part of the time of our forces that were in the field. It was recognized that the factories were too busy and faced too many problems to ask very much of that branch.

This excursion into the field of planning developed quickly that there are three distinct fields. One field is so broad that it should be undertaken by some organization that is in contact with the whole of the national economy and of all branches of industry. Another field relates specifically to a single industrial division. The third is concerned with the corporate unit. It is possible to deal with but a few of the elementary principles and some specific examples.

STARTING POINTS

It is important to have a thorough understanding of the point from which we start, and we must set up a goal of attainment. At the present time we find ourselves in a national-socialistic economy. In reaching this point we had been trending toward full socialism to which the war has emphasized the nationalistic aspect. If our goal is to be socialism of one or another form, then there is little use in planning. It is probable, however, that we will turn back slowly to an economic system in which individual initiative and thrift and freedom will be respected again. Therefore, planning is worthwhile.

The goal for which we are striving is to permit the individual to acquire all possible benefit in measure as he is willing to contribute to production. This means that we must make available opportunity for employment to such of our population as is willing to work and in particular to the demobilized military forces.

We have not yet reached the end of the war and it is necessary to make some assumptions in any planning program as to when that is likely to occur and what will be the economic position of the country at that time. Each of us probably has his own ideas

From a speech delivered Mar. 18, 1943 before the National Industrial Conference Board, New York, N. Y.

on this subject and we are not all in agreement. Practical consideration, therefore, involves setting up several assumptions.

NATIONAL SURVEY

What for example will our people want when the war is over, and what means will they have available for satisfying these wants? Some organization should commence to build a catalogue of the voids and deficiencies occasioned by the wartime scarcity of materials. This is a problem of fundamental interest to all industry and it can be answered best by an organization equipped for general coverage, that is, through a national survey. Only a few of the very large business units are equipped for making such survey and this would leave the thousands of small industrial units, which after all bear by far the largest burden of private employment, without adequate information. For each small unit to undertake such would mean a vast amount of duplication and wasted effort. The results of such survey should be made public. One way not to do this work is to permit the politician to undertake it, the result of which we have an excellent example in the TNEC reports. There probably never was so much misinformation put into print, in the history of the world, as is represented by those reports.

The goal that we are striving for primarily is to shift the manpower of our nation from war to peace with a minimum of idleness and disturbance to the normal habits of our people. It is not directed solely at the preservation of the business unit for that would be a false and narrow and selfish view. If we solve the problem of employment we will not have to worry about the future of our private industry and the business unit.

In this national survey a second item is the estimation of the amount of spending money in the hands of the public immediately after the war. There have been many errors in assuming that this is all avaliable for the purchase of goods. As a matter of fact an important part of planning would involve the setting of a logical tax program which should be aimed at the reduction of the colossal national debt at the earliest possible moment, but always with regard to a minimum of disturbance to national economy. Also a sound tax program in operation in this immediate postwar period would be one of the most constructive factors in permitting industry to convert to peacetime occupation without too much pressure from this vast amount of spending money. In brief a national budget from the standpoints of the public, as well as the government, should be a part of this country-wide statistical study.

Later this national survey should also be carried forward to cover that period not specifically included by the word *reconstruction*. We should begin to think and particularly correct some of these very immature predictions about annual postwar national incomes. We have no quarrel with those who speak in terms of big figures. As a matter of fact, we may wonder whether they really understand what they are talking about and even if their figures are large enough. What will that national income, however large the figures, mean in terms of purchasing power? How many units of goods will it buy? Industry operates in terms of quantities of goods, units or tons or carloads. It keeps historical records in terms of dollars. We must not confuse these two units: the unit of production and the unit of money. The relationship has varied from time immemorial.

It is, therefore, necessary that industry have some idea of the probable purchasing power of these monetary values so that its productive operations, which mean employment, can be planned properly. This too is a problem of a national survey the results of which should be made available to all.

SPOT SURVEYS

Through industrial business units, a spot survey should be made of the intimate wants and desires of the public. One or two such surveys of very limited scope have developed some very surprising facts. Of course, we all know everybody wants a new automobile, new tires, but there are other items apparently that the public wants and in quantity. Some of these have not been mentioned publicly. We hear too much about housing. Yet that does not seem to be on the list of a large number of people who will have money to spend. They seem much more interested in repairs, remodeling, renovation, and much less in new houses than publicity indicates.

Those manufacturing units that are now on munitions and expect to go back to peacetime production, have been working at top speed and probably with substandard attendance and maintenance. Their plants will need rehabilitation, repair and replacement parts. A complete schedule of these requirements should be made ready with orders written, so that the purchasing can be started well in advance. Remember many people are going to want this same kind of equipment all at once when the war is over, and there should be no delay in the mechanical and clerical departments incident to preparing this schedule.

For those plants that have undergone much reconstruction to meet the war program, complete plans should be made as early as possible for their conversion. The war has taught many short-cuts and speed-up methods, and in planning the reconstruction all such as are applicable should be included in the remodeling.

POSTWAR SCHEDULES

There are plants that are contemplating new production after the war. Their schedules of raw materials should be made ready and all contemplated layout of equipment planned well in advance. Also one must include the complete program for distribution of the new items. It is almost superfluous to add that schedules of time required for the change-over should be developed for this information is needed by the sales department to plan their attack on the customer.

There seems to be an exaggerated idea about the place of new materials and new models. Since the foundation of the Republic, industry has been in continual change. It has never stood still for any period of time. On the other hand we all know that these changes are not instantaneous but take place progressively over the years, each new model representing step by step advances in the art of design and production. The first business that every company is going to take on is to fill the voids left as a result of the shortage of civilian goods. These voids can be met quite satisfactorily with the models abandoned at the time factories turned to war production. There may be cases where our material shortages have developed some effective utilization of substitutes, but on the whole such will not be controlling in the reconstruction period. Later when we get back to more normal, they will find their natural places in our industrial program.

There will be a great many repairs and replacements needed to take care of wear and tear during the war period. These essentially call for the older models and will form a very large backlog which will not be greatly affected by new designs and new materials and upon which business can resume activity. One should not be deterred in formulation of a program by the search for the will-of-the-wisp of novelty. While this immediate void is being filled, the engineering and production departments can busy themselves, possibly for as long as two years in appraisal of new projects.

Many organizations feel that the immediate postwar period is going to be a seller's market. This is probably true. However, they should not overlook the fact that a competent field organization is necessary and very much so for the succeeding years. As a part of the postwar planning it is suggested that the field organizations be instructed early as to the necessity of surveying along definite lines.

There has been a vast movement of population in this country incident to the construction of new manufacturing units. Is the field representation adequate in these new territories? Some major shifts will be found necessary in balancing divisional territories and manpower.

The field force should catalogue any new plants, as well as the local conditions with respect to housing, transportation, and other factors affecting their future. A complete study of the production facilities of these is also in order for the purpose of determining what possibility there is for peacetime operation of many of these new plant facilities. They should pick up local rumors as to any plans for the future, remembering that many of the plants will become political footballs, and that local politicians may possibly have more knowledge of the future than the present management.

This field force should follow closely the local established units that are being squeezed and may not survive. Once out of production it is going to be difficult for many of these older units to resume in the light of the competition from the newer and transformed war plants.

Administrative officers will have a problem on their hands in financing the change-over. It is very important that all factors bearing on conversion be assembled and adequate notice of financial requirements be placed in their hands. We must remember that the tax burden is now so great and the difficulties of accumulating surplus so insurmountable that a new financial burden is far greater than ever in the history of American industry.

In conclusion, it is suggested that a central organization of appropriate size be set up to clear the postwar planning problems. Every unit of organization mentioned above should be required to make its own study and prepare full reports of its progress, copies of which should be deposited with the central planning committee. It should not be the function of this central committee, even in the larger organizations, to perform these surveys. At the present time we must bend every effort to the war and the studies of the type suggested above must be fitted in with the war production program without interference with immediate war work. These reports, therefore, may not come with the regularity of a scheduled task carried out by a unit devoting its entire attention to this problem. This central committee should get the maximum of results by making it its business to keep the problem before the several groups and to give general direction.

The central committee can classify and extract the pertinent facts from the reports and route them in segregated form to the appropriate division of management. They can assist in redistribution of personnel where weakness or surplus develops. They can assist the management in determining probable financial needs.

Summarizing this very brief treatment of the subject, it is recommended that some competent national institution undertake to collect information of general character respecting shifts of population, voids incident to scarcity, probable postwar price levels and purchasing power of national income at several levels. The individual operating unit should survey its plant facilities, condition of equipment, repairs and replacements needed, and supplies for early production. The field staff should accumulate local information as to new competitive facilities and probable conversions. All preparatory work incident to change-over should be commenced at the earliest practicable opportunity, and the time for completion estimated so that distribution of product can be organized. In the larger institutions a central planning committee should be charged with clearing information collected from sub-committees and keep up to the minute charts of progress in the planning program.

There are many more details that properly belong to this important subject, and which have not been discussed here. The plan should include at some status a survey of the fruits of research, the possibilities of entering new fields of production, and also abandonment of old items. There is also the problem of disposal of surplus equipment and productive capacity.

But after all postwar planning is exactly the same kind of planning that every industry should do from the date of its foundation until it passes out of the picture. It is really not a new problem, merely an old one given a new name. It involves no new factors. It does require a little more comprehensive understanding of our economy and a little greater pressure for accomplishment than is usual in normal development.

MOVING A PLANT

(*Continued from page* 101)

the States to assist in completing the installation and in starting up the plant. As previously stated, it was decided to use an all-Mexican organization to operate the plant. These men are good natured, resourceful, and respond to the American methods for performing their duties. The chemists and engineers are 1940 and 1941 graduates from a local university.

When all was ready it was decided to start operations as follows:

(1) The water system was started so that both hard and soft water were available where and when needed.

(2) The laboratory was organized. The numerous solutions that would be required for control of the process were made and standardized.

(3) The diesel engines and boilers were started.

(4) The 65 tanks used in the processing were cleaned and calibrated. And all other equipment was cleaned and made ready to operate.

(5) Next the working solutions were made up and analyzed;

(a) Caustic soda solution for steeping the pulp.

(b) Caustic soda solution for dissolving the xanthate.

(c) Coagulating bath for spinning the viscose.

(d) Finishing solutions for after treatment of the rayon fiber.

(6) All ventilating systems were started and balanced for humidity and vacuum required.

(7) The refrigeration system was started and the flow of brine checked.

(8) Then the controlled temperature areas were checked and balanced for desired temperature.

(9) The compressed air systems and vacuum system were put into operation.

(10) The operating schedule was made out, which is a time table showing the exact time each batch starts and finishes, in each department, throughout the entire processing.

(11) Thus with everything ready and working to the standards set, the operating procedures were followed and 3-shift continuous production was started on Aug. 26, 1942, by the steeping of Rayonier's Ferninandia rayon pulp. Thus commenced the production of viscose rayon yarn and a new chemical process industry in Mexico. On Sept. 18, 1942, the first batch fo the viscose rayon that had been spun, finished, dried and wound was sent to a customer who wove it into cloth and then piece dyed it Blue FF.

The training of the Mexican staff and labor for operating this plant is progressing rapidly. The key men that came from the U.S.A. returned in November and December.

Soap from Southern Pines

NORMAN G. FARQUHAR *Assistant Editor, Chem. & Met.*

Chem. & Met. INTERPRETATION

In an effort to determine the true place of rosin in soap, the chemists of the Hercules Powder Co. are conducting extensive tests on rosin soaps made in the Experiment Station laboratories at Wilmington, Del. The following preliminary report shows how this investigation is bearing fruit.—*Editors.*

THREE YEARS of comprehensive research by the Hercules Powder Co. in cooperation with soap manufacturers have disclosed accurate information proving that rosin, when used properly, imparts desirable qualities to soap. This is of particular importance at the present time when soapers are seeking new raw materials to replace the oils and fats which are critically needed in the war effort. However, it is expected that the use of rosin in soap will continue to increase in the post-war period as there is a plentiful supply in this country at low price. The development of polymerized and hydrogenated rosin derivatives has further insured the place of rosin in soap manufacture.

The output of rosin during the 1943-44 season is estimated at 725,000,000 lb. whereas, at present, only 125,000,000 lb. are consumed annually in soap. Unless unforeseen military demands should develop, the rosin supply will be adequate for soap requirements which are not expected to exceed 400,000,000 lb. per year.

The complicated molecular structure of rosin (acids, hydrocarbons, secondary alcohols, esters, etc.) makes it impossible to predict the properties which will be imparted by its addition to soap. Therefore, in order to evaluate the effect of rosin in soap, actual soap batches of 5-10 lb. were made in a specially constructed glass kettle. White tallow (75 percent) and Cochin coconut oil (25 percent) were used as a white stock and brown tallow plus coconut oil formed the brown stock. Various soaps were made using different percentages and grades of wood and gum rosins and rosin derivatives.

Yields of rosin soaps were comparable to yields of fatty soaps and indicate that normal yields could be obtained in full-scale plant operations.

Color changes were measured by relative brightness, dominant wavelength and excitation purity. A G.E. recording spectrophotometer was used to eliminate the error involved in human inspection, and it was found that, for practical purposes, visual differences were adequately measured by excitation purity alone. Bar soap containing up to 20 percent of Staybelite (Hercules hydrogenated rosin) showed little increase in color over soap made without rosin. All the other rosins used caused an appreciable increase in the color of soaps made from white stock, but caused only slight darkening of soaps made from brown stock. One to seven months storage of the 20 percent Staybelite soap resulted in only slight darkening.

Hardness of white base soap was not appreciably changed by addition of Staybelite up to 15 percent. At concentrations of 20 percent and higher, however, there was considerable softening of the bar.

Neat soaps containing up to 20 percent Staybelite soap had a water content less than 1 percent greater than in soaps made without rosin. The maximum equilibrium moisture content was 30 percent at about 30 percent Staybelite soap concentration.

Rosin was most effective in increasing the solubility of soaps made from low titer fats.

Detergency tests made on carefully prepared fabric samples revealed that in some cases the addition of rosin or rosin derivatives actually improved the detergent efficiency. Dispersing action was satisfactory and no redeposition of soil was noted on unsoiled cloth when it was washed in the presence of soiled cloth.

Sudsing was either increased or unaffected by addition of rosin up to about 30 percent.

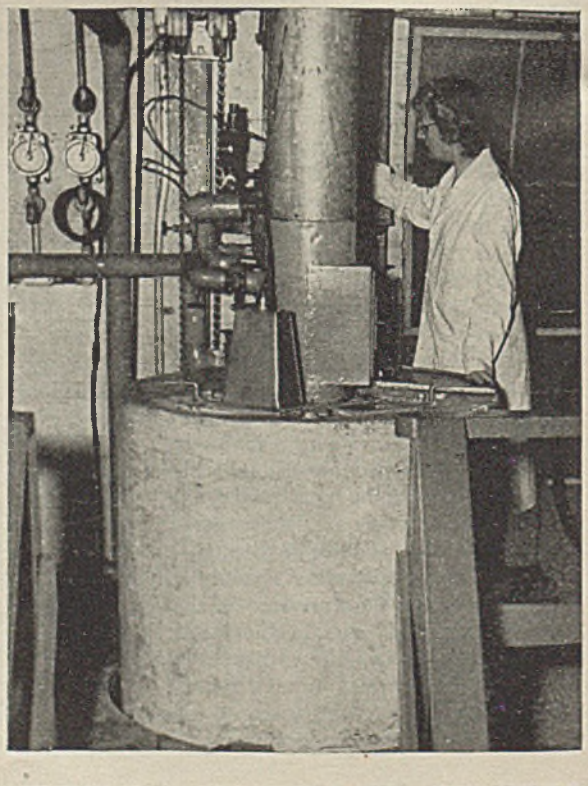
Color and dustiness of 15-20 percent rosin soaps dried in a pilot plant spray-dryer compared favorably with commercially spray-dried soaps. Exposure for 300 hr. at 80 deg. F. in an atmosphere of 97-100 percent relative humidity caused no lumping of the spray-dried product.

Based on results obtained thus far, it is recommended that rosin in soap be limited to 3 to 30 percent of the total soap stocks used depending on the type of product desired.

Experiments made on tallow-rosin soaps, eliminating the use of coconut oil, revealed that their performance is intermediate between a straight tallow soap and a tallow-coconut oil soap.

Continuation of this research program is expected to result in even better products than have been obtained already. Higher titer rosins and more complete hydrogenation of rosin will probably be among the first improvements. The manufacture of hydrogenated rosin is curtailed at the present time due to lack of suitable equipment, but will be expanded as soon as the equipment is again available.

Hercules woman chemist standing on top platform of experimental spray-drying tower which produces soap powder similar to commercially dried soaps



Unusual Stuffing Box Problems Encountered in Acid Pumping

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Chem. & Met. INTERPRETATION

This is the fourth and last of a series of articles dealing with the selection, installation and operation of acid pumps under war-time conditions. In spite of the fact that numerous articles on chemical pump stuffing boxes and packing have appeared in the past, there is always room for a new one if it has something exceptional to offer. This we believe to be true of the present paper. The "trouble-shooter" of Mr. Pratt's article diagnoses and solves a very mystifying and elusive pump ailment, showing how the trouble could easily have been avoided by proper operation, without change in design.—*Editors.*

Several types of problems are encountered in the use of centrifugal chemical pumps, for the handling of corrosive solutions and slurries, which are not always recognized as fundamental. This article is the fourth of a series which has dealt with a considerable number of these problems, including: (1) the selection and operation of pumps for the loading and transfer of oleum and strong sulphuric acid; (2) the selection of construction materials for centrifugal acid pumps; and (3) the proper choice of a pump for the handling of heavy and viscous acids, especially where high friction losses are encountered in the suction line.

So much has been written in recent years on the stuffing box problem, and on packing for acid pumps, that at first thought another article on this subject may seem unnecessary. However, the main points emphasized herein are those which apparently get little serious consideration from acid pump manufacturers, acid pump maintenance men, or acid pump operators, alike.

Another justification for further discussing this "bugbear" of acid pumping—stuffing boxes and packing—is that many process industries, particularly those engaged in manufacturing chemicals and explosives, are now faced with the terrific problem of teaching hundreds of inexperienced men how to operate and service centrifugal acid pumps of various types, handling hazardous chemicals. If we can reach and interest but 5 percent of these new operators and maintenance men with articles of this nature, then these few men may appreciate the special problems and take better care of their equipment. They, in turn, may teach others to realize the hazards involved in improper operating and maintenance technique. This will result in saving money, materials and production.

In the pumping of water or oil at reasonable pressures there is little or no demand for centrifugal pumps with other than the conventional stuffing box, with which there is seldom any trouble. However, there is definite proof that the same type of stuffing box used on a water pump, or the operation of the pump as if it were handling water, may lead to serious trouble when pumping acids and many other chemical solutions. For example, evidence of this is found in the demand that exists for acid pumps without a stuffing box, and for self-priming acid pumps which can be set above the supply so that the stuffing box will be under negative operating pressure.

The majority of acid pumps in use today are of the standard, end-suction, vertically split type with one stuffing box. Due to the simplicity and relatively low cost of this type of pump we can expect this situation to continue. Therefore, every pump maintenance man and pump operator in a chemical plant (and, in fact, in any plant that pumps acids) should be instructed why an acid pump must be built, operated and serviced differently than a water pump. A good, well-constructed, standard type of acid pump, when so treated, will compare very favorably in its performance with a reliable water pump.

We are assuming in our further discussion that readers are familiar with the usual instructions and practice for getting satisfactory results from packing in the stuffing box of a well-made chemical pump. If not, the bibliography appended to this article lists some previous publications on the subject as well as other available literature. Our concern in this article is to analyze some of the probable causes of troubles that occur on certain acid pump installations where all operating conditions appear to be favorable, and yet recurrent serious difficulty persists. Since we want the acid pump maintenance man to learn what to look for in spotting the causes of such troubles, beyond the usual check-up for accuracy of running parts, type of packing, etc., we are going to detail the steps that a "trouble-shooter" goes through.

The installation in our example consists of an acid pump of the standard end-suction, vertically split, open-impeller type, handling a warm acid that is not corrosive to the nickel-chrome stainless alloy material of which the unit is made. The installation is satisfactory with flooded suction. A proper grade of packing is used and the stuffing box is served with an independent water seal. The pump shaft is protected through the stuffing box by a conventional shaft sleeve and both shaft and sleeve are made of the same alloy as the casing. In other words, the pump is one that has been on the market for years and duplicates hundreds of others in service which have been handling various acids to the entire satisfaction of the users. Also, this particular installation seems to have been made in a suitable manner. Nevertheless, in spite of all this, the user has had continual trouble, and he has finally appealed to the pump manufacturer after several months operation, making the following complaints:

1. He cannot keep the impeller nuts tight and has resorted to welding them to shaft.
2. The impeller rubs against the suction head and both these parts are badly worn.
3. Acid leaks from the stuffing box in spite of constant use of the water seal and frequent repacking, causing loss and external damage.
4. Both the capacity and the head have fallen off.

5. When new replacement pump parts are installed the same things happen again.

The pump manufacturer sent his "trouble-shooter" to the plant where the trouble reported was quickly confirmed. One of the pumps was removed to the shop for examination. As it was dismantled the "trouble-shooter" made the following observations:

1. Suction Head—Deeply scored. Ridges and gouges 3/32 in. or more deep. Mated exactly with gouges and ridges on impeller vane. Proves contact was made under running pressure resulting in the galling typical of chrome-nickel stainless alloys. Maximum clearance at time of dismantling 0.042 in. (taken by removing old gasket, replacing suction head to hard contact with impeller, and comparing thickness of feeler gages with thickness of removed gasket.)

2. Impeller Nuts—(Double locknut style.) Loose. Show attempts to hold tight by peening and also by welding to shaft. Threads on shaft partially broken off and some metal from shaft threads frozen into the threads of the nuts. Proves excessive strain on the threads.

3. Impeller—Front faces of vanes badly scored as noted above. Loose on shaft. Key and keyway battered up, probably by vibration due to looseness. Play due to looseness about 0.020 in., leaving a minimum clearance of 0.022 in. between impeller and suction head. Score marks on impeller and suction head quite smooth, indicating pump had been run for some time after damage occurred, as otherwise there would have been sharp slivers of metal on the scored surfaces.

4. Shaft Sleeve—Loose on shaft, with end motion between impeller hub and shoulder on shaft. Evidence of acid leakage underneath sleeve. Sleeve grooved by packing. No unpolished portion under correct location of seal cage (lantern ring), indicating cage had been pushed to bottom of the stuffing box when new packing rings had been added. This would have closed off water seal.

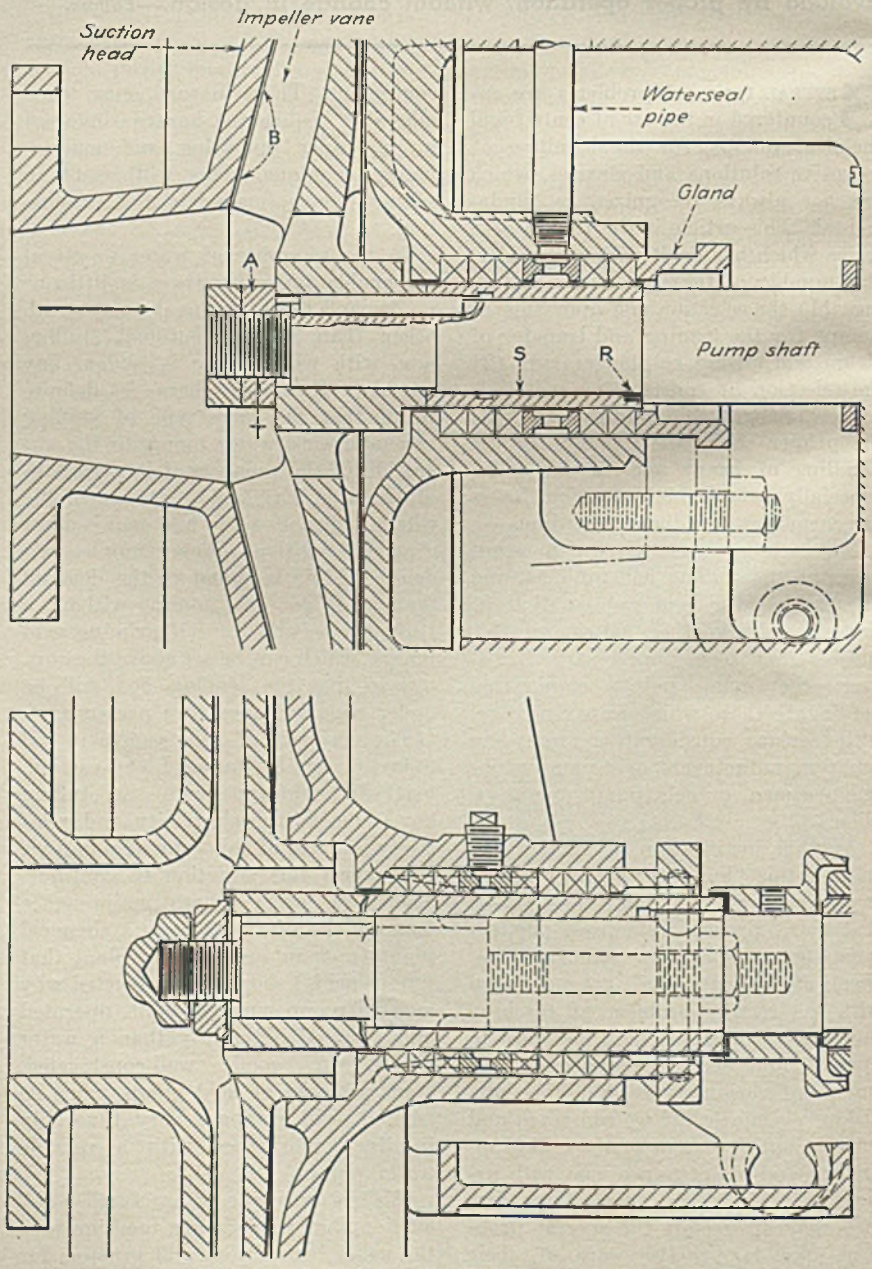
It was obvious to the "trouble shooter" what could have caused the above described damage, but it was necessary to confirm this by observing the methods of operating the pumps by the various operators on both day and night shifts. In this manner some of the suspected reasons for the failures might be confirmed. With these observations and with the helpful cooperation of both maintenance men and operators, the whole picture could be pieced together. Once the actual causes of the failures became known, it was then only a matter of education to correct the practices and secure satisfactory operation.

Since it could be assumed that the pump parts and the original assembly were made to the manufacturer's standards, it was only necessary to confine the observations to those practices in operation which could bring about a change in the original assembly. These included expansion, or strain caused by misalignment or incorrect piping. To clarify these observations it will be helpful first to study the general design of the pump used on this particular installation. Fig. 1 shows the central portion only of the pump as this details the affected parts. In general features it is similar to acid pumps sold by many manufacturers. Each manufacturer may introduce minor deviations, using a different shape of impeller, a different method of holding the impeller on the shaft, and variations in the shaft sleeve design (if a sleeve is used). It will become evident later that the elimination of the shaft sleeve is often good practice on small acid pumps.

This pump has a heavy cast iron frame with ball bearings and a heavy

Fig. 1—Improper running-in of packing of this typical acid pump caused excessive heating of the stuffing box, expansion of the shaft sleeve and freezing of the impeller to the suction head, despite proper design*

Fig. 2—This confined shaft sleeve construction is designed to prevent leakage between shaft and sleeve, even in event of overheating*



shaft, stiff enough to prevent any running whip through the stuffing box. The shaft sleeve is a push fit, keyed to the shaft with the same key that joins impeller hub and shaft. The impeller hub has sufficient length to give a satisfactory bearing on the shaft with a drive fit. The impeller nuts and shaft are so threaded that with the correct direction of rotation the nuts tend to tighten, and the double nuts lock them effectively. The stuffing box is of ample depth, served by an independent water-seal, correctly located for controlling dilution of the product, leakage of acid and wear on the packing and shaft sleeve. The design is admitted to be satisfactory for the usual operating conditions and hundreds of these pumps have given satisfactory service for many years.

Now for the results of the observations of the operation of the pumps on this particular set-up and an analysis of what were found to be the causes for the serious failures that had occurred in this case: The first unusual occurrence noted in the operation of one of the pumps was that the supply tank ran dry and no operator showed up to shut down the pump for 23 minutes. In the mean time the pump continued to churn the acid until it was at or near the boiling point. During this time the shaft and sleeve were kept relatively cool by the water seal so no great expansion took place and the impeller did not rub the suction head. Since there was a possibility that this condition might have occurred when the water seal was not functioning, a calculation was made for the possible expansion of the shaft at 100 deg. F. rise in temperature, averaged over its length of 16 in. from thrust (fixed) bearing to impeller. Taking a coefficient of expansion of 0.9×10^{-5}, we find $0.00009\times100\times16=0.0144$ in. expansion. Since the pump checked had 0.022 in. minimum clearance, and since the minimum clearance used in the construction or assembly is 0.020 in., this particular error in method of operation probably had nothing to do with the failure noted. However, this was called to the attention of the operators as a dangerous practice, since it increases the rate of corrosion on the pump parts, causes unnecessary vibration, disintegrates the bottom ring of packing, wastes power, and might cause serious damage to the pump if the water seal failed at the same time.

At a later time one of the pumps (there were several installed on duplicate conditions) started to leak badly at the stuffing box and a maintenance man was called to correct it. This man attempted to stop the leak by adding a new ring of packing and tightening the gland, but he left the pump with a reduced amount of liquor leaking at the gland. This leakage liquor proved to be acid leaking underneath the shaft sleeve and little or no sealing water was passing between the sleeve and the packing. In about three minutes the stuffing box became smoking hot, with steam coming out instead of liquor as before. The pump became very noisy in operation and an operator arrived to shut it down. It was then impossible to turn the pump over by hand as the impeller was apparently "frozen" against the suction head. The operator used a hose to cool off the pump and stuffing box, after which he started it up again, saying "It will run okey now." It did but with considerably more leakage at the stuffing box.

This sudden overheating in the stuffing box occurs more frequently on acid pumps than others, owing to the greater "friction drag" of most acid-resisting packings. To offset this tendency to generate heat many grades of chemical packing contain large quantities of acid-resisting lubricants or greases, which expand considerably with increase in temperature. Hence, the tendency with new packing is to tighten the packing against the shaft so much that no sealing water can leak past to keep the shaft sleeve and packing cool.

The "trouble-shooter" observed this situation and noted that the packing saturant grease was bubbling (boiling) out at the gland before the hose was turned on it. As this could indicate that the sleeve temperature had probably reached 600 to 700 deg. F., some calculations were made on the basis of an *increase* in the shaft sleeve temperature of 500 deg. F. Referring to Fig. 1, it will be noted that the shaft sleeve is inserted between a solid shoulder on the shaft and the inside face of the impeller hub. When this sleeve expands something must "give." The coefficient of expansion of the metal is about 0.9×10^{-5} between 32 and 212 deg. F., but from 212 deg. to 600 deg. F. the coefficient is probably about 1½ times this amount or, say, 1.4×10^{-5}. Taking an average probable coefficient of 1.2×10^{-5}, with a sleeve length of 3 in., then the expansion would amount to $0.000012\times3\times500=0.018$ in.

Since from previous examination it was noted that the impeller nuts were loose and the maintenance men said they could not keep the impellers tight, it was now possible to explain this chronic looseness. The fact that this pump impeller contacted the suction head indicated that this expansion of the shaft sleeve, plus the original expansion of the shaft itself was greater than the original clearance allowance.

Referring again to Fig. 1, when impeller nut *A* is originally tightened, it is set up as hard as a man can do it with a 12-in. wrench. This puts an initial severe strain on the threads *T* on the shaft. Then when an additional strain is put on these same threads by an expansion of the shaft sleeve S by as much as 0.015–0.020 in., the metal may be strained beyond its elastic limit, causing a permanent set. The impeller nut is then loose as soon as the sleeve cools down, or the shaft heats up to the sleeve temperature. The impeller nuts may be tightened subsequently, but they will loosen again with the same cycle of circumstances, until the shaft threads are broken down completely.*

When the impeller nuts are welded to the shaft, with the idea of preventing loosening, then when the same cycle of events occurs and the shaft sleeve suddenly expands, something again must give. The shaft itself, at the threaded portion, may stretch beyond its elastic limit, or the weld material may give way. While the nuts may not back off as did the threaded nuts (on account of vibration), still the impeller becomes loose and the whole assembly gets so noisy from constant wear and vibration that the complete rotor must be replaced.

A new spare pump was then taken from the warehouse and the clearance between suction head and impeller vanes was checked at a temperature of 85 deg. F. and found to be 0.020 in. This was then installed at the location where the original pump had been removed, for a check on the head-capacity of a new pump compared with the original pump. When the waterseal was connected it was noted that the minimum pressure was 60 lb. per sq. in. After the installation was completed and the pump packed with new packing, it was started up, pumping acid at 120 deg. F. The seal water would not leak through this new packing as the high seal-water pressure acted just as if the gland had been tightened severely. Since none of the operators or maintenance men made any move to do anything when the packing started immediately to smoke, the factory man shut down the pump and cooled the stuffing box with a hose.

* Shaft and shaft sleeve constructions, similar to those shown in Figs. 1 and 2, have proved so satisfactory for most applications that this article should not be construed as condemning the design. Rather, this article is intended as an analysis of causes of troubles caused by incorrect operation. Pump manufacturers will continue to build pumps embodying these designs as the thousands of pumps in service will require repair parts and satisfied users will continue to buy such pumps for standardization purposes.

The pump was then started again and still no seal water would leak through, so the water from the hose was left playing over the stuffing box and gland to keep the packing cool until it could "set" sufficiently to allow seal-water leakage for cooling. As the pump continued to operate satisfactorily for some time, the factory man left it to measure the volume being pumped.

This proved to be a mistake, for during the time he was away, one of the men took the hose, which had been keeping the stuffing box cool, to wash down some leaking acid at another point. Within a few minutes' time, this brand new pump had frozen solid and stalled the motor. In these few minutes of operation without any means of cooling the stuffing box (and thus the shaft sleeve), the sleeve produced enough heat and expanded enough to push the impeller out against the suction head. After contact was made the man nearest the pump could not get to the switch before the motor was stalled. The pump was opened and it was noted that the surfaces at point *B*, Fig. 1, were deeply scored and frozen together.

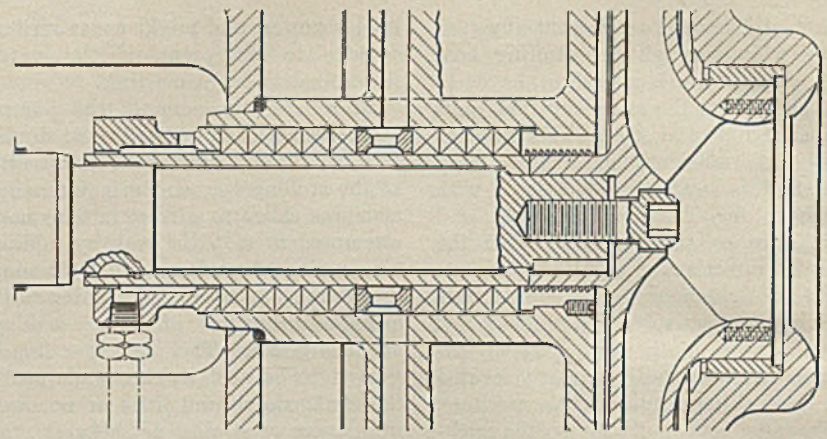
Calculations of the expansion of the parts to cause contact at point *B*, Fig. 1, tell what probably occurred:

1. Since the pump was handling liquor at 120 deg. F., and since the new bearings also contributed to heating up the oil or grease in a hot location, the pump shaft probably averaged 120 deg. F. throughout its length. This would cause an expansion from thrust bearing to impeller hub (16 in.) of 0.000009×16 (120–85) = 0.005 in.

2. The shaft sleeve attained a temperature within a few minutes which was at or close to the boiling point of the grease saturant in the packing, and did this too fast for much of the temperature rise to be transmitted to the shaft. Assuming that the sleeve was 450 deg. F. hotter than the shaft, we calculate the expansion of the sleeve alone as $0.000012 \times 3 \times 450 =$ 0.016 in.*

3. This represents a total movement at point *B*, Fig. 1, of 0.005 plus 0.016 in. or 0.021 in. This would represent sufficient movement to have caused contact of the impeller vanes with the suction head under pressure and to have resulted in the damage noted and the stalling of the motor.

Thus by observation, analysis and a few simple calculations the "troubleshooter" satisfied everyone at the plant as to what had caused all of the damage and repeated failures. The plant then adopted the following measures which stopped the reported troubles:



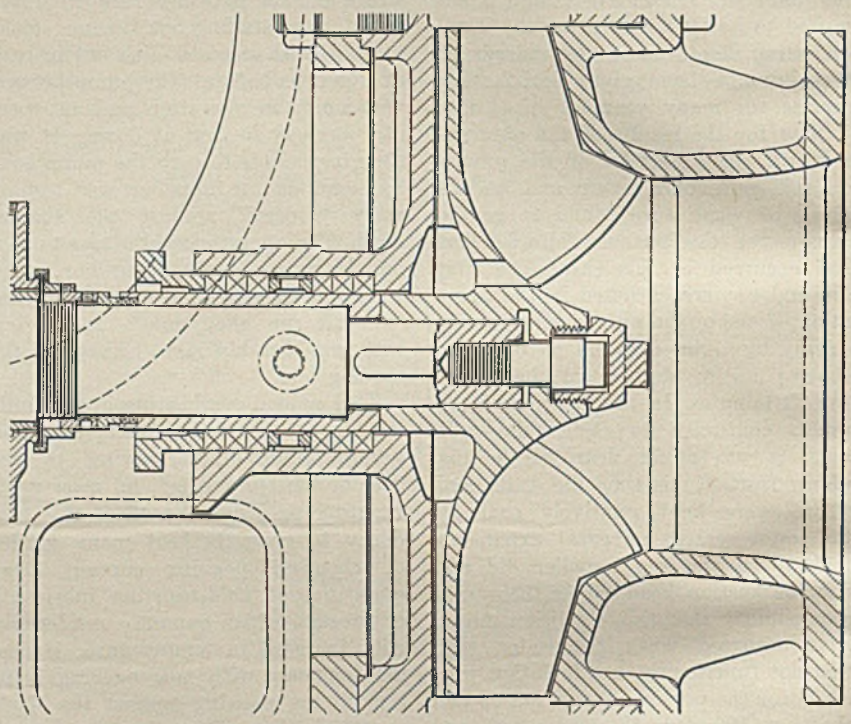


Fig. 3—This unconfined shaft sleeve can expand without strain on the device holding the impeller in its fixed position on the shaft

Fig. 4—Free to expand, this shaft sleeve design for large acid pumps has a secondary stuffing box to prevent leakage between sleeve and shaft

1. The original clearance between impeller vanes and suction head was set at 0.030–0.040 in., so that if incorrect operation allowed sudden overheating of the shaft sleeve no contact between impeller and suction head could occur. The extra large clearance could be tolerated for this installation as the pumps developed sufficient head-capacity when so assembled. The pump manufacturers' standard clearance is based on safe performance under average operating conditions without sacrificing too much efficiency due to excessive clearance.

2. Shaft sleeves were removed from all pumps and recessed at the outer end as indicated at point *R*, Fig. 1. This cavity was then filled with a non-hardening chemical putty which would prevent leakage of acid underneath shaft sleeve, even if the sleeve were damaged or loosened.*

3. Maintenance men who packed the stuffing boxes were instructed to stay with the pump after repacking or tightening the gland until the stuffing box had run cool for five minutes and sealing water was leaking sufficiently from gland.

4. Instructions were issued to run-in new packing as follows: (*a*) Pack the box in accordance with manufacturer's instructions, pulling the gland tight and then backing off the nuts one turn; (*b*) turn on the seal water, start the pump and run until the gland starts to feel warm (usually about one minute); (*c*) stop the pump and cool off the stuffing box with a hose or

bucket of water (usually about three minutes); (*d*) repeat the starting and stopping of the pump, running the pump a little longer each time, until seal water leaks through packing in sufficient amount to cool stuffing box.

Although this procedure may require 15 to 20 minutes longer at each repacking, it will save many days per month in maintenance.

Under the described circumstances, it is probable that if the pumps had had solid shafts without shaft sleeves, the troubles as described would not have occurred.* With a solid shaft there would not have been any strain due to differential expansion on the impeller nut threads, thus causing loosening of the impeller. Since a solid shaft would be smaller in diameter than the sleeve, there would be less friction on the packing and hence the shaft would not get so hot. Such heat as would be generated would be dissipated more quickly through a solid shaft. Without a sleeve there would be no leakage between shaft and sleeve to cause an unobservant mechanic to overtighten the gland.

It is possible, of course, that at first many solid shafts might have been badly scored and replacement costs for a number of new shafts would have been higher than for shaft sleeves. However, the overall replacement costs might have been much lower as the impellers and suction heads would not have been ruined. The early return of one of the scored solid shafts to the manufacturer would have disclosed the causes for the scoring and the improper methods of operating could have been corrected quickly by mail instructions or by a local service man.

Since it is recognized that leakage underneath the ordinary shaft sleeve is probable, many special designs have been developed to prevent this leakage, or reduce it to a minimum, in the case of pumps designed to handle hazardous or costly liquids. Those designs that are mainly intended to protect a steel shaft from corrosion by the liquor being pumped will not be discussed, but a few of the better designs are described and illustrated as a matter of guidance to interested engineers.

The sketch of Fig. 2 shows a good, although more costly design for a shaft sleeve construction, which is confined at both ends. The joints between the impeller nuts and the impeller hub, and between the impeller hub and the sleeve are of the best liquid tight, metal-to-metal construction. (Gaskets or soft metals at such points in an acid pump are useless.) The joints as made have a little "give" to them under compression, without losing their effectiveness. If the sleeve is overheated too much and too fast so these joints leak, the elastic chemical putty in the recess under the bearing shield (slinger) at the outer end of the sleeve is an effective seal against leakage of acid under the sleeve.*

Fig. 3 illustrates a design where the shaft sleeve is not confined between a fixed shoulder on the shaft and the impeller hub. This construction has the definite advantage that it allows the shaft sleeve to expand without putting any strain on the device used for holding the impeller in a fixed position on the shaft. If any leakage occurs at the joint between the impeller and the sleeve, there is then an internal, beveled, ground and lapped joint to prevent leakage between the shaft and the sleeve. This construction in an acid pump would be costly and any deviation from the highest accuracy in workmanship or assembly would allow leakage. However, many pumps employing this design for the shaft sleeve are in successful use handling hot, hazardous chemicals.

In pumps of fairly large size, constructed of expensive alloys, the extra cost of the best and safest construction for applying a shaft sleeve may be well worth while. As the diameter of the shaft increases with the size of the pump, the possibility of wear at the packing area is increased accordingly, and it may prove an expensive item to replace a large shaft too frequently.

The design of Fig. 4 is a shaft sleeve for large acid pumps that has much to recommend it. The impeller bolt and cover nut prevent loosening at this point, while the "pipe-thread" joint prevents internal leakage. The shaft sleeve is free to expand so accidental overheating cannot affect the impeller attachment. Should leakage pass the two internal joints at the internal end of the sleeve, allowing acid to get between the shaft (which is made of the same acid resisting alloy as the pump) and the sleeve, leakage to the outside is prevented by the secondary gland and packed stuffing box. This rotates with the shaft and sleeve and is, therefore, easy to keep liquid tight, but it is still adjustable as may be necessary. This is one design that has all the advantages of the replaceable shaft sleeve construction, without the possibility of putting any strain on the shaft or impeller nut. At the same time any possible leakage of hazardous chemicals underneath the sleeve is under definite control from outside of the pump. However, this construction is warranted and practicable only on large size pumps.

In general, for small, low-head chemical pumps it is recommended that those designs which have shaft sleeves should be avoided. Sleeves are rather costly in most of the acid-resisting alloys and in many cases when sleeves are to be replaced the shaft is damaged anyway when the old sleeve is removed. In very small pumps the whole shaft costs little, if any, more as a replacement part than a shaft sleeve, while the first cost of a small pump is lower without the more involved construction required when a sleeve is used. It should be kept in mind, however, that if a pump manufacturer is requested to furnish a solid shaft without shaft sleeve in a pump that was designed for a shaft sleeve, the cost may be higher for the special construction and a very considerable delay may be caused.

In the foregoing discussion, it has been shown how damaging excessive heat in the stuffing box can be to an acid pump. Another factor which contributes to overheating a stuffing box is an excessive amount of packing which presents more surface for developing frictional heat. The time worn specification calling for "extra-deep stuffing boxes" has been overworked and it may be responsible for some designs that require entirely too much packing for economical results.

This article has attempted to show the engineer responsible for plant maintenance why chemical pumps that have given good service in many plants, can still fall down miserably in other plants when some of the finer points of good operation and maintenance are overlooked. It has also explained the steps that can be taken to correct the resulting troubles. Information has been given on alternative designs for pump shafts and stuffing boxes that should assist an engineer in pump selection.

* See footnote on page 111.

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Harnessing the "Know How"

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Chem. & Met. INTERPRETATION

Technical "know how" is of value only when it is used. Herein the author, eminently qualified to speak on the subject, shows how the nation is mobilizing its vast technical "know how" to win the war and points out how this same mobilization of scientific knowledge can win the peace and possibly advance our standards of living at least half a century within the span of a few short years.—*Editors.*

THREE TYPES of people are in great demand for the production army at the present time: those with "know how", those who can act as catalysts or promoters, or as they are called in Washington, expediters, and those trained for specific jobs. Without all three, production quotas cannot be met.

The civilian population is confronted with the rationing of one commodity after another. Except for items imported, there is no one who would disagree with the broad statement that there is sufficient technical "know how" in this country to produce an abundance of all other items which are rationed. It has been our inability to harness this technical "know how" which makes rationing necessary.

Solving the sugar shortage by growing sugar beets, the beef shortage by raising more cattle, and the oil shortage by building more pipe lines and drilling more oil wells are possible, but in each instance manpower and materials are needed.

Many people compare World War I to the present conflict as a pilot plant to commercial operation. In the pilot plant of over twenty years ago we had submarines, tanks, airplanes, radio and chemical warfare. We built the better pilot plants and won the war, and having won it, we decided that our way of living would never again be challenged. Some of our pilot plants were junked, others wore out and were never replaced, and in some instances, as in the radio field, we went into industrial production. Having rested on the laurels of our pilot plants for a quarter of a century, we are now confronted with the problem of large-scale industrial production in a minimum of time.

Improvements in the weapons of warfare have developed. Compare the bomber of today with the plane of twenty-five years ago, or the tank, or any of many other items and these advances can be noted. Some people believe that the energy of the inventor and research worker should be directed entirely to the improvement of products now known. Thus it is argued that our goal must be that of producing bigger and better bombers, tanks, submarines, guns and other weapons of war—and more of them. Many improvements are needed and I know that they are being developed.

DER FUEHRER'S WORRIES

But we must not stop here; we cannot afford to do so. Hitler has shouted "secret weapon" from time to time, but where is it? He can command his research workers to invent a new weapon of war but all the commands and threats of the concentration camp or death will never promote the creation of new ideas. Creative minds can thrive best only in a free country. The only secret weapon Hitler ever had was the fact that we let the fires go out under the boilers of our pilot plants.

Hitler fears our inventive genius. Now that we are in the harness again he knows that improvements in weapons of war are coming. Furthermore, he knows from our past performances that he must expect some secret weapons to appear against him. In this country it is unnecessary to command the inventive minds to go to work, for they are already at work.

We know that the technical men of Germany laid plans for this war based upon the creation of stock piles of strategic materials, development of "ersatz" materials, and quickly conquering of territory containing materials not available by stock piling, "ersatz" and normal production. By harnessing this "know how" and utilizing "blitz" tactics they expected to win.

They anticipated that our methods of development were too slow to overcome their time advantage. The refusal of the Russians and British to be overwhelmed by "blitz" tactics and the rapidity with which our allies and this nation have gotten into mass production of the implements of war have upset the German time table.

Now that this time table has been upset people wonder whether or not some new technical development may give the Axis the advantage needed to win the war. Speculation and rumors are rampant but sound reasoning indicates that the probability of such happening is of a very low order. There are two reasons for this. First, the number of high-caliber men engaged in research by the Axis countries is much smaller than that of the Allies. Therefore, on a straight probability basis the advantage is all on our side. Second, the working conditions are better among the allied nations. Fundamentally, it is a difference between being commanded to do something and being asked to do it.

People frequently ask such questions as: What will happen if Germany finds out how to harness the power from uranium on a commercial scale before we do? What will we do if they develop a rocket type of plane which gives them the advantage of speed and control of the air? What will happen if they develop a new war gas for which we have no protection? What will we do if they increase the efficiency of the submarine to such an extent that our ships can no longer use the seas? What will happen if an explosive much more powerful than any now known is developed?

If my statement that the Allies have technical superiority is correct, then the answer is obvious. We can meet their best and return it with interest. As evidence that the Allies have technical superiority, I wish to describe some of the agencies and work which they are doing.

"Know how" and workers can function together as a team only if they are organized for efficiency. In peace, utilization of "know how" depended almost entirely upon private initiative. During times of stress such as these

it has appeared advisable to superimpose on this program one which will promote, as rapidly as possible, the production of end products needed in winning the war.

For many years this nation has had the greatest educational program of the world. We have built large research laboratories for colleges, universities, government and industry. Thousands of men and women have been trained to attack a problem scientifically.

The National Roster of Scientific and Specialized Personnel has detailed information concerning the qualifications of more than 500,000 of the Nation's scientists and professional men and women. Over 140,000 of these have been certified to agencies engaged in the war effort. This trained personnel is a national resource indispensable in winning the war. Our colleges, universities and other training centers have an almost insurmountable task in meeting the replacements required in the various technical fields.

TECHNICAL MANPOWER

Here is just one example to illustrate the magnitude of the technical manpower situation. Our colleges and universities will graduate approximately 4,700 chemists and 2,000 chemical engineers between January 1 and July 1, 1943. Approximately 1,400 of these are committed to the combat army through the Air Corps, Navy, Marines and R.O.T.C., which leaves about 5,400 potential employees available for the chemical industry. The shortage of chemists and chemical engineers is serious in spite of this graduating class, and it may get worse before it is better.

Our Army and Navy have announced their program for utilization of many colleges and universities in the training program for the combat army. This is further evidence of the technical nature of modern warfare and emphasizes the resources available in this country for such a training program. No other nation has equivalent facilities available.

The next technical shortage facing us is that of trained personnel needed to operate the hundreds of plants approved for construction during 1943. The synthetic rubber program alone will require thousands. This new industry must either train men and women or obtain them from other chemical plants. We must solve this problem and keep the industrial plants operating at full capacity or else the planned plant expansion will not meet the demands of the combat army. Probably this is the most serious problem confronting us at this time.

Government agencies engaged in developing new "know how" or clarifying and expediting it can be divided into two groups. The first are those which were in existence prior to the present war and the second those which came into being because of events leading up to this war or created since Pearl Harbor.

In the Army and Navy, such outstanding units as the Chemical Warfare and the Naval Research Laboratory have been known for many years. Unfortunately, our Army and Navy technological programs in peacetime did not receive the support they deserved.

The Bureau of Mines, the Bureau of Standards, the Bureau of Agricultural Chemistry, the Forest Products Laboratory and more recently organized Agricultural Regional Laboratories of the Department of Agriculture in California, Louisiana, Illinois and Pennsylvania are among the outstanding government technological organizations now harnessed for war work.

Our Office of Scientific Research and Development set up by executive order of June 28, 1941 contains many sub-groups which devote their time to special lines of investigation. Dr. Vannevar Bush has a large technical staff supervising and promoting research devoted to war problems. The exact research problems are in most cases military secrets. The work is being done in government, college and university, and private research laboratories. The fact that hundreds of men and women are engaged in such problems indicates that we are trying to develop "know how" as fast as possible.

There are many instances where we have developed improvements in processes used both by the enemy and by ourselves. We have no desire to tell the enemy of these improvements. Timing the use of a new idea is extremely important. In some instances a secret weapon is of maximum value only once. It is essential that such secret weapons be kept secret until ready for use and then used to advantage.

INDUSTRIAL PROCESSES

The Office of Production Research and Development, an organization within the War Production Board, has as its director Harvey N. Davis. Here we find industrial processes being considered, evaluated and sponsored. Some of the processes submitted remind me of the story of the college professor who, after examining a thesis submitted by a student, called him in and said, "Young man, there is much in your thesis which is true and much which is new but, unfortunately, that which is true is not new and that which is new is not true."

All too frequently inventors and proponents of new processes have presented them to the public for evaluation and through undue publicity have made it appear that they have the solution to new technical processes. It is possible that some of these can effectively slow down the war program. In war, to claim that you can do something that you can't do may have an effect equal to that of direct sabotage.

The longer the war and the greater the expansion of industry, the more important will be the role of the Office of Production Research and Development. It is part of our insurance program to protect ourselves in case of a long war. It is only by creating and harnessing new "know how" that we can, for example, greatly expand the production of aluminum, benzol, steel and other essential commodities.

Our new Agricultural Research Administration under Dr. E. C. Auchter will serve the Food Administrator in a somewhat similar manner to the way the Office of Production Research and Development serves the War Production Board.

RUBBER RESEARCH

The Office of Rubber Director has a technical staff furthering developments in synthetic rubber. Probably no single field of research has received more thought and energy than that of the manufacture of synthetic rubber. This is typical of any new development. Once a new idea is put forward and men start working on it, modifications and improvements follow at a very rapid rate. Many people have the idea that there are only two ways of making butadiene used in the manufacture of synthetic rubber. This impression results from the heated debates on the production of butadiene from petroleum versus grain. Actually there are dozens of methods for making butadiene and it is quite likely that new and even better methods may be discovered. It is no longer a question of whether or not we can make a tire from synthetic rubber: the problem now is to build the plants for the manufacture of synthetic rubber. There are dozens of methods and dozens of different types of synthetic rubber. Many of these are impracticable and it is almost impossible to predict the future for some. The only thing certain is that the synthetic rubber of tomorrow will be tailor-made for a particular job. We no longer attempt

to make a rubber which will bounce like natural rubber, as for many uses bouncing is not a prerequisite.

Studies on high-octane gasoline are being made by the Office of Petroleum Administrator. Here again, war has stimulated research and progress in this field. The gasoline for civilian use after the war will most certainly be a greatly improved product over that used before the war.

The National Inventors Council was created in August, 1940, by the Secretary of Commerce with the full concurrence of the President to collect "know how" from all over the United States. Its primary functions are to encourage the public to submit inventions or inventive ideas of war value and to evaluate promptly these proposals. Much of the time of the engineers and technical committees functioning in the National Inventors Council must be spent in advising people that what they think is new may really not be new at all. In fact, new ideas which are workable and of great significance to the war effort are very rare. However, from these thousands of suggestions sent to the National Inventors Council come some ideas which are being put to use in winning the war.

PATENTS AND "KNOW HOW"

The Patent Office War Division searches the "know how" in applications for patents which may be useful in producing commodities for war. Examiners in the Patent Office, now located at Richmond, watch for new ideas which are of significance as found in applications for patents and send them to the Patent Office War Division in Washington for evaluation. Some of these ideas thus uncovered have been of significance. We must remember that the Patent Office is a great storehouse of "know how". In fact, were only one building containing technical information to remain in the United States and all other technical books of all of the other libraries and sources of technical information to be destroyed, that one which should remain at all cost is the Patent Office, for from the thousands of patents and applications for patents now in it most of the technical developments of the United States could be reproduced.

We frequently speak of using patents in winning the war. Actually what we mean is using the "know how" contained in the patents. Never before in the history of our country has this "know how" been more efficiently used than at the present time. This has been done through the pooling of knowledge and the redistribution of it in various fields. Thus, through the Office of the Rubber Director technical information on this subject is pooled and disseminated to those needing the information.

50,000 AXIS PATENTS

During the first world war 4,802 patents and 291 applications for patents of Axis countries were seized by the Alien Property Custodian and sold to the Chemical Foundation for $250,000. Of these, 403 were licensed and 241 paid royalties.

For the six year period 1936–41 inclusive, citizens and companies of Germany were granted 13,672 patents, Italy 533 and Japan 343. On this basis the Office of the Alien Property Custodian should vest about 50,000 patents belonging to the Axis countries. These are being made available to American industry and some will be used. Thousands of them are of no value but we intend to utilize the "know how" contained in them to the fullest extent.

Many interlocking committees such as those of the National Academy of Science and the National Research Council are global in nature. It appears inevitable that some duplication of effort and differences of opinion must result from this gigantic technical enterprise. Hearings before a subcommittee of the Senate Committee on Military Affairs concerned with a bill dealing with technological mobilization lists 61 technical groups within the Federal Government.

After we have won the war, our next problem will be that of adjustment of peacetime conditions. Let us reason this through. We are agreed that we have the technological "know how" to win the war. If we cannot survive a peace which follows the war, then we are admitting that peace is worse than war. True, we will be confronted with adjustments of work and huge debts, but both of these disappear at the same time if we are capable of doing in peace that which we are doing now.

The national debt, huge as it is, has never apeared to me to be insurmountable. There are two methods by which the national debt can be paid off—one is by inflation and the other by invention. Inflation is as cowardly as invention is constructive. Harnessing technological "know how" is the solution to this problem.

WAR-CATALYZED ADVANCES

Many believe that this war has spurred scientific advancements to the extent of the equivalent of 30 to 50 years of normal research. There is no question but what many advances have appeared during the past few years and many of these can be harnessed for the good of all after the war. Our tremendous increase in capacity for production means that we have the plant facilities for making far more materials than we ever had before the war began.

When we realize that we are making about seven times as much aluminum now as we did in 1939 and about 100 times as much magnesium, we realize that we now have the facilities for producing the raw material from which innumerable light metal products can be made. Tons of these metals will, no doubt, find their way into planes, trains and even ordinary constructive materials.

No field has advanced more rapidly than the plastics industry. The number and variety of plastics which can be produced are almost innumerable. By utilizing different ratios and different combinations of chemicals, plastics are obtained which will find dozens of uses in our daily lives. No other chemical field has, at the moment, a more promising future.

It is obvious that we will come out of this war with new "know how" in the fields of medicine, surgery, dentistry and with a deeper appreciation of physical fitness. We will have new methods for the production of clothes and shelter, better methods of transportation and all down the line technological advances will be available for improving our post-war world.

SCIENCE AND SOCIETY

One big problem will be that of knowing how to use this "know how" for the common good. Somehow, sociological progress has lagged far behind that in the technical fields. Milesticks are needed to measure technical progress in the last 100 years whereas micro equipment is needed to record social progress. There is no reason why technological advances, wars and unemployment should go hand in hand. Out of this war must come a "know how" capable of solving this problem.

If it be that the technologist of the past has been satisfied to turn his inventions over to others to mold into our civilization, then it is time that he assume an additional role in world affairs.

Our combat forces returning from the fighting fronts are going to demand that the "know how" be harnessed to make this country a better place in which to live and at the same time they will encourage raising the standard of living of the rest of the world. To do this, we must harness the team and plow.

PLANT NOTEBOOK

CUTTING MAINTENANCE COSTS BY ARC WELDING CHEMICAL PROCESS EQUIPMENT

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THE TASK of maintaining machinery to give maximum production at minimum cost is the function of the maintenance department in this plant. A more or less standard piece of equipment is installed somewhere along the flow line with the expectation that it will do the job for which it was installed economically and well. Too often it turns out to be the beginning of new headaches. The "bugs" must be taken out of it, and the cure often calls for welding, which did not exist in the machine as it was furnished by the manufacturer. The following are some instances which were engineered here.

A rotary dryer for coke came provided with ½ in.-thick bolted-on alloy steel wear plates for liners. The dryer is 6 ft. 6 in. in diameter and 45 ft. 0 in. long. Coke is very abrasive. After only a year of service, the wear plates were replaced with cast alloy plates of various compositions, but one year of service was about all cast plates gave.

At this plant a great many 1¼ in.-round bars 16 ft. 0 in. long are used. These have a carbon content of 0.40 to 0.50 percent. The short ends find their way to the scrap pile. A method was conceived for using these bars, instead of the conventional wear plates, in the manner shown in Fig. 1. The bars were welded around the surface to the inner shell at a 3 in. center to center spacing, the bars running lengthwise of the dryer. This allowed a 1¾ in. minimum space between bars which keyed up with caked coke. The caked coke thus became the wearing surface, and the steel shell was protected from abrasive action.

New plates were costing about $600 a year. This bar idea was installed in January, 1940. After two years of service, the bars showed but little wear, and it was estimated would give about four years of service. Plates would cost $3,600 over a six-year period. The bars, if new, would have cost about $250, but being short ends they were only worth a scrap value of about $20. The cost to install the bars, including labor and welding rod, was about $380. Over a six-year period this is a total saving of $3,200. An illustration shows the cross section assembly.

A conventional roll crusher equipped by the manufacturer with cast segment wear plates was installed in September, 1936. Each roll required six plates. It was soon found that these cast plates broke when a stray piece of metal went through the crusher, which is inevitable in a plant of this type. The average cost of these cast plates was $16.74 each.

The records showed for an average 12-month period that 23 plates were replaced, which cost $385 for the plates alone.

On Sept. 18, 1939 on one roll was installed two rolled half-sole abrasive-resisting steel plates, welded together where the halves met. These were 1 in. thick. On lines 2½ in. center to center across these steel plates were welded hard surfacing beads, which cost as follows:

Abrasive-resisting steel plates	$210.00
Labor applying plates and running beads	19.20
Welding rods and miscellaneous supplies	22.00
Total	$251.20

The roll described above stood up splendidly and with no maintenance, but it was desired to try a design which would be as satisfactory and cheaper. On Mar. 3, 1941, on the other roll were installed two ½ in.-thick half-sole mild steel plates, and across these skip welded abrasive steel bars. These were 1 in. x 2 in., laid flat with 1½ in. spaces between, which cost as follows:

Rolled steel plates	$49.00
1 in. x 2 in. abrasive steel bars	23.86
Labor applying plates and bars	15.80
Welding rods and miscellaneous supplies	8.50
Total	$97.16

Cast plates were no longer bought. For six months these two rolls operated together in the crusher with little sign of wear on either. At the end of that period or on Sept. 5, 1941, the first mentioned roll had to be removed because of a bent shaft. It was necessary to replace it with a spare roll, and for expediency to use some cast plates which were on hand. As of Mar. 1, 1942, the 1 in. x 2 in. bar roll is still operating satisfactorily and showing negligible wear. It will last four years with no maintenance, if estimates are correct.

If a second 1 in. x 2 in. bar roll had been made and used, the total cost of the two rolls would be $194.32. As their

Fig. 1—Bars welded to the inner surface of this rotary dryer for coke products protects the steel shell from abrasive action

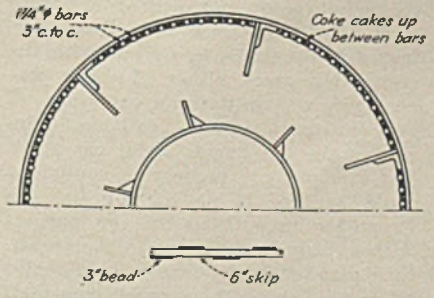

Fig. 2 (below)—Welding half-sole mild steel plates and skip welded abrasive steel bars reduces maintenance on this roll crusher

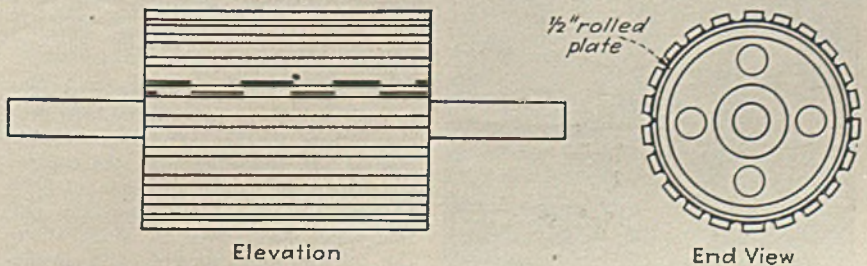

Fig. 3—Welded steel cutters with tips coated with hard surfacing rods on a pug mill

A study submitted to the James F. Lincoln Arc Welding Foundation in its recent $200,000 Industrial Progress Award Program for reports and advances and improvements made by the application of arc welding in design, fabrication, construction and maintenance.

life is four years, the annual cost would be $48.58 per year as compared with cast plates costing $385. Therefore, the 1 in. x 2 in. bar roll saves $336.42 per year. There rightfully could be claimed other savings because cast plate breakage cuts down production and, of course, there were labor costs of the replacements.

This 1 in. x 2 in. bar roll is shown in Fig. 2.

The following is a description of efforts showing how the maintenance ton cost has been gradually decreased in spite of the gradual increase in wages of late years.

A 48 in. x 10 ft. 0 in. pug mill was installed, but the conventional cast blades with which it was equipped did not satisfactorily chew up the material. In addition, cast blades were subjected to breakage from shock. There was no other alternative than to make our own cutters, determining by experiment the right size, spacing and angularity of blades. It was decided to weld some 30 in. long sections. A recent one is shown in an accompanying illustration.

Following the split pulley idea, each 30 in. section is built in two halves with welded lugs, thus providing a means of bolting the halves to each other around the shaft. Each split half is composed of two ½-in. x 4½-in. flats welded at right angles to each other. Long mild steel blades ½ in. x 2½ in. x 10 in. were welded to these flats. The tips of these blades were coated with hard surfacing rods. Prior to 1939 the ½ in. x 2½ in. x 10 in. blades were used, afterwards experiments were made with ¾ in. x 2½ in. x 10 in. The theory was that thicker blades would stand up better. This proved to be correct. The thicker blades did a good job and used no more power. Of course, fewer blades were used in order to get the same spacing between blades. The tons handled and cost of blades has been:

	Tons Handled	Cost	Cost per ton
1938	344,871	$3,985.38	$.0115
1939 (shifted to thicker blades)	279,104	1,967.44	.0070
1940	321,566	2,434.00	.0075
1941	423,563	2,932.00	.0069

During the years shown above wages rapidly increased.

Previous to 1941 nothing was done to the cutters after installation except to move them towards the discharge end as they wore. During 1941 the practice was started of touching up with hard surfacing material all blades in place during the weekly shut-downs. Thus it was possible to reduce the cost throughout 1941. It is believed that 1-in. thick blades would be even cheaper, but that they would not give the fine cutting necessary in addition to consuming increased power.

A great number of different hard surfacing rods were investigated, and the data given are based in the main on a rod costing about $2.25 per lb. As 1942 commences and as this paper is written, it is believed another stunt has been found that is going to cut down our costs still further. In an endeavor to find substitutes for the higher priced hard surfacing rods the blades were first coated with a cast iron rod and then chilled. After this one coat only of the higher priced hard surfacing rods was applied, where two coats were formerly used. It is too early to be sure, but results have been promising.

It is not possible to state what savings over cast cutters the welded steel cutters have provided. However, it is possible to point out that the development on the item of cutters alone based on 1941 costs has saved the company over 1938 costs as follows:

423,563 tons at 0.0115 ..... $4,870.97
Actual cost in 1941 ..... 2,932.00

Annual saving $1,938.97

and ton costs will be further reduced resulting in greater savings.

Safe Design for Stills With Open Firing

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In a recent consultation with a chemical manufacturer the writer had an opportunity to propose and carry through a simple modification of a number of open-fired stills, thus eliminating an explosion hazard which had previously resulted in a costly explosion and fire. The change is one that can readily be made in similar circumstances in other plants.

The greater part of the process was carried out in stills which in the initial part of the run were heated by high pressure steam. The steam temperature was not adequate for the last 24 hours of the run, however, so the stills were provided with atmospheric gas burners to supply the heat for the last part of the working cycle. Since atmospheric air was required for combustion, there were openings into the burner chamber near the bottom. Other openings were provided at the top of the shell surrounding the still to permit discharge of the products of combustion into the air of the room. Thus explosive gases that might be present in the atmosphere were allowed to come into direct contact with the flame, as well as with the combustion gases, either of which was hot enough to initiate an explosion.

One of the gas-fired stills, showing complete inclosure and ducts for fresh air and products of combustion

Several methods were available for inclosing the gas flames under the stills. For example, gas pre-mixing equipment could be used to deliver air and gas in proper proportions to the burners without admission of atmospheric air, thus permitting the burner to be sealed off completely. This would cure half the problem, but it would still be necessary to conduct the burnt gases to the atmosphere by means of a duct. The joint cost of duct and extra motor-operated gas equipment would be excessive and a simpler but equally effective scheme was employed.

Two sheet metal ducts were brought to each still from out-of-doors, one near the bottom for the admission of combustion air, the other near the top for the discharge of the products of combustion. The openings near the bottom which had served to admit air to the burner were covered with insulation and the new fresh air duct was connected to the chamber at the bottom where the gas burner was located. A slide damper was provided to permit lighting and shutting down the burner and a piece of Pyrex glass was installed in the door of the chamber to give a view of the flame. The holes in the upper part of the still casing were inclosed by means of an annular sheet metal duct of proper cross section, which was then connected to the riser previously mentioned for the discharge of burnt gases. As a safety measure, an automatic damper was installed on the air inlet pipe for each still, arranged to close by gravity with the releasing of a fusible link in the event of fire.

The only problem was to provide adequate draft for the discharge of combustion gases, since it was necessary to have both the inlet and outlet pipes pass through the wall on the same floor as the still, so as to localize fires which might break out on any floor. Sufficient draft was secured by making the ducts of large enough size, an area of 1 sq.in. for each 10 cu.ft. of gas burned per hour being adequate in most instances. Incidentally, in this connection it should be noted that the use of exhaust blowers for removing the products of combustion from gas burning equipment is highly dangerous and should never be tolerated, owing to the possibility of the suction pulling the flame away from the burner, with probably explosive results.

Mechanical Maintenance In Process Plants

More engineering application to the problem of plant maintenance is necessary if existing equipment is to hold up under production schedules as they are today. Replacement rather than repair may be the more economical procedure in normal times, but new equipment will not be plentiful again until after the war is over. It behooves those who are responsible for production to see to it that every maintenance method is utilized in a plant-wide program designed to minimize outage and prolong equipment life. While most engineers stick to time-tested methods, novel ideas should not be overlooked at the expense of a plant shut-down.

The wise engineer is also concerned with laying the ground-work for post-war rehabilitation wherever possible.

IN THIS REPORT we hope to accomplish at least two aims. The first is to encourage and broaden maintenance thinking among management, maintenance supervisors and chemical engineers who are responsible for keeping production facilities in operation during the present national emergency. The other is to suggest a few of the successful maintenance and repair methods now being used in the chemical and allied industries.

The first objective we believe to be the more important since the success or failure of any plan for maintenance and repair is dependent on careful ingenious adaptation of engineering knowledge by those responsible for solving specific problems in the individual plants. The actual methods and ideas suggested are intended to stimulate thinking along repair and maintenance lines in addition to providing immediately workable solutions for some of the more common and serious difficulties experienced in the chemical process industries.

The practical necessity of a system of preventative maintenance and a well-organized maintenance staff for actual repair jobs has been stressed over and over again and is recognized by many of the larger chemical companies at least. Preventative maintenance has taken on added significance with the current unavailability of critical materials for repair purposes. Not only do regular inspections and adjustments of plant equipment produce economy of maintenance, but today chemical companies cannot afford to permit equipment to deteriorate to the point of complete failure as it probably would mean weeks or even months of waiting for replacement parts at a time when production outage causes delay in the war effort. It is essential that the life of each tank, kettle, pump, pipeline, etc., be extended to the limit.

Scrap piles of abandoned machinery which previously were allowed to accumulate until they interfered with operations and then were sold to the junk yard are now a rich source of replacement parts. Some of these parts having been cleaned and put through the shop are now performing service for which no new equipment could be obtained.

Idle equipment no longer needed for the reduced civilian output can often be used directly in war production or may be modified for use in some essential service other than that for which it was originally intended. One company which formerly operated three distilleries has ceased operations at one location and is dismantling the plant for distribution of the equipment wherever it can be used.

Used equipment dealers are providing the chemical industries with a considerable amount of all kinds of chemical equipment which have been thoroughly inspected and rebuilt in their shops. Some types of equipment not currently being built or not available in the new equipment market can be located in the stock of the used equipment dealer who generally is able to rebuild the item for fairly prompt delivery.

Standardization of repair parts is proving its value in several plants which have adopted this policy. This is to be recommended wherever possible, although to bring it up now may be somewhat similar to locking the barn door after the horse has departed. However, in purchasing new equipment it will be worthwhile bearing this idea in mind, especially in connection with pumps, valves, shafts, bearings, chains, gears, sprockets, etc. Generally the performance of a standard item of equipment, while it may not be quite equal to that of a specially designed part, is entirely satisfactory or can be made so by minor changes in the item or the process at the time of installation.

A typical example is the use of standard size centrifugal pumps. Some plants purchase only certain pump sizes such as 1½ in., 2 in., 3 in. and 4 in., and then obtain the desired pump characteristics, within limits, by utilizing various sizes of impellers. In this way it is only necessary to carry four sizes of spare parts in the stockroom. Naturally the operating efficiency will not always be the maximum, but in most cases it will be wholly adequate to do the job and will assure quick repairs in the event of trouble or breakdown. Occasionally it is necessary, due to the strict requirements of a process, to purchase a specific pump of special design or size.

METALLIZING

Of the various methods which have been widely used in repairing worn parts, metallizing has been one of the most spectacular and has resulted in the conservation of considerable critical material. The process is an old one but has been improved and become prominent during the last ten years. It is used for building up worn surfaces or providing corrosion resistant surfaces on almost all types of equipment.

The various metals to be applied to the worn part by spraying are supplied in the form of wire or powder and include carbon steel, stainless steel, nickel, Monel metal, aluminum, copper, cadmium, babbitt, brass, bronze, lead, tin and zinc. The metal is fed to a spray gun in which it is melted by an oxyacetylene flame and then atomized by compressed air.

Most important in metallizing is the preparation of the metal surface to be sprayed. All old paint, rust, scale, grease, etc., must be entirely removed by such methods as washing with solvents, sand or grit blasting or rough machining in the case of spindle pieces. Otherwise the coating may scale and chip off soon after being applied, as the bond is purely mechanical and the sprayed metal is in the crystalline state. In order to secure a good bond, it is advantageous to roughen up the piece to be metallized by nicking or sometimes by threading in a lathe. Once prepared, the piece must be kept clean and dry until the coating is applied, which should be done as soon as possible.

Metal is sprayed on the piece until it is oversize and then the piece is ground to size or else is put in a lathe where it is machined down to finish size. The rate of application of sprayed metal coating is dependent on the specific gravity, specific heat, melting point and hardness of the metal which is being sprayed. As might be expected, the rate is quite rapid for tin, lead and zinc, and becomes considerably slower for copper, steel and nickel alloys.

Since the bond is mechanical, the effect of metallizing is similar to a shrink-fit and for this reason the bond is much stronger on convex or cylindrical surfaces. In metallizing a concave surface, shrinking of the coating can be prevented by preheating the base metal to a predetermined temperature depending on the relative expansion coefficients of the base and sprayed metal.

Machining and grinding the metallized surface results in a denser wearing surface as these operations tend to close the pores. It should be remembered that the coating, due to its crystalline structure, is usually harder to grind than the base metal and therefore special wheels should be used. Sprayed metal is not dissimilar to iron castings as far as its finishing characteristics are concerned.

The porosity of a sprayed metal coating is an advantage in reducing wear on bearings and journals as the lubricant is easily absorbed and retained.

Storage tanks have been successfully protected from corrosion by metallizing with tin or lead. No sharp instruments should be used, but it has been found advisable to rub and brush the coating to produce a dense surface film.

Pump casings and impellers can be protected from corrosion by metallizing, and pump shafts may be finished with a stainless steel coating which often wears better than the original shaft.

Large plug cocks which have become wiredrawn and worn may be given a rough cut in the lathe and then metallized. If a soft metal such as bronze is used, there will be less danger of freezing the cock although the wearing quality of the renewed plug will be reduced somewhat.

Fans which are used to handle corrosive gases can be protected by metallizing both the casing and the wheel.

Mixers, dryers, kettles, digesters, pipe coils, pistons, valves and numerous other types of chemical process equipment have been coated by metallizing. Details on how to apply spray coatings should be secured from the manufacturers of the spray equipment.

It should be remembered that a thick coat may not be as good as a thinner one in that it may separate from the base metal during expansion or contraction. On vessels which are subject to shock or impact it may be difficult to prevent scaling or chipping.

Metallizing can be used to refinish surfaces which are shaped or located so that other methods of application are practically impossible. Another advantage of metallizing lies in the fact that the sprayed metal is cool when it strikes the metal to be coated so that there is no warpage due to heat stresses.

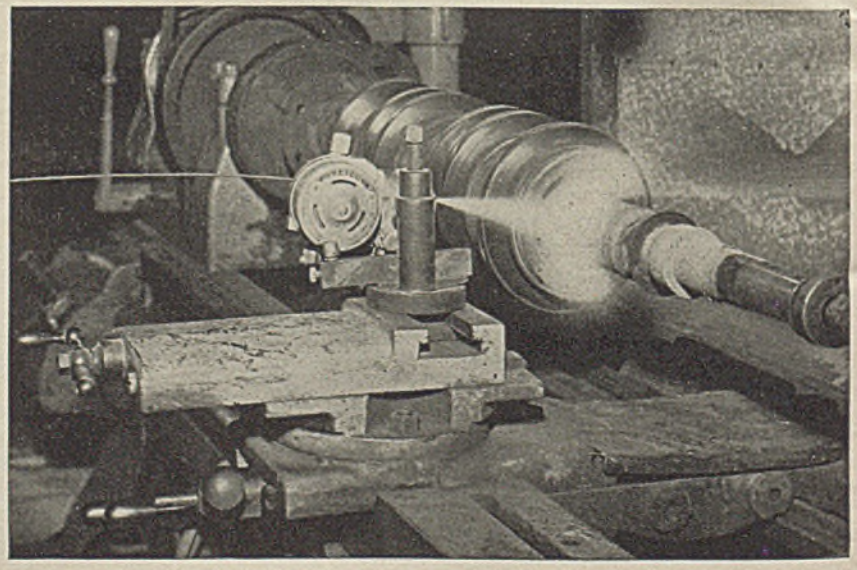
A recently developed process fuses a rough deposit of electrode metal on to the surface to be metallized, electrodes being applied with a special holder which uses up to six electrodes at one time, depending on the size and nature of the part to be prepared. Small parts can be prepared as easily as large shafts, since there is no excessive heating of the base metal or disturbance of its physical characteristics.

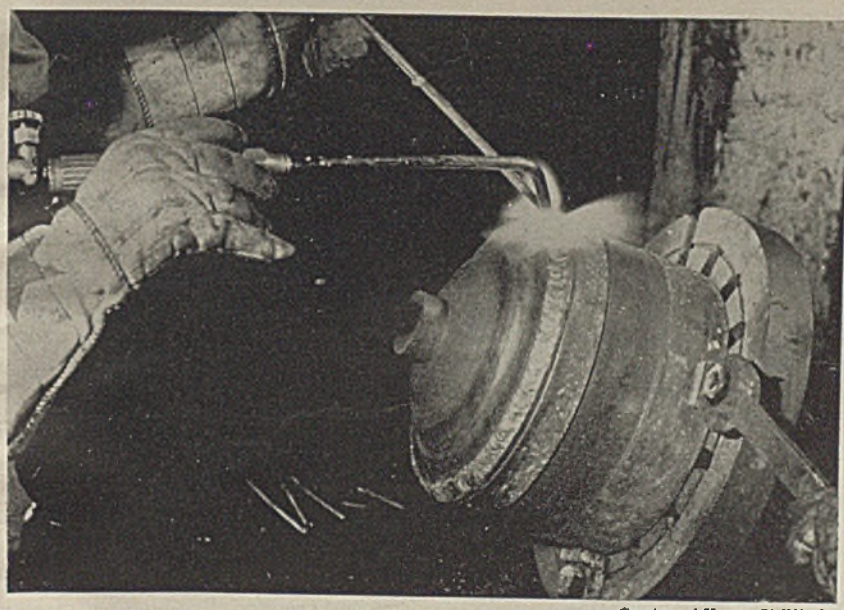
WELDING

Welding, by arc or gas, is one of the most versatile tools of the maintenance engineer. It is used for innumerable jobs from repairing breaks and filling cracks to hard-surfacing and building up worn parts. Welding can be used successfully for repairing practically all sizes and thickness of pipes and plates of most of the metals including carbon steel, stainless steel, copper and aluminum.

Equipment which is fabricated by welding can sometimes be assembled on the site making it unnecessary to tear down a building wall which might be required in the case of installing a prefabricated vessel. Often a welded

Worn pump impeller being built up on the worn bearing surfaces with sprayed steel, using a Metco Metallizing Gun





Courtesy of Haynes Stellite Co.

This 9-in. valve disk for high temperature, high pressure steam service is being hard-surfaced with a non-galling, non-ferrous alloy of cobalt, chromium and tungsten which is especially resistant to abrasion, corrosion and erosion and retains its inherent hardness at a red heat. After preheating to 1,100 deg. F., the disk is faced with a ⅛-in. layer of hard-facing alloy as shown and is then reheated to 1,250 deg. F., and furnace-cooled. Gate and globe valve seats and disks faced in this way outlast usual materials six to ten times

patch will postpone the complete replacement of a tank. This is true in the case of storage tanks for concentrated acids where the submerged metal is unaffected, but the metal in the vapor space is rapidly attacked by the diluted gases. Welding can also be used for removing frozen rivets by building up a square head which can be held in the jaws of a wrench.

The building up of a worn surface by welding is of particular interest at the present time. It is important, first of all, to determine what type of surface is really required as there are various filler metals which impart different characteristics such as hardness, resistance to corrosion, high temperature, impact or abrasion.

Here again, as when metallizing, the importance of preparing the part cannot be stressed too much. The worn piece should be cleaned to remove all trace of dirt, such as grease, chemicals and other particles of foreign matter by filing, grinding, turning in a lathe, wire brushing, etc.

After cleaning, the weld is laid on the surface, due care being exercised to control the molten flux and eliminate slag trapping. Warpage from heat stresses (particularly in spindle pieces) can be prevented to a large extent by various systems of laying alternate rows of welds, thus maintaining a fairly constant temperature over the entire surface. It is advisable to follow the manufacturer's recommendations for current settings and sizes of electrodes.

When hard metals are applied for service under pressure or impact, peening the weld deposit is essential although not an easy or a pleasant task. The peening, if done when the metal is still hot, will relieve heat stresses invariably set up in the weld metal which has lower ductility than the parent metal. Of course, if resistance to abrasion is the desired characteristic, peening is not necessary. It does, however, help to produce a smoother, finer build-up which will require less grinding for finishing to close tolerances.

When the part to be repaired will not be subject to abrasion, or if it will be lubricated while in operation, bronze metal is often used. An example of this type of build-up is on the piston in a reciprocating pump or compressor. In this case there is the added advantage of allowing the less expensive part to wear, thus postponing the reboring of the cylinder.

In general, oxyacetylene welding is the method used for applying bronze and other similar non-ferrous alloys, or for hard facing materials which must be "puddled." On the other hand, the electric arc method permits working in locations where gas welding is impossible, allows better control of the heat and is somewhat faster. Valve disks and seats, pump casings and cast iron gear teeth are restored by building up with bronze, usually by oxyacetylene flame welding.

Among the hard facing materials, Stellite, which is a non-ferrous cobalt-chromium-tungsten alloy, is the most common. It is used extensively for facing valve seats where severe cutting has been experienced. Stellite tips have been used to renew parts which are subject to erosion in high speed centrifugal filters.

Stainless steel, while less hard, provides a fairly satisfactory surface and can be welded to the base metal whereas Stellite must be puddled.

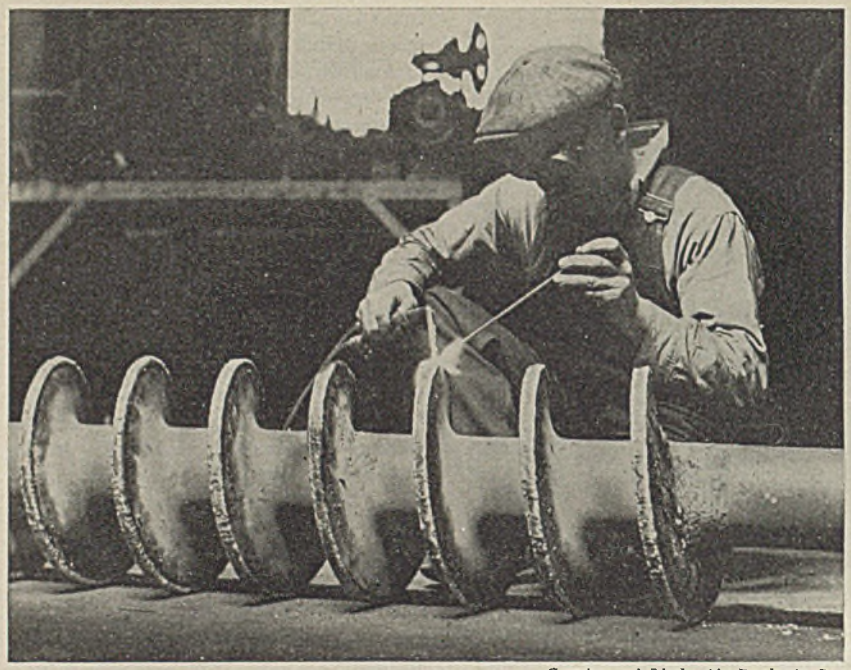
Aluminum products such as sheets, tubing and extruded shapes can be welded by the various welding processes. Metal arc welding is generally satisfactory for heavier pieces, and gas welding is preferable for thicknesses less than ¼ in. Die castings are difficult to weld, but sand castings may be welded with considerably less difficulty.

A relatively new welding process utilizes the characteristic low melting point of eutectic mixtures. "Castolin eutectics" rods are available for welding practically all kinds of metals and are designed for use with the welding torch. The parent metal is not heated to its melting point in this process and the welding material diffuses into the pores of the metal to secure a bond.

LUBRICATION

Lubrication is one of the more difficult maintenance problems in the chemical plant, not only because of the physical problems involved, but because of the apparent lack of appreciation of its importance by operating personnel and sometimes by the maintenance department itself. It is impossible to lay down general rules for lubrication other than to remind ourselves that whereas manufacturers can supply lubricants for practically every type of service, only regular periodic inspection by a competent man or crew of men can insure that bearing surfaces will be properly protected from unnecessary wear.

As much as is possible, all gears, sprockets, bearings, chains, etc., should be housed in so that they are easily accessible and yet are protected from dirt, water and chemicals. In the design of new equipment or in revising existing equipment, adequate provision for lubrication should be included. Here is one method of preventative maintenance which, if attended to, pays big dividends, or, if neglected, results in excessive repair and replacement. There will be less of a backlog of work in the machine shop when more time and care are applied to keeping plant machinery in good



Courtesy of Linde Air Products Co.

Building up the worn flights on a screw conveyor by the oxyacetylene flame welding method

running condition by proper methods of lubrication.

Plain babbitt bearings must be properly maintained just as in the case of anti-friction bearings. Here the installation of the right type of bearing is probably as important as the maintenance after it is installed.

Bearing clearances must provide space for the lubricant to penetrate between bearing surfaces and must allow for expansion due to heat. If the clearance is too small, the film of lubricant will break down and metal to metal contact will result with consequent friction and wear. If the clearance is too large, there will be slapping and knocking which will break the oil film. The bearing area should be ample to take the load without exceeding the strength of the bearing material. A good "mirror finish" will aid in the formation of the proper oil film and will improve the unlubricated friction factor of the bearing.

At the present time the scarcity of tin requires the use of babbitt of a cheaper grade whenever possible. In a babbitt bearing the oil grooves should be placed in the upper half of the bearing if the shaft is bearing on the lower half of the bearing. This will provide a maximum of bearing surface where needed and will also allow the proper distribution of the lubricant.

All sharp edges should be removed from the joint between the two halves of a split bearing, to reduce the starting load and to prevent oil from being scraped off the shaft. When grease fittings are provided they should be changed frequently and the old grease should be cleaned out if it is at all wet or dirty. Wick oilers and ring oiling bearings provide automatic positive trouble-free service and are more generally satisfactory. However, they must be inspected quite frequently to assure a supply of oil and to keep the rings in operation.

The lubrication of anti-friction bearings is quite different from plain or sleeve-type bearings. The successful operation of an anti-friction bearing is dependent on adequate lubrication although, of course, the design and construction of the bearing are of prime importance also.

There are so many factors influencing the friction torque in a bearing that it is impossible to recommend specific lubricants for every installation. Although the greatest reduction in friction is gained by using a thin film of low viscosity oil, there are other considerations involved in the lubrication of chemical plant equipment. It is generally of more importance to sacrifice some efficiency to insure continuous operation. This requires an excess of lubricant present in a reservoir. Usually a more viscous lubricant than necessary is used so that losses from leakage or evaporation will not be high enough to leave the bearing dry. Oils of fairly constant viscosity should be used when the bearing is subjected to varying temperatures. Otherwise, the oil may thin out and fail to lubricate properly at high temperatures, or the bearing may freeze or cause excessive wear when starting up. If extremely high temperatures are experienced, it is sometimes worthwhile to install a metal disk on the shaft between the bearing and the source of heat in order to dissipate the heat.

When using grease in ball or roller bearings it should be remembered that only the grease near the rotating part performs any lubricating service. Since constant contact results in oxidation of the grease or separation of the lubricating oil from the grease base, it is necessary to permit some grease to "bleed" from the bearing. A full bearing housing is good protection against dust and dirt, but if the bearing is otherwise protected or in a clean location, it is better not to pack the housing as churning with consequent breakdown and loss of grease may result. For best results, the housing should be about one-third full. Roller bearings in general require addition of lubricants more frequently than ball bearings.

To prevent condensation in water cooled bearings, the water should be turned off when the shaft is not rotating. If moisture should penetrate into the bearing housing when the shaft is rotating, a non-corrosive emulsion with the grease will probably be formed. However, emulsification will not take place if the shaft is not rotating and the water is very likely to corrode the shaft. For this reason the grease must be changed more frequently when the bearing is in a moist area. Occasional inspections of idle machinery which has been stored away should be made to insure that the grease film has not been penetrated by moisture.

Bearings removed for maintenance should be thoroughly washed by soaking in kerosene, or, in exceptional cases, in hot light oils at about 220 deg. F. If aqueous cleaners are used, the bearing should be spun dry and rewashed in kerosene first, followed by a wash in light oil. Chlorinated solvents may cause the bearing to rust and therefore are not recommended for this cleaning operation.

CENTRIFUGAL PUMPS

Centrifugal pumps are universally used in chemical plants and take a good share of the time and money spent for plant maintenance. The first step in maintaining a centrifugal pump is to make sure that it is of the proper design for the job it has to do. If it is not correctly designed, it is often advisable to attempt to exchange it with some other pump in the plant, or even to correct the defect by making minor changes in the plant shop.

Give the pump manufacturer all the data he needs to select a pump for the required service. Accurate information as to properties of liquid handled, suction head, discharge head, gallons per minute, etc. will eliminate the need for the large "factor of safety" which sometimes results in poor pump operation.

Sometimes it is found that the packing gland assembly is easier to adjust and maintain if iron parts are replaced with non-rusting and non-freezing bronze or stainless steel. Otherwise the iron parts rust and the job of tightening the packing is difficult, plus the fact that the sleeve may get unnecessary wear due to improper gland pressure.

One engineer reports that cast iron casings are replaced with bronze casings because the bronze can be easily built up with bronze welding while the cast iron cannot be thus repaired.

To avoid packing trouble, a pump shaft must run true within 0.002 in. It it is not running smooth and true, the impeller may be out of balance, a sleeve may be eccentric or the bearing may be worn, and tightening the packing will give only temporary relief.

When a sleeve is scored, it should be removed for repair to prevent tearing the packing. If the scoring is not greater than about 1/32 in., it can be machined undersize on the packing surface provided that there is not enough resultant clearance to permit the packing to pass into the pump interior. Some engineers have overcome this difficulty by installing a brass ring in the stuffing box which will keep the clearance down to 1/32 in. or less. In the case of excessive scoring, the sleeve can be built up with manganese bronze.

Regular inspection of pumps will enable the maintenance department to make repairs during a scheduled shutdown and will thus reduce the possibility of breakdown during operation. Inspection should cover such things as gland adjustments (especially in handling corrosive materials), bearing temperature, state of lubrication and motor temperature. Rigid pipe lines connected directly to the pump, if they must be used, should be supported so that there is no stress on the pump casing. It is better wherever possible to use reinforced suction-type hose with flanged connections between the pump and the pipe line.

Where there is the possibility of foreign matter in the suction line, a strainer should be used. This is especially true in the case of a high silica iron or chemical stoneware pump which may easily be fractured.

When acids or other highly corrosive liquids are being pumped, the base plate of the pump may be covered with lead to take care of leakage. The drip cup does not always carry away all the leakage from the gland, particularly if the liquid is one which crystallizes easily and clogs the cup.

Oversize packing is difficult to install and may cause excessive friction. Undersize may be ruined by too much takeup in the glands. Excessive wearing ring clearance will reduce the efficiency of the pumps, but rings are easily resurfaced and can be maintained indefinitely. Machined surfaces of sleeves, rings and bearings must be concentric with the shaft or leakage will result with consequent pitting and rusting of the shaft.

Cavitation of an impeller is caused by either wrong design or wrong application of the pump. If the pump characteristics do not match the conditions for which the pump was installed, the rate of cavitation may be greatly increased. When cavitation does occur, the impeller may be resurfaced, preferably with polished stainless steel.

PIPING

The innumerable types of piping and liquids which are handled in chemical plants make the maintenance of piping of great importance. In addition, pipes and valves are very difficult to obtain at present, so that maintenance of the plant's "arteries" is absolutely essential.

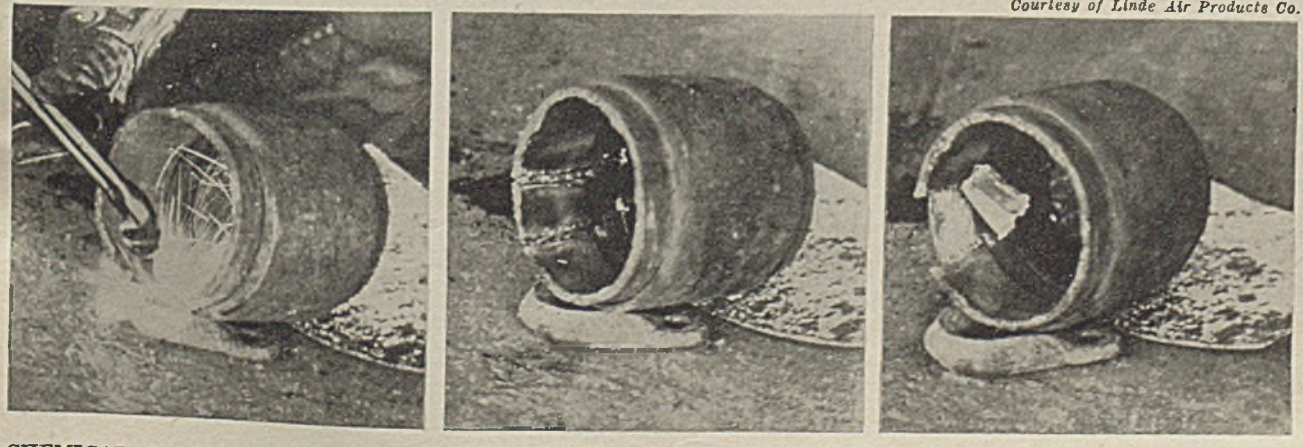
Whether screwed, flanged or welded pipe, the proper initial installation and suuport will go far to prolonging life. In the larger sizes of pipe, it is particularly important that the pipe should be fitted accurately and all mechanical stress eliminated by good substantial hangers. Every effort should be made to eliminate curves and bends which increase wear due to erosion and require more fittings. By providing cover for the pipe or running the pipe over a clear route, external corrosion resulting from corrosive fumes, dripping liquids or excessive sweating may be partly eliminated. Pipes which run through floors can be protected from rusting by pouring concrete collars or by installing worn pipe for sleeves.

In dismantling piping, fittings and valves, they need not be broken if a torch is available. Old pipe, valves and fittings should be salvaged and reused.

Pipelines which must cross between buildings should be supported on a bridge or have a supporting truss. Low points should not be permitted in pipelines. Vertical risers should be provided with condensate drains when steam or condensible gas is being handled. When laying out equipment, due consideration should be given to making slurry lines short as they are

In salvaging this 8-in. collar, two parallel gouges are made across the inside of the pipe stub. The first cut goes down to the threads and the second is not quite so deep. The section of wall between the gouges is collapsed with a hammer and hinged inward to permit easy removal.

Courtesy of Linde Air Products Co.



apt to clog. In some piping installations, particularly at storage tanks, separate piping can be eliminated and headers installed. For general service in a process building one central outlet and a hose length will often suffice for serving several items of equipment. In plants which are using river water, strainers placed in the main supply line, or in the main service branches, will be of great help in reducing the maintenance necessary in the piping network. Strainers are available which permit cleaning during operation.

The use of welded pipe and fittings will help to overcome certain common troubles in pipe maintenance. Welded pipe is more quickly installed, easier to insulate, has no thin walls as in threaded pipe, is more resistant to vibration and has fewer flanges and consequently fewer gaskets to replace and fewer bolts to tighten.

Installation of gaskets does not make up for misaligned flanges. Gaskets should be as thin as is feasible and expansion should be taken care of by using expansion joints. Dope should be used carefully and no oil should contact a rubber gasket.

For installation of service piping, a general rule to follow is to use gate valves for water and globe valves for steam. Corrosion of brine pipelines can be materially reduced by seeing to it that the brine is kept neutral.

Glass piping installed where there is not much danger of mechanical shock will give indefinite trouble-free service for corrosive liquids and even for abrasive slurries. The cost is about equal to that for copper or brass piping. Fittings are available to connect glass piping to existing metal pipelines. Hangers for glass pipelines should be padded to avoid scratching.

For serious corrosion problems in piping, chemical stoneware piping provides a very satisfactory corrosion resistant material. Adequate support must be provided.

The insulation of process equipment and pipelines is sometimes an important factor in making the process work, and in all cases where it is necessary, should be maintained for economical operation. Whether the installation is glass wool, rock wool, magnesia, or some other material, it should be properly protected if subject to moist corrosive conditions or to mechanical damage. Depending upon the severity of the conditions to which it is exposed, protective coatings of cement, paint, canvas, or metal may be used.

If pipelines must be steam traced as well as insulated, the fewer connections in the steam line the better, as steam leaks will ruin the insulation.

CONVEYORS

Conveyor belt maintenance should be largely preventative. Most of the wear occurs at points where the material is loaded on to the belt and attention to this problem will aid greatly in extending the belt's life. Hopper discharges should be located between idler pulleys to provide the best cushioning for the load. As far as possible, the product should be deflected before hitting the belt so that it is traveling in the same direction as the belt and at about the same speed. It should be remembered that a slow running belt will deliver as much material as when traveling twice as fast with half the load, and will result in less than half the wear. Most belts are run faster than necessary for the maximum flow.

A screen in the loading hopper is sometimes helpful in reducing the impact as the finer particles reach the belt first and cushion the blow of the larger chunks.

It goes almost without saying that the loading hoppers, skirt boards or any other stationary fixture should not touch the belt at any point. If trouble is experienced with materials wedging themselves between the belt and skirt boards, the boards should be set to diverge in the direction of belt travel, thus permitting wedged particles to be thrown off the sides. The return side of the belt should be protected from overflowing particles by installing a deck under the carrying section of the belt. Otherwise the belt will soon be cut and worn through at the pulleys.

Rubber belt conveyors which operate outdoors should be protected from the elements and especially from the direct sunlight which causes very rapid deterioration. Materials which have a high grease content may hasten deterioration of the rubber belt. One remedy which has been used successfully in preventing this, calls for applying a fine powdered soapstone on the belt.

If belts run crooked, they should not be straightened out by setting the end pulleys out of line or by increasing the tension in the belt. The trouble may be that the belt was not cut square when the splice was made, one edge may be worn more than the other, the idler pulleys may not be properly lined up, there may be idlers which have become frozen, or loose idlers sliding on the shaft, there may be unequal loading, etc. Correct lubrication of idlers is essential. Too much grease will spoil the rubber if it comes in contact with it and insufficient lubrication may cause the idler to freeze and wear through to a jagged edge which will cut the belt to shreds.

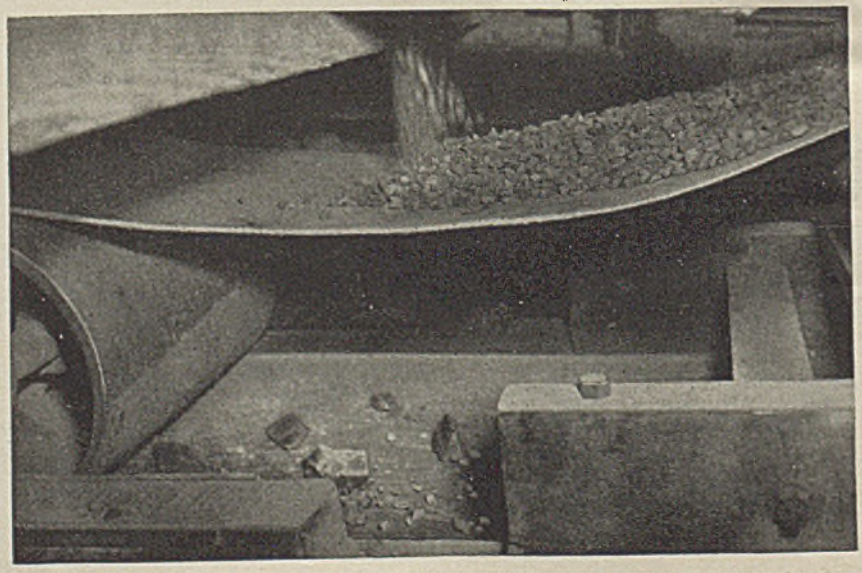
Vulcanized splices are better than metallic fasteners and should be used whenever possible. They are stronger and also eliminate many of the mechanical difficulties experienced when metallic fasteners are used.

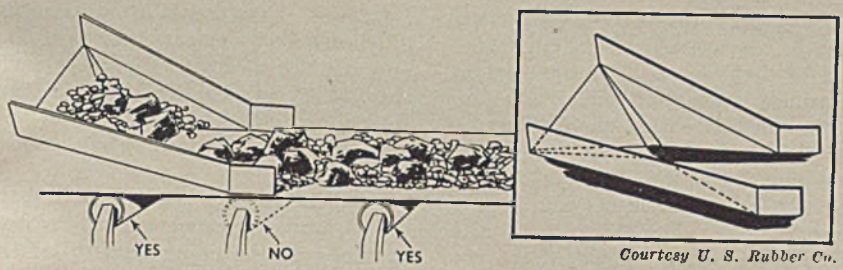
Pulleys should be kept free from stuck materials by periodic cleaning. Sometimes it is feasible to provide continuous cleaning with brushes, scrapers, water spray, etc. For bucket elevators which carry sticky products such as soap flakes, it may be advisable to use a slat pulley in the boot of the elevator to prevent the gumming up of a flat pulley.

Buckets on elevator conveyors are sometimes torn away from the belt by the packing of material behind the bucket. A pad of belting placed be-

Decking between belt sections would prevent spilled pieces from cutting belt at pulley. This belt needs tightening also

Courtesy New York Belting & Packing Co.





Courtesy U. S. Rubber Co.

This loading hopper distributes the load along the belt between supporting pulleys thus preventing excessive wear

tween the bucket and the belt, or short rubber spacers on the bolts will reduce this tendency. The lining of steel elevator casings with old belting will also aid in reducing abrasion by the bucket. Ventilation should be provided to permit cooling of the belt.

Screw conveyors should be checked for proper alignment of screws, and hangers or other supports should be made firm and rigid to prevent excessive vibration. Bearings should be kept free from the product which is being conveyed (often an abrasive material) and should be lubricated regularly. If a section of screw conveyor is turning with a "hump," it uses extra power, and in addition causes excessive bearing wear. The section should be taken out and the shaft straightened to run true. If the flights are badly corroded or eroded, they may be built up with weld material. Coverings of wood or metal should be installed to prevent dust or other foreign material from entering into the trough.

TRANSMISSION BELTS

Rubber V-belts should be kept tense to the touch in order to provide full arc of contact on the sheave and to lessen the possibility of snapping off the belt. In order to keep the tension, and therefore the wear, even, only matched sets of belts should be installed. Sheaves should be kept parallel and in line. Where there is danger of oil contacting the belt, synthetic rubber should be used.

When sheaves become rusted, pitted or worn, they must be trued with a grooving tool. However, before attempting to repair a worn sheave, it is advisable to contact the original manufacturer of the sheave.

Minimum pitch diameters as specified by the manufacturer of the sheave should be strictly adhered to or the belt may split along the pitch line. V-belts should not be stretched over pulleys or sheaves, but the motor should be moved along the slide rail to permit easy installation without stretching. Guards should be placed far enough away so that they do not come in contact with the belt at any place, allowing for certain flexing.

Flat rubber transmission belts should be washed with soap and water when dirty but should never be dressed with belt dressing. On the other hand, leather transmission belts should be cleaned and dressed with good belt dressing every few months. Leather belts should be run as slack as possible without causing slipping, and idlers should be avoided wherever possible as they put reverse bends in the leather.

RUBBER EQUIPMENT

Rubber lined tanks and pumps and other equipment should be used in the service for which they were designed. If the operating department finds it necessary to use substitute production materials or change the method of processing, a check should be made by the engineering department to make sure that no excessive concentration of acid or no excessively high temperatures are introduced. If it should become necessary to use higher temperatures than the rubber will stand, installation of a brick lining over the rubber lining may be satisfactory.

When rubber lining fails, immediate repair will prevent further damage to the lining as well as corrosion of the retaining metal itself. When making repairs to rubber lined tanks, workmen should wear rubber soled shoes, and no sharp tools or welding sparks should be allowed to come in contact with the lining.

When rubber lined equipment has moving parts which are lubricated, guards or drip pans should be provided to prevent any of the oil from reaching the rubber lining. Idle equipment such as a rubber lined tank is best stored by completely submerging with dilute acid. Rubber lined valves should be cleaned and thoroughly dried before storing when not in use.

Careful handling of rubber hose will extend its life considerably. When connecting rubber hose to steel pipe, the pipe should be held stationary and the hose pushed over the nipple. If a lubricant is necessary, soap or rubber cement will be satisfactory but grease should never be used as it will cause deterioration of the rubber. Short separate sections of hose installed in places where bending is severe will permit quick replacement without removing the entire length of hose. Don't bend hose near couplings any more than is absolutely necessary.

Acid rubber hose lines used in place of metal pipe should be provided with supporting troughs to prevent bending and to keep them off the floor. If rubber hose is used in a vat for a steam drop, it can be protected by installing a wooden box around it. If that is not convenient, regular iron pipe with rubber hose inside and outside, vulcanized at the end, may be substituted.

FANS

Blower fans or exhausters handling corrosive gases may gradually build up a condensate in the bottom of the casing which will corrode through the metal unless it is drained. Enamels have been used with some success for painting the inside parts of fans operating with certain acid gases. The discharge ducts from such exhaust fans should be high enough above the surrounding equipment so that the gases do not corrode the equipment in addition to constituting a potential health hazard to employees in that area. Likewise, fresh air intake air ducts should be located so that only pure air is taken in, if possible. If the stacks are not vertical throughout the entire length, drainage facilities should be provided to eliminate the possibilities of corrosive condensate collecting on horizontal runs. All power lines should be kept as far away as possible from fan discharge ducts. Since fans will often run for long periods of time without very much attention, there is a tendency to overlook them and neglect giving them proper care and maintenance. Besides checking lubrications periodically, the alignment of the fans and the wear of the fan wheels should also be checked.

MISCELLANEOUS MAINTENANCE TIPS

Sometimes heating coils installed in tanks which are used for evaporating liquids become coated, have reduced heat transfer rates, and corrode rapidly. In such a case it is worth while considering the feasibility of installing a steel jacket on the outside of the tank, provided there is sufficient area to supply the necessary heat transfer. It is easier to keep the flat sides of the tank clean, and the clean jacket may have a higher transfer rate than the coated coil.

Chemical stoneware equipment can often be protected from cracking by vibration if it is set on a rubber pad or some other absorbent material. Floors of asphalt or other similar compounds will help to reduce the breakage from vibration. For large items of stoneware equipment such as towers, a sand bed is sometimes suitable. Of course a retaining wall is necessary for the sand and can be constructed of brick or concrete.

Plate and frame presses when idle for a fairly long period of time should be kept tight and full of water. If wooden plates and frames are removed, they should be stored in water under a weight or in clamps to prevent warpage. Operators should be instructed to keep ports clean and thus prevent uneven pressure. Yellow pine is recommended for filtering cold or lukewarm solutions and maple is suggested for hot solutions.

Wooden vats can be kept free from leaks by pulling up the hoops occasionally, especially when the vat is new. False bottoms installed inside the vats will protect the bottom from excessive wear and premature failure. The supporting joists and sleepers should be installed so that the chimes are free and the bottom is supported over the entire area.

Ball mills, mixers, grinders, etc., should be inspected regularly with special attention being given to the alignment and general mechanical condition of moving parts such as gears, pinions, speed reducers, agitator arms, etc. Vessels using liners to take extra heavy wear should be checked occasionally to tighten liner bolts and lessen danger of breakage.

Steam drums used for drying, flaking, etc., should be adjusted carefully and cleaned thoroughly between operations in order to prevent unnecessary wear and corrosion and also to eliminate excessive replacement or regrinding operations.

Systematic clearance measurements of double-drum dryers are of considerable help to the maintenance engineer. They tell him how long he can expect the drums to operate satisfactorily and also reveal any unusual corrosion conditions. If the measurements are taken at several points on the circumference of the roll it may be possible to rotate one of the rolls with respect to the other to obtain a better match and thus permit leaving the roll in service for a longer period of time. A set of rolls which is matched when cold and at atmospheric pressure will generally not have uniform clearance when operating under steam pressure. It is possible, however, to simulate operating conditions when grinding the rolls by using water pressure. The rolls will then be concave when not under stress and will bulge out to the proper clearance when put under pressure. Rolls which have been standing for any length of time will sag temporarily and should be rotated before attempting to take measurements of roll clearance.

Pressure tests, hammer tests, and drilling holes to ascertain thickness of metal should be regular periodic practice for pressure vessels. If weakness in the vessel is discovered before it collapses or bursts, it may be possible to repair the vessel by patching, or to operate temporarily at some lower pressure.

Open vessels used as evaporators or concentrators generally leave a crust of solid material on the side of the vessel some time during the process. Regular cleaning of this crust may be of help in eliminating corrosion at the liquor level line.

Pressure regulator valves should be inspected regularly to insure that they are working properly. It is a dangerous mistake to leave the valves unrepaired and attempt to operate equipment by cracking the bypass valve. Permanent damage is apt to result to the equipment although it may be able to stand the full line pressure without bursting.

In cases of installations where equipment extends through the floor, curbs should be provided and maintained to prevent dirt and drainage from running down the side of the equipment to the floor below. Floors should be adequately pitched to drainage, and should be kept smooth to prevent unnecessary wear or difficulty in operation of trailers, acid wagons, barrows, etc.

In processes where batches are blown through pipelines to drowning vats or tanks, a splash plate which will provide for localized corrosion can be installed where the blow line enters the receiving vessel. The air should be shut off as soon as the product has passed through the line.

Electric vibrators installed on storage bins or hoppers will eliminate the necessity for hammering and may result in longer life of the metal.

When charging a glass-lined kettle, a soft material, such as lead, should be placed over the opening to prevent chipping.

Tampers for packing products in barrels or drums, and other vibrating equipment require substantial foundations, preferably concrete. If inadequate support is provided, it will crack and loosen, the machine itself will receive excessive wear and will operate poorly.

Of the metals used in fabrication of chemical equipment, lead is probably the least critical at the present time. It is advisable, therefore, to consider the possibilities of this metal for use wherever chemical corrosion is experienced.

Lead linings will last longer if they are firmly supported against a flat surface. If the lining tends to crack or sag, this trouble can be overcome by some bonding to the metal backing. Tellurium lead, while slightly more expensive, will give longer life than chemical lead in installations where vibration or high temperatures are likely to be met.

In distillation processes care should be taken to see that traps in vacuum lines are in good condition. The vacuum pump should be properly lubricated, and cooling water provided if necessary. If there are several pump installations it generally pays to have one man responsible for the maintenance of the pumps as he becomes familiar with the operating difficulties.

Tubular heat exchangers acting as condensers should also be protected by a trap in the vapor line if solids are present in the still. This will postpone the necessity for shutting down the unit to clean the tubes, will keep the rate of heat transfer high, and will prevent undue corrosion.

While stainless steel and other metals are scarce, vent stacks may often be made from cement-asbestos materials or fiber and plastic material. In some cases the substitute has proved to outlive the original installation.

Flexible couplings will receive excessive wear if the shafts they connect are not aligned reasonably well. They should be checked occasionally for this as vibration of the equipment may shift the alignment.

Steam and brine if used alternately in process equipment such as tanks, vats, kettles, etc., will tend to increase the rate of corrosion.

Weighing scales can be kept free from water and other liquids on the floor by installing the scale slightly above floor level and providing a ramp up to the scale. A drainage pit should be provided for stationary scales to insure protection from flooded floors. If there is danger of harm from contact with trucks, trailers or barrels, a protecting rail should be supplied. Care should be taken not to overload the scale.

Reprints of this 8-page report are available at 25 cents per copy. Address the Editorial Department, Chem. & Met., 330 W. 42nd St., New York, N. Y.

PROCESS EQUIPMENT NEWS

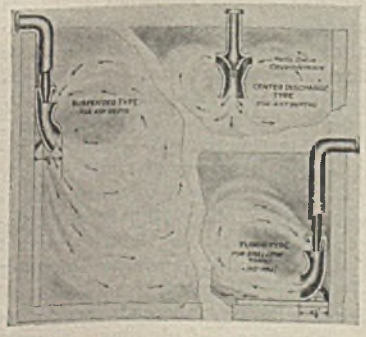
Jet Heaters

THREE NEW circulating jet heaters have been announced by the Duriron Co., Dayton, Ohio. Manufactured either from Duriron high-silicon iron alloy, or from the special stainless steel, Durimet, these devices are said to be particularly efficient for heating acid solutions, dissolving powdered or lump chemicals, and for the digestion of minerals. They fit snugly against the inside walls of either square or circular tanks, projecting not more than 4½ in. The suspended and center discharge types shown in the accompanying illustration are suitable for tanks of any depth, while the floor type is recommended for tanks of any depth up to 60 in. All types are designed for efficient agitation and circulation of the tank contents.

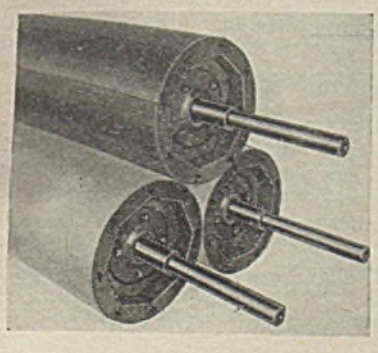
Wood Stave Roll

FOR A VARIETY of industrial uses, Rodney Hunt Machine Co., Orange, Mass., is now producing special lightweight, low-cost wood rolls of an improved design, as shown in the accompanying illustration. The rolls in the illustration are 12 in. in diameter by 88 in. long, the two lower rolls being covered with a spiral wound webbing to provide greater "pull." To save weight and reduce cost the usual cast iron spiders are replaced with wood heads which are anchored securely to the through shaft by means of a special construction developed by this company. For light-duty carrier roll service, this wood drum construction is provided in various diameters from 12 in. up.

New circulation steam jets



Improved wood stave rolls



Pilot Plant Filter

FOR USE in small pilot-plant and research work, the R. P. Adams Co., 55 Chicago St., Buffalo, N. Y., has introduced the WJR-1 pilot filter. As shown in the accompanying illustration, this is a compact, single-tube unit of simplified construction, the working surface of which is readily accessible for inspection at all times. The filter is suitable for practically all types of non-corrosive filtration, according to the manufacturer.

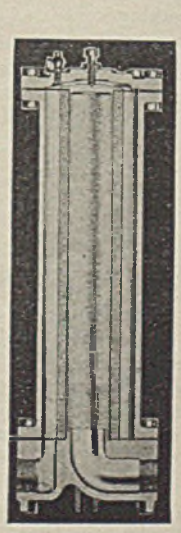
Since several different filter media are available, the filter is said to offer exceptionally complete coverage of clarification operations. Using the company's Poro-Stone, fine, medium and coarse separations in the range of particle size from 0.001 to 0.003 in. can be made. Poro-Carbon, also available in fine medium and coarse sizes, is suitable for caustic clarification. Poro-Screen is a Monel metal cloth medium, giving separations of particles from 0.004 in. to 0.006 in.

The company is also prepared to supply single-tube filters for pilot-plant and small acid-plant service, equipped with rubber or lead linings, and designated as RL-1 and LL-1, respectively. Where the WJR-1 filter has a filtering surface of 2¼ sq. ft., the lined models offer 3 sq. ft. of filtering surface. Any of these models may be arranged for backwashing with either the filtered liquid or with water.

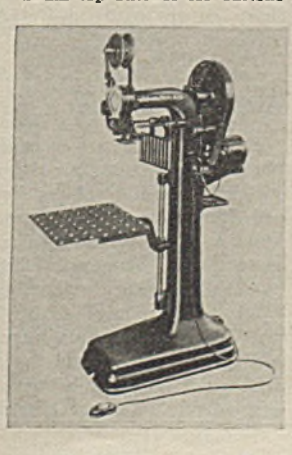
Carton Stitcher

RAPID CLOSING of carton tops, up to four times faster than by previous methods, is the function of the new seam Silverstitcher, recently introduced by Acme Steel Co., 2840 Archer Ave., Chicago, Ill. The new stitcher is said already to be in use in ordnance plants and others producing for the war. A vertical roller guide and unique arrangement of the seam unit are claimed to assure tight, positive closure for the carton top. The machine is power driven and can form and drive as many as 285 steel stitches per minute, drawing the necessary material from a large continuous coil of wire. The mechanism can be quickly halted or put into operation by means of an electric control operated from the floor button shown in the illustration. Since the table and vertical roller guides are adjustable, the machine can accommodate containers of varying depths and widths.

Left—Type WJR-1 pilot filter



Seam top stitcher for cartons



Dust Collector Tubes

ANOTHER DEVELOPMENT in the steel-saving campaign is the line of ceramic tubular dust collector tubes now being produced by the Prat-Daniel Corp., Port Chester, N. Y., for use in this company's tubular dust collectors. The special fire clay used is said to produce tubes which are proof against fracture from normal handling or from changes in temperature, yet which weigh no more than the steel tubes previously used. In the assembly of a dust collector, the tubes can be mounted in a concrete or brick casing above concrete bins, entirely eliminating the use of steel. Thus, concerns without the proper rating for steel equipment are enabled to secure dust collectors made of these non-priority materials, and obtain prompt delivery, according to the manufacturer.

Lining Division Formed

A NEW DEPARTMENT, known as the Tensilgrip Rubber Lining Division, has recently been organized by the American Wringer Co., Woonsocket, R. I., for the purpose of taking over of this concern's business in the lining of metal equipment with Tensilgrip rubber and synthetics. The company has specialized for many years in the manufacture of rubber rolls, and several years ago entered the rubber lining field. Heretofore activities in the lining and covering of metallic equipment have been in the hands of the company's mechanical roll division where rolls for the paper, textile and steel industries were produced.

Acetylene Generator

FOR THE PRODUCTION of acetylene gas for welding, cutting and other gas-using operations, the Adler Mfg. Co., 1440 North Fourth St., Milwaukee, Wis., has introduced an improved acetylene generator which, although new in the United

States, has been made and sold in Europe for many years. This generator operates on the displacement method whereby the carbide is totally immersed in water, the resulting acetylene gas forcing the water into an outer chamber, thus stopping further development of acetylene until the accumulated gas has been used. At this point, water again reaches the carbide, producing further gas as needed. The generator uses lump carbide which is said not only to be cheaper, but to produce 50 percent more gas than rice carbide. Models are available having load capacities of 12 and 25 lb.

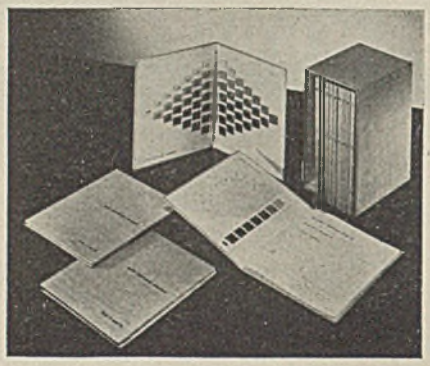
Improved Color System

AVAILABLE for the first time in the United States, the Ostwald color system is now being presented to industry by the Color Laboratories Division of Container Corp. of America, 111 West Washington St., Chicago, Ill. This first American reproduction of the Ostwald colors was developed by Carl E. Foss from colorimetric specifications in accordance with standard procedures, through the use of spectrophotometric measurements. The system is offered in two forms, the "Color Harmony Manual" and the "Color Harmony Index." The Manual consists of 12 book charts providing 680 colors in the form of small cellulose acetate chips which have been sprayed with the colors. The chips are removable and so may be compared easily with each other or with fabrics, papers, paints, etc. The Index instead of employing the chip books, assembles the chips in six plastic indexes of the self-selecting variety. The chips are 1 in. square, fitting the usual photometric instruments.

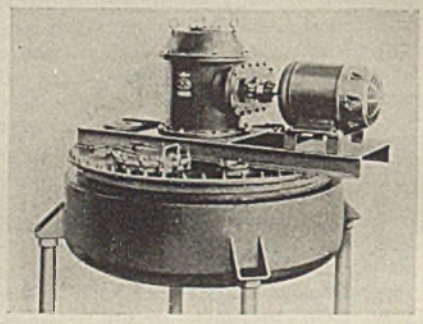
In this system, symbols instead of names are used for colors, avoiding confusion of terminology. The symbols may be communicated verbally or by wire, thus facilitating transmission of colors specifications.

Synthetic Rubber Mountings

RUBBER MOUNTINGS of the types which have been available for many years in natural rubber from the B. F. Goodrich Co., Akron, Ohio, are now being made in Ameripol synthetic rubber by this company. These mountings, known as Vibro-Insulators, are used for the isolation and insulation of vibration. In the new synthetic rubber types the manufacturer expects them to find wide application in fields where the action of oils, greases, paints, fatty acids or heat results in too-rapid deterioration of natural rubber mountings. These mountings consist of rubber cushions of various types bonded to metal. Since rubber in shear is known to have six times the resiliency of rubber in compression, the mountings are all designed to carry the load in shear. They are used to reduce wear and tear on important machinery, to eliminate noise and vibration, and prevent transmission of sound or vibration from one building or piece of equipment to another.



New color harmony manual



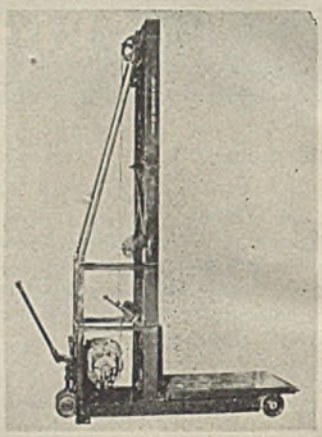
Kettle for viscous materials

Scraper Type Kettle

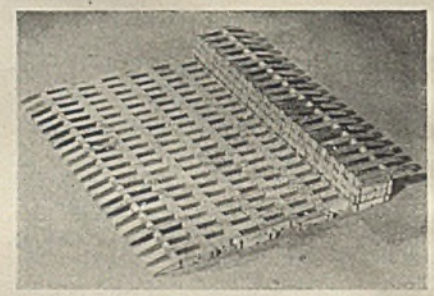
FOR MIXING or processing a variety of viscous materials which must be heated and have a tendency to settle or cake on the bottom or sides of the processing vessel, a special kettle has been designed by L. O. Koven & Bro., Jersey City, N. J. The kettle, as shown in the accompanying illustration, is a shallow jacketed vessel of steel, stainless steel or other metal, of all-welded construction, equipped with a motor-driven mixing and scraping mechanism which consists of a U-shaped paddle agitator. When rotated the agitator simultaneously removes material from the sides and concave bottom of the kettle, throwing it back toward the center. Oblique blades supporting the U-shaped paddle shear through the mass, causing a more uniform kneading and dispersion. Constant removal of the material from the sides and bottom prevents caking and overheating and allows the material to be heated rapidly and thoroughly, according to the manufacturer. A vapor-tight cover with two large manhole covers is provided.

Air-Power Stacker

PRIMARILY for use in explosive atmospheres is a new air-powered stacker which has been developed by Lewis-Shepard Sales Corp., Watertown, Mass. The stacker is powered with a rugged air motor, said to operate efficiently at the same air pressure and volume as industrial overhead air hoists. Precise control of the stacker platform is available, with finger-tip control for any speed of lifting or lowering between a maximum and zero. The stacker platform is stopped instantly when the operator removes his hand from either of the dual hold-over controls. The new air-powered stackers are produced in the same speeds and capacities as this company's standard line of electric-power stackers.



Air-power stacker for explosive atmospheres



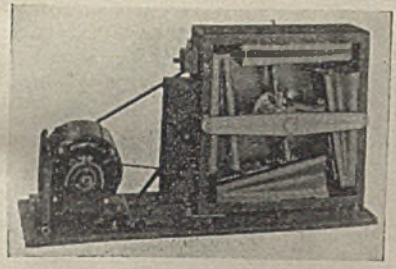
Flexible wood-link mat

Flexible Wood Mat

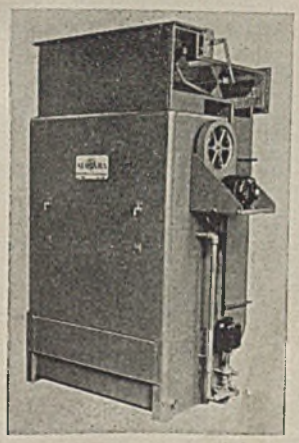
ANOTHER of the numerous ingenious adaptations of plentiful materials to wartime industrial requirements is a line of flexible wood-link matting developed for use in wet or slippery locations by American Mat Corp., 1799 Adams St., Toledo, Ohio. As the accompanying illustration shows, the new mat folds readily into a small space and in use accommodates itself to underlying floor irregularities. The mat is light in weight and can be rolled or folded for easy handling and cleaning. It affords good drainage and has its ends beveled to reduce the danger of slipping. The mat is 1 in. thick and comes in stock sizes of 18x32, 24x38 and 30x44. It is also obtainable in special sizes of any length and up to 36 in. in width.

Positive Vacuum Pump

A NOVEL ADAPTATION of readily available materials of construction is found in a new positive-type vacuum pump for production and laboratory applications, which has been announced by American Automatic Typewriter Co., 614 North Carpenter St., Chicago, Ill. Available in two sizes, the pump is supplied with either individual electric motor drive,



Bellows-type vacuum pump



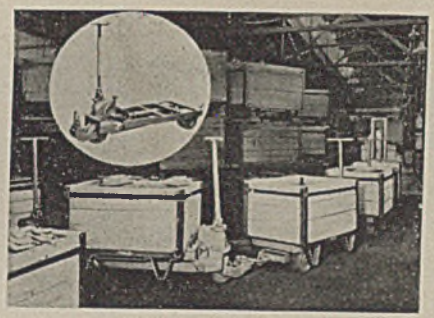
Improved evaporative cooler

or without motor, for use with an available power source. The pump employs four bellows mounted within a square wood frame, connected to each other and to the pump outlet by a channel running through the frame. These bellows are successively expanded to exhaust air or gas from the equipment connected to the pump, by means of a revolving shaft and connecting straps. At 200 r.p.m., the unit is said to be quiet in operation and low in maintenance.

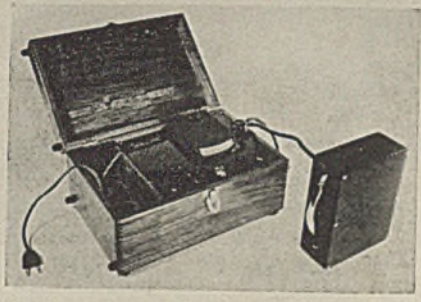
The flexible sides of the bellows are made of leather, as are the intake and exhaust valves. Neoprene cloth is used for gasketing all joints. The larger unit is rated at 15 c.f.m. displacement at 4 in. Hg. and the smaller unit at 7 c.f.m. at 4 in. Hg. A governor is provided to vary the capacity and prevent excessive wear on the pump parts after air or gas has been exhausted to the capacity of the pump.

Evaporative Heat Exchanger

A NEW METHOD of automatic temperature control for use in its Aero heat exchangers for the cooling of industrial liquids has been announced by Niagara Blower Co., 6 East 45th St., New York, N. Y. This heat exchanger, which is of the evaporative cooler type, can now be controlled by regulating the amount of outside air passed through the evaporative cooling chamber, rather than by altering the flow of liquid being cooled. This method is said to improve accuracy, giving a cooling effect directly in proportion to load changes and nearly straight-line temperature control without "hunting." Water savings are increased, and the use of a uniform liquid flow rate through the exchanger tends to prevent the settling of any carried solids which might otherwise settle out if a variable flow rate were used. The apparatus comprises a recirculating air duct to which outside air is admitted by dampers controlled by a thermostat in the liquid line. Only the minimum amount of outside air is admitted, keeping spray water temperature above freezing to prevent damage during cold weather.



Trailer-type hand-lift trucks in use



Photoelectric Glossmeter

Trailer-Type Lift Truck

A NEW IDEA combining the advantages of the conventional hand-life truck and the trailer truck has been developed by the Yale & Towne Manufacturing Co., Philadelphia Div., Philadelphia, Pa. It is now available in the new Load King trailer-type hand-lift truck. This is a mechanical-lift, multi-stroke, hand-lift truck, built in capacities up to 20,000 lb. It is equipped with wide-spaced wheels mounted on ball bearings, and is provided with a towing arrangement attached to the double front wheels, and a safety coupler attached to the rear of the truck frame. As shown in the accompanying illustration, such trucks carrying skid-borne loads can be coupled in trains and pulled to the destination, or series of destinations, by any sort of appropriate tractor equipment, such as a tilting fork truck. The overall cost of such a train is said to be reduced 50 percent as compared to conventional trailer equipment.

When not required for use in trains, the hand-lift trucks can be used in the ordinary manner, distributed among various departments. The trucks are able to operate in close quarters, yet can elevate a full load ready for coupling into a trailer train with a few strokes of the handle. Since materials can be kept on inexpensive skids during temporary storage, it is unnecessary in this system to tie up costly floor truck trailers. Another advantage is that the system is able to utilize present skid platforms and pallets, since it is adaptable to the handling of all types of loads on skids, bins, dump body skids, and other special type skids.

Photoelectric Glossmeter

A NEW INSTRUMENT designed especially for measuring specular gloss of paints and varnishes, ceramics, paper and other polished surfaces is being produced by Photovolt Corp., 95 Madison Ave., New York, N. Y. The instrument is said to be particularly suited to measuring changes in specular gloss as a result of age, wear, abrasion, or exposure to moisture, heat, light or corrosive influences. The Glossmeter comprises the instrument proper, and a search unit which is connected to it by a flexible cable. The latter is placed on the sample to be tested, or under or against the surface. The unit is regularly designed for 60 deg. gloss, although search units for 45 or 75 deg. gloss are available. Other angles can be furnished to order. The instrument is built for operation on dry cells, alternating current, or with a storage battery. It is simple in operation, requiring no training on the part of the user. It is first standardized to give a reading of 92.5 for polished black glass, after which the search unit is placed on the sample, and the needle indicates directly the gloss in terms of an ideal, completely reflecting mirror, rated as 1,000.

Screw Conveyor Trough

COMBINING a steel trough bottom with wooden sides and a wooden cover board, Link-Belt Co., 2410 West 18th St., Chicago, Ill., has developed a combination conveyor trough which saves steel, yet gives a tight inclosure for the screw and the material it conveys. The new combination trough is adapted to all standard screw conveyor fittings and readily connects with existing steel troughs. The curved bottom, which is made of steel no heavier than 10 gage, is readily removed from the wooden trough sides for cleaning and replacement. (See illustration on p. 130).

Bubble-Type Viscosimeter

INTENDED primarily for use in determining viscosity of liquids too viscous for testing conveniently by other methods, the new Young-McArdle viscosimeter has recently been put on the market by R. P. Cargille, 118 Liberty St., New York, N. Y. The apparatus consists of a series of liquids of certified viscosity sealed in matched glass tubes, together with a group of empty matched tubes for the samples to be tested. Viscosity is determined by inverting the tubes and comparing the rise of an air bubble

in the sample with the rise of bubbles in the known standards. The air bubble in the heaviest standard requires about three minutes to rise. The procedure requires no special experience and is extremely quick. It is recommended for the testing of highly viscous liquids such as polymer solutions, particularly in synthetic rubber plant control. The method is also used in connection with heavy-bodied oils, rubber cements and solutions, and heavy viscous solutions of glues, gums, starches and sugars.

Voltage Stabilizer

To provide a constant output of 115 volts from circuits varying between 95 and 130 volts, General Electric Co., Scheectady, N. Y., has developed a new voltage stabilizer which is quick in response, and is without moving parts. The stabilizer is insensitive to load power factor. It is not affected by variations in load, from no load to full load, or by changes in power factor from unity to 0.8 lagging. The device is completely self-protecting and will operate continuously throughout the range from open circuit to short circuit without damage. It is suitable for use in connection with a variety of electronic equipment, X-ray machines, photo-cell equipment, and in the calibration of meters, instruments and relays. Ratings from 50 va. to 5,000 va. are available.

Free-Machining Alloy

Previously the use of the low-expansion alloy known as Invar has been limited by its machining capabilities. According to the Carpenter Steel Co., Reading, Pa., this difficulty has now been overcome with the development of a free-machining grade which is now in commercial production. Providing a rate of thermal expansion approximately one-tenth that of carbon steel at temperatures up to 400 deg. F., this alloy has been widely used in scientific and industrial instruments. Addition of selenium to the alloy has now so improved its machining properties, according to the manufacturer, that a saving of as much as 72 percent in machining time is possible. An accompanying illustration shows test bars of regular Invar (at left) and the new free-machining variety (at right), machined with identical tools under identical conditions. It will be observed that the new alloy cuts cleanly and without burrs.

Combination Respirator

Adding to the previously available list of cartridges for its Type R-1000 respirator, the American Optical Co., Southbridge, Mass., has developed a new type AD cartridge to protect the lungs of workers against a combination of all types of dusts, including toxic, pneumoconiosis-producing, and nuisance dusts. The face-piece of the Type R-1000 respirator contains a compartment into which a cartridge can be inserted. Including the new one, seven different cartridges designed for interchangeable protection against common respiratory hazards are now available. Earlier available cartridges include Type T, for toxic metal dusts; Type A, for quarry dusts; Type CC-1, for low organic-vapor concentrations; Type CC-2, for low acid-gas concentrations; Type CC-3, for low concentrations of combined acid and organic gases; and Type CC-4, for protection against nuisance concentrations of ammonia. As shown by the seven workers in the accompanying illustration, all seven cartridges fit the same respirator.

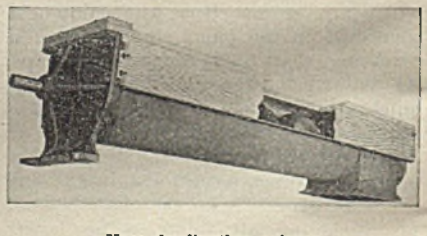
Print Maker

Known as the Spee-Dee printer, the new device offered by Peck & Harvey, 4325 Addison St., Chicago, Ill., is available for the rapid making of blueprints, as well as black-and-white prints. It is claimed that either blue or black-and-white prints can be made in half a minute. The printer plugs into any standard electrical outlet and it is said to be easy to operate, coming in sizes of 12x18, and 18x24 in. With it tracings, drawings, letters, invoices or other written or printed matter an easily be duplicated, at a cost said to be as low as 1½ cents per sq. ft.

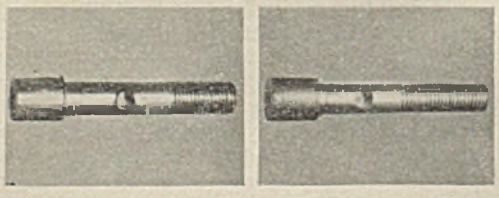
Lift-Truck Hopper

To make possible a standard method of handling hopper-contained bulk materials in a wide variety of production operations, Towmotor Corp., 1226 East 152d St., Cleveland, Ohio, has developed a hopper attachment for use on standard models of its fork-type lift trucks. The hopper is built in various sizes, the one illustrated having a capacity of 17½ cu.ft. To provide a firm carrying position and permit rapid tilting in dumping hopper loads, the attachment is carried directly on the fork-support bar of the lift truck by means of a hook which is an integral part of the hopper. The accompanying illustration shows the forks in a lowered position, demonstrating that there is ample clearance beneath the hopper to allow handling without removal of the standard forks. The hopper gate, it will be observed, is opened for discharge by pulling down a hand lever which is within easy reach of the operator. Quick discharge is assured by the slanting bottom of the hopper. The gate is closed by gravity and secured by an automatic catch. The device is particularly recommended by the manufacturer for the handling of bulk materials from storage bins.

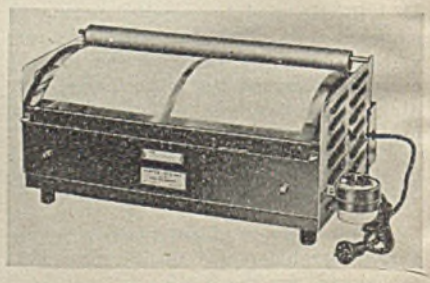
Wood-steel conveying trough (see p. 129)



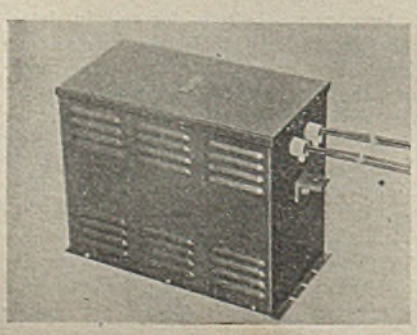
Comparison of regular Invar (at left) and new free-machining Invar (at right), showing superior results achieved with new alloy



New duplicating printer

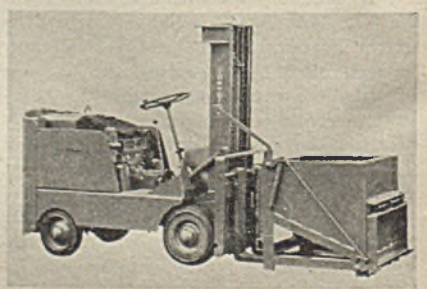


New voltage stabilizer



Type R-1000 respirator with seven different cartridges

Hopper attachment for fork trucks



ENGINEERING NOTES ON GIRBOTOL GAS PURIFICATION

• Standard factory-assembled Girbotol plants offer *low cost purification* for many applications that may not require large, individually engineered plants. These compact, easily-erected standard units are designed in *six sizes.*

The Girbotol Process has proven *the most economical method known* for removing and recovering acid gases, such as hydrogen sulfide and carbon dioxide, from gaseous mixtures and liquid hydrocarbons.

The Girdler Corporation also offers several other processes for purifying, separating, reforming or dehydrating many gases.

Processes for the economical manufacture of gases such as hydrogen and carbon monoxide are available.

Anyone who has a problem involving *any* of the gases *listed at the right,* or mixtures of these gases, is urged to write for further details.

Processes for

Production, Purification, Separation, Reforming or Dehydration of

HYDROGEN SULFIDE
CARBON MONOXIDE
BLUE WATER GAS
ORGANIC SULFUR
CARBON DIOXIDE
HYDROCARBONS
HYDROGEN
NITROGEN
OXYGEN

and various mixtures.

The GIRDLER CORPORATION

SPECIALISTS IN BETTER GAS PROCESSES

GAS PROCESSES DIVISION • LOUISVILLE, KY.

Superphosphate Production

SUPERPHOSPHATE is the most important commercial source of phosphorus for plant food purposes. It ranks first among phosphorus carriers in the fertilizer industry in quantity consumed. Superphosphate is made as shown in the accompanying flow-sheet of a plant of The Davison Chemical Corp., Baltimore, Md.

This material is made by causing sulphuric acid to react with pulverized rock phosphate, the two being in about equal proportions by weight. The acid is usually one having a strength of 52 to 55 deg. Bé. It is important to maintain a proper ratio and accurate scales are used for weighing the acid and ground rock. The acid has the effect of converting the relatively insoluble tri-calcium phosphate into a form that is available. The mixture becomes a sort of boiling mud and after it has been stirred in iron mixing pans, the wet mass is poured into dens to "cure" for a short time. It is then removed from the den and put into large piles to complete the reaction or curing process.

The product resulting from the acidulation is called ordinary or normal superphosphate, and is a mixture comprising mono- and di-calcium phosphate and calcium sulphate in almost equal proportions. Ordinary superphosphate usually contains from 18 to 19.5 percent available phosphoric acid.

Granulated superphosphate is now produced in one direct operation to contain 20 to 21 percent available phosphoric acid. To granulate superphosphate requires two treatment stages which follow each other immediately. In the first stage, the material is conditioned, i.e., its moisture content is adjusted accurately to that at which the granulation best takes place. In the second stage, the material so moistened or conditioned is dried while passing through a rotary kiln unit where the pellet or granular form is fixed or set by the heating and drying.

For additional information on this process refer to Fertilizer Practice at Curtis Bay, by R. S. McBride, *Chem. & Met.*, Vol. 47, pp. 4-9, and Granulating Phosphate Fertilizers, by J. N. Mackall and Mark Sheeld, *Chem. & Met.*, Vol. 47, pp. 102-105.

CHEMICAL & METALLURGICAL ENGINEERING

April, 1943

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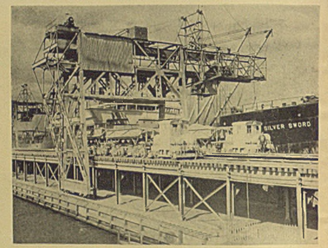
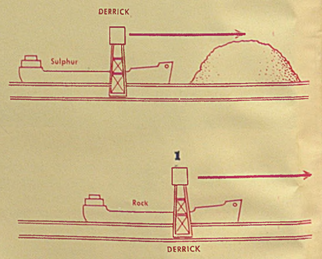
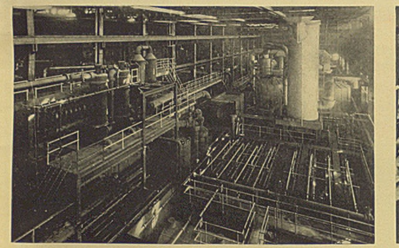


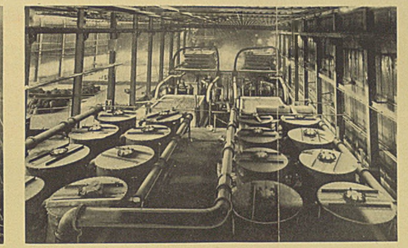
1 Rock phosphate is unloaded by the gantry crane and transferred by cars to the storage pits. Sulphur is handled at another pier



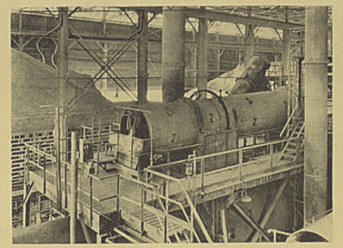
2 Superphosphate building showing ground rock handling equipment. Dust collectors discharge into ground rock storage hoppers under roof



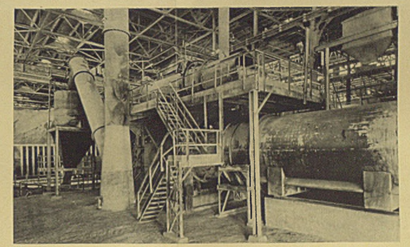
4 Sulphuric acid is made by both chamber and contact processes. In this contact plant are shown acid coolers, absorbers and heat exchangers



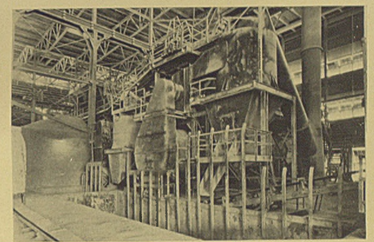
5 Contact acid production has been added partly to supplant and partly to supplement the chamber capacity



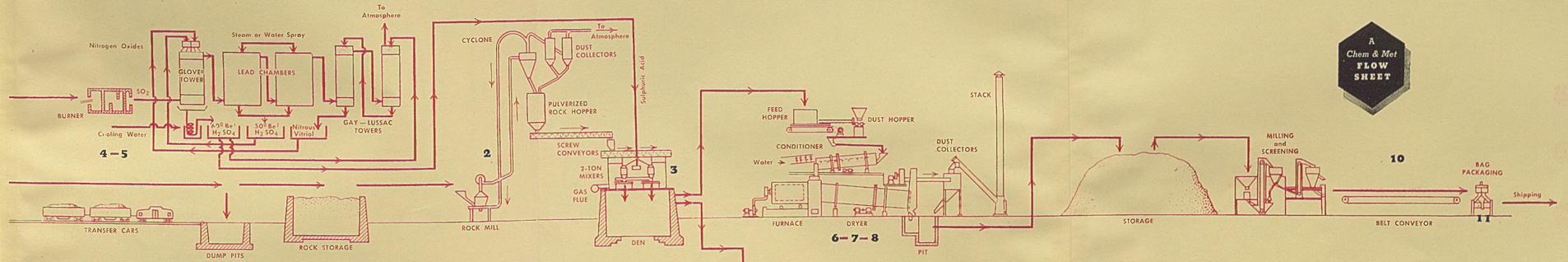
6 Conditioner and operating platform of 1,000 ton granulating unit showing spray valves, flood light, and instrument panel



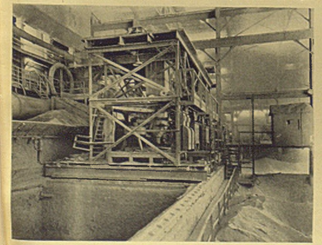
7 Granulating unit showing conditioner above, dryer below, and stack and dust collector at the left



8 Discharge ends and receiving pits of both conditioners, with discharge breechings, exhaust fans, cyclone collectors and one stack visible

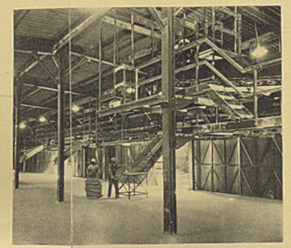


3 Mechanical mixing platform where rock dust and acid are mixed and dropped into den beneath it. Storage bin is on right

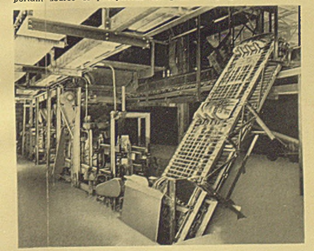


9 Storage bin and crane. In the background are superphosphate dens and acid mixing machine

10 Conveyor system for bagged superphosphate rail or truck shipments. The chutes may be turned



11 Modern bagging machine. Superphosphate is the most important source of phosphorus for plantfood purposes



The chemical control laboratory plays an important part in the production. Here are shown a large number of phosphoric acid determinations

%PROPORTIONEERS, INC.%
SPECIALIZED ENGINEERING ON PROPORTIONING PROBLEMS

The Secret of Pumping Synthetic Latex Lies In Slow Speed, Ample Clearance and Large Port Areas

There are also a number of other secrets which %Proportioneers, Inc.% have learned in their 10 years of experience handling viscous fluids in all types of chemical process work.

In the case of regular and off-grade latex:

1. All interior surfaces of the measuring cylinder are sandblasted smooth—and corners are well-rounded.

2. A special double stuffing gland containing "stripper rings" keeps viscous material from "balling up" in the packing.

3. Both displacement plunger and stuffing gland are fluid sealed and, in addition, provision has been made for continuous washing of the plunger.

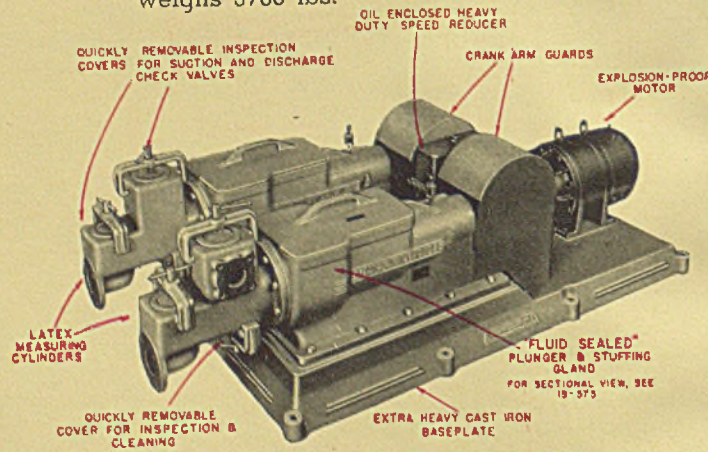
4. Large, easily removable inspection ports, with hand clamps, are provided for ready inspection of the 3½" diameter ball check valves.

5. A trash pocket and hand hole have been located in the bottom of the measuring cylinder.

6. Drive motor and speed reducer are separated to permit the individual removal of either unit in the event that repair or reconditioning is necessary.

7. The moving parts of the pump are fully enclosed, presenting a pleasing appearance as well as complete safety to the operator—although stroke length scales showing the actual displacement set are visible at all times.

8. Latex Proportioneers (now leaving our plant at a rate of 12 per week) are available in simplex and duplex constructions and in sizes up to and including 30 g.p.m. at 43 r.p.m. The largest pump weighs 3700 lbs.

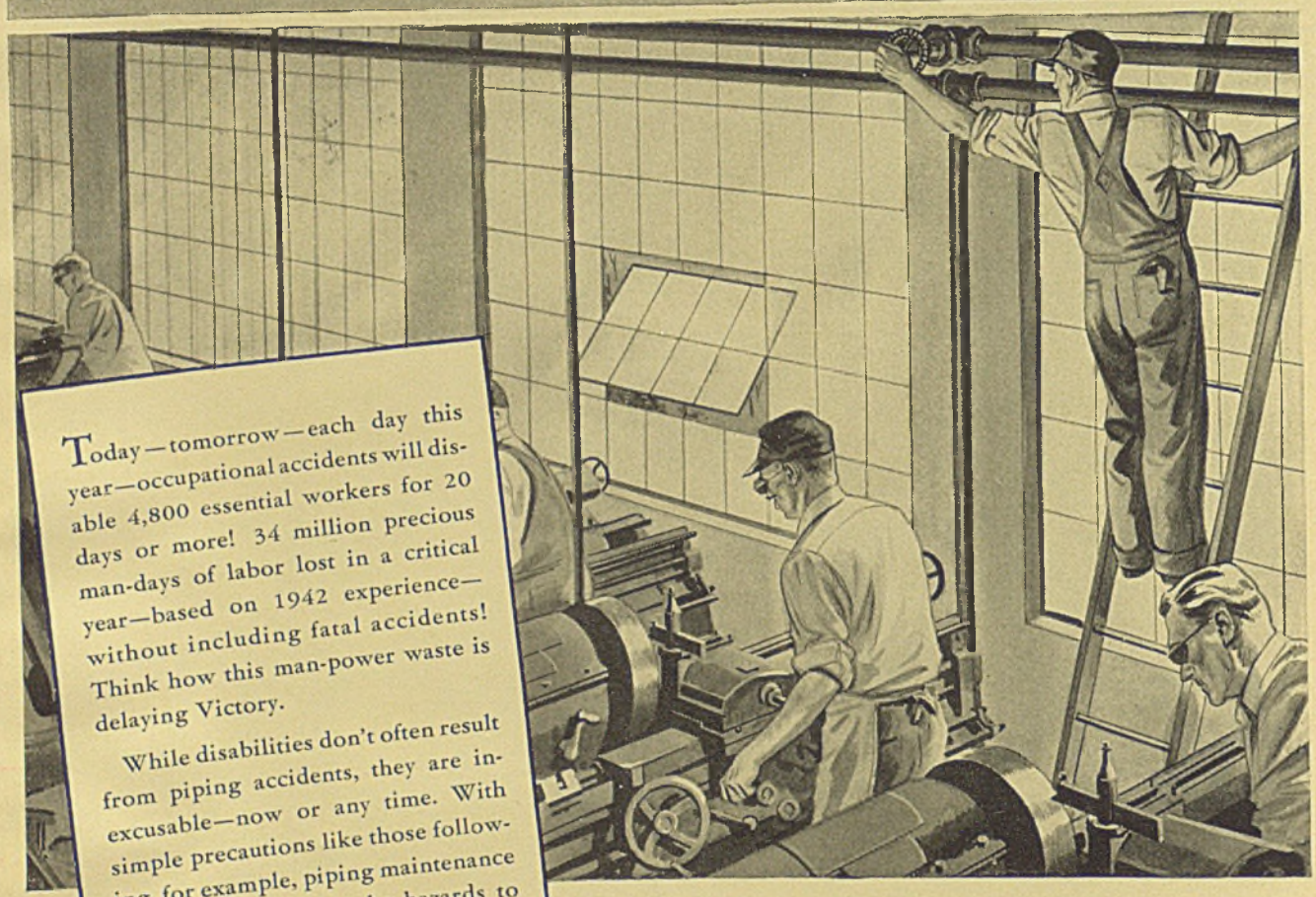


MODEL 4XD SERIES DUPLEX SLOW SPEED PLUNGER TYPE ADJUST-O-FEEDER PROPORTIONING PUMP FOR REGULAR AND OFF-GRADE LATEX. CAPACITIES UP TO AND INCLUDING 30 GPM. AT 43 R.P.M.

Specifications, photographs, and sectional drawings will be furnished upon request. %Proportioneers% has also developed and furnished apparatus for continuously proportioning and blending the liquid ingredients used in the manufacture of synthetic rubber as well as other devices for the same field of operation. Full details upon request.

%PROPORTIONEERS, INC.%
29 CODDING STREET, PROVIDENCE, R. I.

4800 WORKERS WILL BE HURT TODAY



Today—tomorrow—each day this year—occupational accidents will disable 4,800 essential workers for 20 days or more! 34 million precious man-days of labor lost in a critical year—based on 1942 experience—without including fatal accidents! Think how this man-power waste is delaying Victory.

While disabilities don't often result from piping accidents, they are inexcusable—now or any time. With simple precautions like those following, for example, piping maintenance men can help lessen the hazards to American workers now when they're most needed on the job.

SAFETY HINTS FOR PIPING MEN

1. Don't install valves where getting at them means exposure to danger.
2. Support lines firmly to prevent loosening at joints.
3. Identify valves so they can be quickly operated in emergencies.
4. Install relief valves where there is danger of sudden built-up pressures.
5. Inspect sprinkler system control valves regularly. Keep them open always.

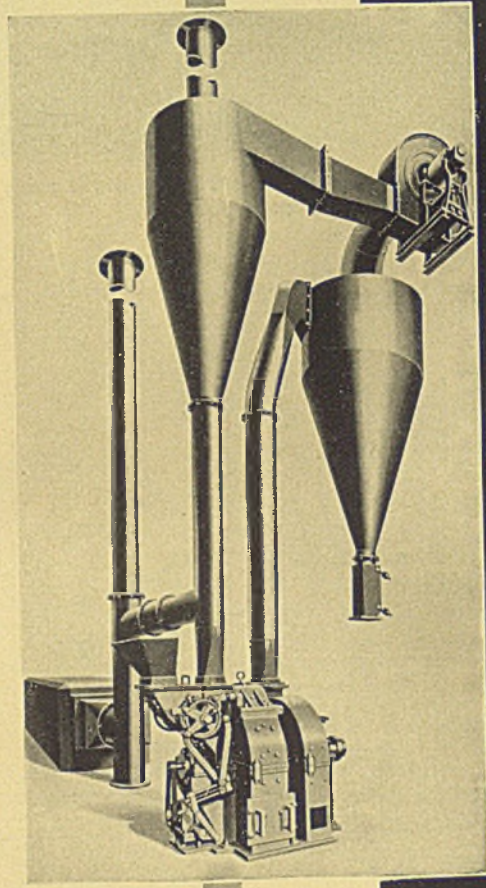
The safety hints given here are from "Piping Pointers" Bulletins—a Crane service aiding piping men in hundreds of plants in doing more to help win the war. Giving many "*do's and don'ts*" and "*rights and wrongs*" on keeping pipe lines at peak efficiency—conserving critical metals—and speeding piping jobs, these bulletins, based on Crane's 87-year leadership in flow-control engineering, are especially valuable for training new maintenance men. Copies free on request from your Crane Representative or by writing to: Crane Co., 836 South Michigan Avenue, Chicago, Illinois.

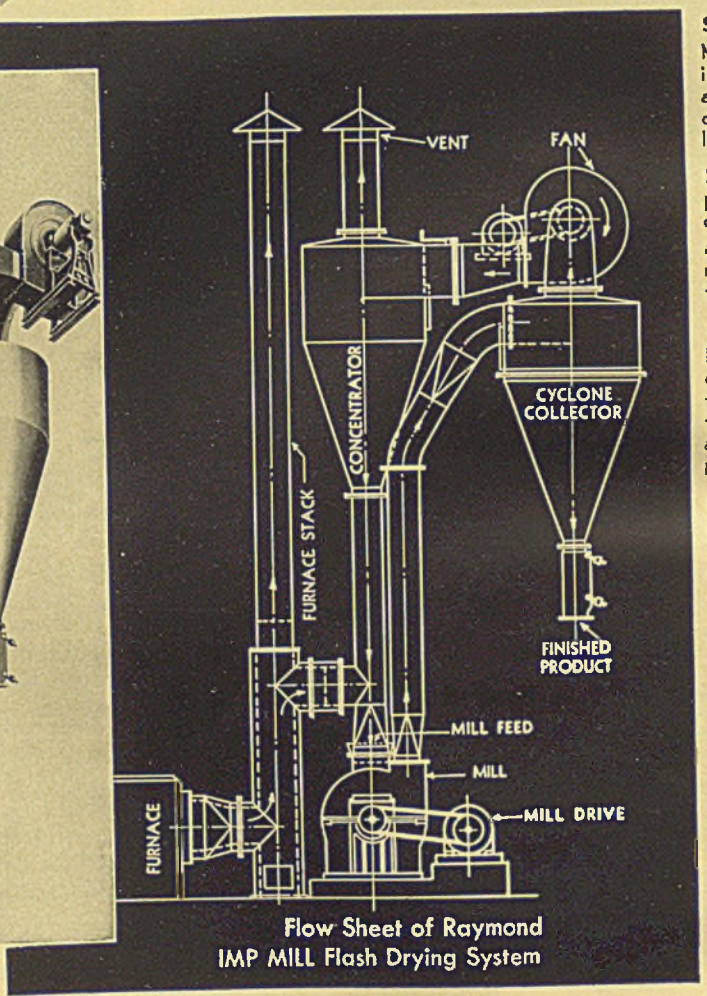
"PIPING POINTERS" BULLETINS—FREE TO ANY PLANT

ARMY NAVY

CRANE VALVES

RAYMOND *Flash Drying* PERFORMANCE





Flow Sheet of Raymond
IMP MILL Flash Drying System

Synthetic Resins
Material dried and disintegrated in one operation, reducing moisture content from 50% to less than 1%.

Manganese Sulphate
Pulverized to fineness of 99.9% passing 100-mesh, and removing surface moisture at the same time.

Gluten Feeds
Drying a mixture of coarse and fine feeds from 60% moisture down to 8%, and evaporating about 10,000 lbs. of water per hour.

Filter Cake
Reducing moisture from 70% to a final 10%, and delivering about 1700 lbs. of dried product per hour.

Acid Treated Clay
Material dried down from 60% to 15% moisture, and reduced to a fineness of 85% passing 200-mesh.

Sewage Sludge
Initial moisture from 75% to 85%, reduced to final 8%. Units are in operation, evaporating up to 20,000 lbs. of water per hour.

FLASH DRYING is a rapid method of removing moisture from materials while reducing the product to specified fineness. The operation is automatic and dustless, and may be used in combination with the Raymond Imp Mill, Cage Mill or Roller Mill. High percentages of moisture can be evaporated with the Imp Mill or Cage Mill . . . and combined moisture may be removed, as in processing copper sulphate. For low-moisture materials, like the non-metallics and many manufactured products, the Raymond Roller Mill with the air-drying system may be used to advantage. Flash Drying is economically adapted for handling chemicals, foods, fertilizers, by-products and industrial wastes.

Write for information

RAYMOND PULVERIZER DIVISION
COMBUSTION ENGINEERING COMPANY, INC.
1311 North Branch Street CHICAGO
Sales Offices in Principal Cities • • • In Canada: Combustion Engineering Corporation, Ltd., Montreal

SINCE 1887

Chemical Engineering NEWS

NEW SYNTHETIC RUBBER PLANTS PLACED IN OPERATION

Two of the plants which are included in the synthetic rubber program, went into operation at the beginning of this month. One at Institute, W. Va., was erected for the Government by the United States Rubber Co. with the Blaw-Knox Co. commissioned by the Defense Plant Corp. to design and install equipment. The first unit now in operation is producing synthetic rubber of the Buna S. type and is supplied with butadiene from a nearby plant of the Carbide & Carbon Chemicals Corp. It is reported that eventually, the plant will have an annual capacity of 90,000 tons of rubber.

The other plant to go into production this month is located at Baton Rouge, La. It is government-owned with the engineering supervised by the Firestone Tire & Rubber Co., the building construction under direction of the H. K. Ferguson Co., and the equipment installation by Blaw-Knox. This plant will later reach a capacity of 30,000 tons and will obtain its butadiene from the Baton Rouge plant of the Standard Oil Co. of New Jersey. It will be operated by the Copolymer Corp., with Col. E. M. Hulings vice-president of the corporation in charge of plant operations. The Copolymer Corp. was formed last year by Sears Roebuck & Co., Dayton Rubber Mfg. Co., Armstrong Tire & Rubber Co., Lakeshore Tire and Rubber Co., Pennsylvania Rubber Co., and Mansfield Tire and Rubber Co.

DOMESTIC BAUXITE RESERVES TO BE EXPLOITED

In a move developed jointly by the Bureau of Mines and the War Production Board, the bureau has undertaken the first steps for expanding the search of additional reserves of domestic bauxite, alunite, and aluminous clays. The expanded search, to be conducted under a $500,000 Congressional appropriation bill is designed to free the United States in the future from dependence upon imported bauxite.

Exploratory crews now in the field already have increased in recent months the known reserves of bauxite by more than six million tons, some of which is of a quality suitable for aluminum production, and the new appropriation will permit the bureau's drilling program to continue at a greatly expanded rate until June 30 of this year. The bureau has requested additional funds to carry the exploratory program through to June 30, 1944, explaining that there has been a ten-fold increase in the utilization of domestic bauxite and that the known national reserves of this ore are not sufficient to keep the United States supplied for a long war.

DOW PLACES NEW MAGNESIUM PLANT IN OPERATION

The first magnesium to be made in eastern Michigan was poured into ingots on April 8 at the huge government-owned plant thus put into operation by the Dow Chemical Co. Eventually the new plant will obtain its cell feed from the rich brine of nine new salt wells across the state where another DPC plant also is being built by the Austin Co. for Dow operation. The outstanding feature of the new electrolytic plant is the use of 2,000,000 pounds of silver bus bars from the U. S. Treasury valued at $20,000,000, rolled and fabricated by Revere Copper and Brass Inc.

Following the plant ceremonies, a dinner was held in Detroit in honor of Dr. Willard H. Dow and his associates. George A. Bryant, president of the Austin Co. declared that if other companies were as willing to plow millions into research, future building would be greatly advanced by the use of magnesium, plastics, and other new construction materials. In his address, Dr. Dow said magnesium production was increasing at the rate of 75 percent a year prior to the war and now it is 35 times what it was three years ago. Correcting S. D. Kirkpatrick, who also spoke, Dr. Dow said he preferred to regard aluminum as 50 percent heavier than magnesium rather than to refer to magnesium as one-third lighter than aluminum.

BUREAU OF MINES WILL HAVE LABORATORY IN OREGON

Albany, Oregon, has been selected as the site for the northwest electro-development laboratory where Bureau of Mines metallurgists will study the recovery and processing of minerals from the Pacific Northwest as part of a program to utilize this region's vast resources in the war effort. Negotiations have been completed for the purchase of the buildings and grounds of the Lewis and Clark College, an institution that moved to Portland a few years ago. Secretary Ickes stated that the site meets the requirements for a laboratory to investigate improved methods of recovering magnesium and aluminum from the plentiful reserves of that area together with research in the processing of other strategic minerals.

GULF OIL CORP. SPONSORS FELLOWSHIPS

The Gulf Oil Corp. has announced the inauguration of fellowships in the fields of physics, chemistry, geology, engineering, and business administration at 11 of the country's foremost colleges and universities. Application for the fellowships is open to graduates of recognized colleges and universities and to men or women who, through established training and achievement, are able to demonstrate their preparedness for advanced training. Those interested in qualifying must make application directly to the participating institutions.

The Gulf companies will make no attempt to direct or administer the fellowships. They are to be wholly under the jurisdiction of the various schools which are granted the utmost freedom in selecting the fellows and in directing their work. During the three-year term of each fellowship, the recipient is under absolutely no obligation to the Gulf companies. Neither is he under any obligation to take employment with Gulf or to follow any specific line of endeavor following its completion.

DR. E. W. REID ON LEAVE FROM DUTIES IN WPB

In a reorganization movement within the War Production Board, a general administrative order of March 24 abolished the position of deputy director-general for operations which had been filled by Dr. Ernest W. Reid. Prior to accepting that position Dr. Reid had served in the capacity of chief of the Chemicals Branch of WPB. He is now on leave and no announcement has yet been made relative to his future connection with WPB.

SECOND QUARTER CARLOADINGS WILL SHOW INCREASE

The 13 Shippers' Advisory Boards expect an increase of 2.5 percent in freight carloadings for the second quarter of this year as compared with the corresponding period of last year. The Boards recognize 28 commodity groups and anticipate increased loadings this year in only 13 of these groups with declines for the other 15. No estimate is given for shipments of chemicals but a gain of 13.4 percent is looked for in the case of fertilizers and 3.2 percent for petroleum and petroleum products. These figures may not be directly comparable with those reported last year because of the trend toward increasing the amount carried in a car.

ACTIVITIES OF CHEMISTRY BUREAU DECENTRALIZED

Practically all experimental work of the Bureau of Agricultural and Industrial Chemistry has been moved out of Washington. Between sixty and seventy members of the staff formerly engaged on this type of activity at the headquarters of the Department of Agriculture were transferred to the four Regional Laboratories by an order of the Secretary of Agriculture made public during mid-March.

This leaves in Washington a small skeleton staff, which will probably be less than fifty persons, to care for administrative, organization, and general services of the Bureau. Some of the activities moved from Washington will be reported directly to headquarters, but other units will be absorbed into the major divisions of the Regional Laboratories.

The principal moves made were: micro biology to Philadelphia, hemicellulose to Peoria, enzyme research to Albany, Calif., Naval Stores Research and Agricultural Chemistry Division to New Orleans. In some cases, however, individuals formerly in these divisions or sections will remain in Washington for special assignments or will be given new duties.

Information services, publications, and general correspondence will be generally conducted from Washington as formerly. Dealings direct with specialists in the Regional Laboratories will, however, continue to be authorized, except for policy matters or new publications which must come to Washington for review before release.

SIGMA XI INSTALLS CHAPTER AT BROOKLYN POLY

The Society of Sigma Xi installed its 86th Chapter at the Polytechnic Institute of Brooklyn, Brooklyn, N. Y., on March 25. The installing officers were Dr. Harlow Shapley of Harvard University, national president, and Dr. George Baitsell of Yale University, national secretary. Twenty-six chapters of the society were represented by delegates at the installation, which was preceded by a convocation where Dr. Harry S. Rogers greeted the delegates and spoke on the subject "Education and Research."

The new chapter has twenty-five charter members. Officers elected at the installation included: Professor Clyde C. Whipple, president, Dr. Raymond T. Ellickson, secretary, and Dr. Chilton A. Wright, treasurer.

NEW HELIUM PLANT IN TEXAS BEGINS PRODUCTION

Last month, the Bureau of Mines announced that it had shipped the first carlot of helium from its new and largest helium plant "somewhere in Texas." Dr. R. R. Sayers, director, in reporting on the progress of the Bureau's $16,000,000 helium expansion program stated that four more plants are now in various stages of production and before the end of this year, six plants will be in operation with a production rate about 40 times that of prewar days. Up to last month helium had been coming solely from the plant at Amarillo, Tex., which has been greatly expanded since the outbreak of the war.

NATIONAL LEAD CO. SELLS ILMENITE PROPERTY

The National Lead Co. has sold all the property and assets of the Ponte Vedra Co., formerly Buckman & Pritchard, according to the annual report to stockholders. The property, consisting of 17 miles of ocean front in Florida, was acquired by the subsidiary in 1922, because of the deposits of ilmenite ore, the basic material for the manufacture of titanium pigment. Development of deposits in India and elsewhere caused the company to drop the project. National Lead is producing ilmenite at Tahawus, N. Y.

CHANDLER MEDAL AWARDED TO WILLARD H. DOW

The Charles Frederick Chandler Medal of Columbia University has been awarded to Willard H. Dow according to an announcement by Dr. Nicholas Murray Butler, president of the University. Mr. Dow was cited as one of the outstanding industrialists of the present generation. "The achievements of the Dow Chemical Co. in the production of bromine from sea water, of magnesium from sea water, of synthetic plastics and synthetic rubber are among the most spectacular and valuable achievements of modern times," the citation said. It further added that these and many other achievements, including the expansion of the chemical industry depending on Michigan salt brines founded by his father, Herbert H. Dow, have been largely due to his leadership, both as a chemical engineer and as an administrator.

FOR PRODUCTION EXCELLENCE

Among the companies which, in the past month, have been awarded the honorary Navy "E" and joint Army and Navy "E" burgee for exceeding all production expectations in view of the facilities at their command, are included the chemical and explosives plants, the chemical process industries and the chemical engineering equipment concerns listed below. Other process and equipment plants will be mentioned in these columns as the awards are presented to the individual plants.

Allis-Chalmers Mfg. Co., West Allis Works and Electric Control Plant, Milwaukee, Wis.
Alloy Steel Gear & Pinion Co., Chicago, Ill.
American Aluminum Ware Co., Newark, N. J.
American Blower Corp., Columbus, Ohio.
American Cyanamid & Chemical Corp., Maynard, Mass.
American Foundry Equipment Co., Mishawaka, Ind.
American Key Can Co., Chicago, Ill.
American Lens Co., Inc., New York, N. Y.
Androscoggin Mills, Lewiston, Me.
Armour & Co., Chicago, Ill.
Arnold Engineering Co., Marengo, Ill.
Arrowhead Electric Co., Duluth, Minn.
Baldwin Locomotive Works, Eddystine, Pa.
Borg-Warner Corp., Rockford, Ill.
Carpenter Container Corp., Brooklyn, N. Y.
Consolidated Chemical Industries, Inc., Baton Rouge, La.
Container Corp. of America, Manayunk, Philadelphia.
Continental Mills, Philadelphia, Pa.
C. B. Cottrell & Sons Co., Westerly, R. I.
Davis Emergency Equipment Co., Newark, N. J.
Denver Steel & Iron Works, Denver, Colo.
Desmond-Stephan Mfg. Co., Urbana, Ohio.
Drayton Mill, Spartanburg, S. C.
E. I. du Pont de Nemours & Co., Morgantown, W. Va.
Eaton Metal Products Co., Denver, Colo.
Edison General Electric Appliance Co., Chicago, Ill.
Exeter Brass Works, Exeter, N. H.
Fairfield Mfg. Co., Lafayette, Ind.
The Foxboro Co., Foxboro, Mass.
General Electric Co., Appliance and Merchandise Department, Bridgeport, Conn.
The Gent Machine Co., South Euclid, Ohio.
Hercules Powder Co., Inc., Hopewell, Va. and Port Ewen, N. Y.
Hammond Brass Works, Hammond, Ind.
Holcomb & Hoke Mfg. Co., Indianapolis, Ind.
Holley Carburetor Co., Detroit, Mich.
Houdaille-Hershey Corp., Oakes Products Division, North Chicago, Ill.
Kensington Steel Co., Chicago, Ill.
Kilby Steel Co., Anniston, Ala.
Lansing Paint & Color Co., Lansing, Mich.
Lederle Laboratories, Inc., Pearl River, N. Y.
The Lufkin Rule Co., Saginaw, Mich.
Machlett Laboratories, Inc., Springdale, Conn.
Manning, Maxwell & Moore, Inc., Bridgeport, Conn. and Boston, Mass.
Mount Vernon Woodberry Mills, Inc., Tallassee, Ala.
Mullins Mfg. Co., Warren, Ohio and Salem, Ohio.
Ogden Arsenal, Ogden, Utah.
Pangborn Corp., Hagerstown, Md.
Pine Bluff Arsenal, Chemical Warfare Service, Pine Bluff, Ark.
Potash Co. of America, Carlsbad, N. M.
Seiberling Rubber Co., Barberton, Ohio.
Singer Mfg. Co., Bridgeport, Conn.
Solar Mfg. Corp., A Plant, Bayonne and Fifty-Second St. Plant, West New York, N. J.
Sprague Specialties Co., Plants No. 1 and No. 2, North Adams, Mass.
Spun Steel Corp., Canton, Ohio.
Steel Cooperage and Coating Co., Detroit, Mich.
The L. S. Starrett Co., Athol, Mass.
Taft-Pierce Mfg. Co., Woonsocket, R. I.
Tennessee Valley Authority, Nitrate Plant No. 2, Wilson Dam, Ala.
Tech-Art Plastics Co., Long Island City, N. Y.
Thompson Pipe and Steel Co., Plants No. 1 and 2, Denver, Col.
The Union Metal Mfg. Co., Canton, Ohio.
The Union Steel Products Co., Albion, Mich.
Van Dorn Iron Works Co., Cleveland, Ohio.
Vickers, Inc., Waterbury, Conn.
War Department Searchlight Mirror Plant, Cincinnati, Ohio.
The Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.
Wincharger Corp., East Seventh St. Plant and Douglas St. Plant, Sioux City, Iowa.
Wright's Automatic Machinery Co., Durham, N. C.
Youngstown Metal Products Co., Girard, Ohio.

WASHINGTON NEWS

Pre-peace talks among the United Nations took the Washington spotlight away from the active fighting front during March. The visits of Anthony Eden and Madame Chiang Kai-shek to this nation's capital, Churchill's March-end broadcast from London and President Roosevelt's press conference hint of forthcoming talks which may bring him and Stalin together were the chief events.

In a broad sense, these conversations generally are looking toward some kind of a postwar cooperative enterprise among nations, armed with power to enforce order throughout the world which the League of Nations lacked. Naturally, little factual detail is known. There seems to be reason to believe, however, that the U. S. and British Governments are substantially in agreement, that Britain is plugging for a strong Russia and seeking to allay the natural American fears of such a postwar setup. Beyond the Big Three nations, however, there is less agreement. China still feels left out, despite Eden's quick "correction" of Churchill's omission of much reference to the Pacific theater in his talk. The smaller of the United Nations also are complaining that they are not being consulted enough —and Russia's trial balloons for postwar territory have increased this tension.

All this obviously has a direct bearing upon American business, including the chemical industry. Upon the kind of international relations which exist after the fighting stops will depend, in considerable measure, the direction of American business in the postwar period. Up to now, at least, there has been little opportunity for Americans to get a sufficient glimpse of what is being discussed to be able to take—let alone make known—a position. Potential vehicle for this is the Senate resolution introduced in March by a bi-partisan group of four Senators designed to put the American Senate on record favoring a postwar collaboration among nations with the United States taking an active role. Should this maneuver reach the stage of active debate, considerable information indicating the direction in which the pre-peace talks are going could be brought out.

Price Control for Drugs

Late in March there was every indication that the overall drug price regulation that had been in the works for the last six months would make its belated appearance. The final details had not been worked out by OPA but at that time it seemed safe to assume that regulation when announced would feature automatic pricing formulas for all packaged drugs, beginning at the manufacturers level.

It was indicated that the new price order would provide for the use of the actual unit direct cost in the computation of prices for new products instead of the March 1942 direct unit costs which previously has more or less been the OPA policy. The usual March markups will be in effect. Prices on the old products are expected to remain the same as those established by the General Maximum Price Regulation. The new regulation goes a long way in recognition of war time changes and factors—for example changes that have occurred in containers.

If there were no changes it will be necessary for the drug manufacturer to compute the prices not only for himself but also for the wholesaler and the retailer. New products will have their retail ceiling price printed on the package by the manufacturer so that there can be no price manipulation.

A major departure for the manufacturer will be that all reporting will be done on one simplified form instead of five or six as formerly. There are at least six instances in the regulation requiring a report and all six use the same form.

It must be stated again that the price regulation for packaged drugs has been a long time coming. Varied products, conditions and trade practices has made it a particularly hard nut to crack. It was a prodigious undertaking that was about ready to be unveiled at the time this issue went to press.

Phenol Production Aided

While the new setup in WPB has not reduced the opportunity for "red tape" nor were there any layers removed between the grade of Division Chief and the top side officials there seems to be a tightening up within the WPB organization all along the line. A sign of the times has been the handling of the program for increasing the production of phenol. The whole program was given the green light late in March.

The adoption of an entire expansion program for one chemical at one time marks a new step in Chemical Division procedure. In the past it has been the policy to consider each bottleneck as it came along rather than to examine an entire program at once. Having the phenol program okayed in entirety should make it much easier to compete for scarce component parts with the rubber program or the aviation gasoline program or any other of the "must" programs that are currently underway.

A methanol shortage was indicated in January that would have shown up at this time as a bottleneck in phenol formaldehyde resin production. The crisis has been averted by the conversion of certain ammonia-producing capacity to the production of methanol. The ammonia plants used were some of the excess capacity that was built at the insistance of the Army.

The Tax Muddle

It will be late in the year, again this year, before American business knows what its 1943 tax bill is to be. There is little chance that the 1943 war tax measure will be sufficiently "set" as to form and rates before late summer, as a result of the House action in sending the pay-as-you-go and withholding tax plans for individuals back to committee at the end of March. The action meant that three months of time had been virtually wasted—the tax problem was exactly where it was at the beginning of the year.

However, there is some certainty that corporate tax rates won't be a lot heavier this year than in the 1942 measure. There was general agreement when the last bill was passed that corporate tax rates had just about reached the limit of practicality. Individual tax rates are likely to be hiked again, especially in the medium income brackets—and this may force some upping of the corporate net income rate for "political balance."

More than is generally appreciated, the tax problem is an integral part of the government's fight against inflation. This front was holding in early April only by tenuous threads. Administration pressure obtained a Senate delay in consideration of farm bloc legislation which would skyrocket farm prices and puncture price control, thus making impossible the holding of the wage level. This victory, temporary though it may be, helped the Government to at least postpone a showdown with John L. Lewis over coal miners' wages by obtaining agreement from the union and the management to continue operations during April while a solution is found to the contract stalemate.

General expectation in Washington, however, is that the best to hope for is some sort of "controlled inflation" in which farm and labor blocs can be pitted against each other in a way to keep the rise in the price index moderate. Taxes fit into this scheme of things as a "great leveler"—to prevent the added income from bidding up prices beyond the pace of the "controlled" rise resulting from wage and farm increases.

Home Fat Salvage

Home fat salvage is getting no better rapidly. Heretofore there has been no particular incentive for the housewife to see that her fat reached the proper collection center. With the rationing of fats and oils for domestic use now underway it appears doubtful if the collection of household salvage fats can even be

kept at their previous level, let alone increased.

One of the most important considerations leading to this pessimistic viewpoint is the acknowledged fact that the housewife is not going to be able to buy as much fat in the future as she has in the past. It has been the policy to salvage as much animal fat as possible at the packer level which is making itself increasingly felt farther down the line. Washington officials are concerned about the situation and are ready to consider any scheme that has a fair chance of bringing in more salvage fat.

One of the ideas advanced has been to pay for the fat collected in ration points. Under general rationing this type of incentive might produce unexpectedly good results. No action had been taken on the proposal on April first, but the idea still was getting active study.

Combined Aluminum Committee

Fourth of its kind set up in the last few months, a Combined Aluminum Committee representing the United States, the United Kingdom and Canada has been established to coordinate the activities of the three countries in respect to the metal. One of its first activities was straightening out a tangle in small castings which threatened American plane production by scheduling the output of existing facilities in the three countries so they would go around.

Charles E. Wilson, executive vice chairman of WPB, is chairman of the new committee. Other members are Sir Richard Fairey, Director General of the British Air Commission and George C. Bateman, Metals Controller of Canada. A technical sub-committee consists of Arthur H. Bunker, director of the WPB aluminum-magnesium division, and P. W. Rolleston, director of materials and supply for the British Air Commission. They will prepare detailed production and requirements estimates of the three countries for 1943 and 1944 to be reported by the committee to the Combined Production and Resources Board and the Combined Raw Materials Board.

Previous committees of like nature have been established in steel, copper and rubber.

The Bureau of Mines received a $500,000 appropriation from Congress in March for carrying on searches for low-grade alumina deposits which can be commercially operated. Most of the drilling work under this new program is to be carried on in Arkansas, the nation's No. 1 bauxite state, where the Bureau already has a mobile laboratory working with drilling crews in charting new reserves.

Magnesium and potassium chlorides found in Grand County, Utah, by the U. S. Geological Survey has lead to speculation as to what the policy of the Department of Interior will be on the lease of these lands. The Secretary issued order No. 914 in 1935 prohibiting the further lease of such lands and this order is still in effect. But in the present emergency this might not be the case. It would be more in keeping with the facts to say that the lands will be leased only if it can be shown that such action will aid the war effort.

The basin in which the salts occur lies at the junction of the Colorado and Green rivers. An analysis of the salts indicate that they could be used at the Las Vegas plant without further refining.

The Alcohol Problem

The alcohol from farm products problem was laid gently back in the lap of Senator Gillette of Iowa by Dr. Walter G. Whitman of the WPB Chemicals Division at the March meeting of the Alcohol Producers Industry Advisory Committee. Last fall the farm bloc in Congress lead by Senator Gillette fought bitterly to see that a larger share of the alcohol production for the rubber program was based upon farm products. The farm bloc was successful (*Chem. & Met.*, Dec. 1942, p. 122) and the Chemical Division revised its plans to use as much grain in the program as it was felt could be used with safety. It was pointed out at that time that so much of the program depended on grain that a partial crop failure would seriously affect production. (*Chem. & Met.*, Jan. 1943, p. 121.)

A crisis developed much sooner than expected. Commodity Credit Corp. announced that the last reserves of corn at its disposal were exhausted and that after April 1 no further contracts for corn would be made. At that time (April 1) it appeared that at least 100 alcohol plants would be closed unless some corn could be made available.

Secretary of Agriculture Wickard promised some time ago that grain for the alcohol program would be made available but he did not say what kind of grain. In addition to the adverse effect of the threatened stoppage to the synthetic rubber program, the situation is affected by politics as well as market factors including the corn and livestock prices which influence the supply of grain. The wheat price has not been guaranteed and there appears to be a very good opportunity to run prices up and take the increases out of the distillers hides.

Controlled Materials Plan

The Controlled Materials Plan weathered its first major assault in March. This first burst of open opposition came from Detroit, a round-robin of complaint from the auto manufacturers who charged that CMP allotments were balled up and that production would drop in the second quarter.

A two-day series of lively meetings in Washington ended the battle, if it didn't straighten out all the kinks. Chief concession was WPB's decision to postpone effective date of CMP on carbon steel deliveries until April 15—most other controlled materials are sufficiently carefully allocated that the commodity divisions in WPB can do a lot toward seeing that the right people get material at the start even if CMP allotment numbers aren't all ship-shape.

The auto man's complaints reached Washington about the time CMP was formally restored to the capable hands of J. A. Krug who now in addition to being War Utilities Czar is also a WPB vice-chairman in what is left of Ferdinand Eberstadt's old seat. In his new post Krug runs CMP, the Requirements Committee and WPB's Program Bureau, which makes him the WPB No. 3 man next to Chairman Nelson and Executive Vice-Chairman Charles E. Wilson.

This reorganization, following Eberstadt's forced retirement, holds some promise of being more stable than have many of the war agency's realignments of the past. There is evidence that WPB is shaking down to a more solid foundation than heretofore, both in personnel and procedures. The Nelson-Wilson combine is now a vertical organization, with Krug in the operations seat and Donald D. Davis as a vice-chairman in the administrative wing, replacing the former Director-General Curtis Calder. New facilities and the like are problems which remain directly under Wilson, in the hands of Vice-Chairman Ralph J. Cordiner. International affairs stay with Vice-Chairman William L. Batt.

Fertilizer Supplies

Ample supplies of chemical fertilizers are available in this country. Newspaper reports to the contrary have been the result of local shortages of a type difficult to control. Total supplies of nitrogen, phosphoric acid, and potash for the fertilizer year 1942–43 are larger than for any previous year being estimated at more than 2 million tons, up over 100,000 tons from the previous fertilizer year.

Last year the consumption of fertilizer reached an all time peak with the consumption of nitrogen higher than any year except 1941. On the production side the figures are equally impressive. Superphosphate was substantially above any previous record while the production of domestic potash was more than four times the domestic production in 1938, the last year imports from Germany were received in this country.

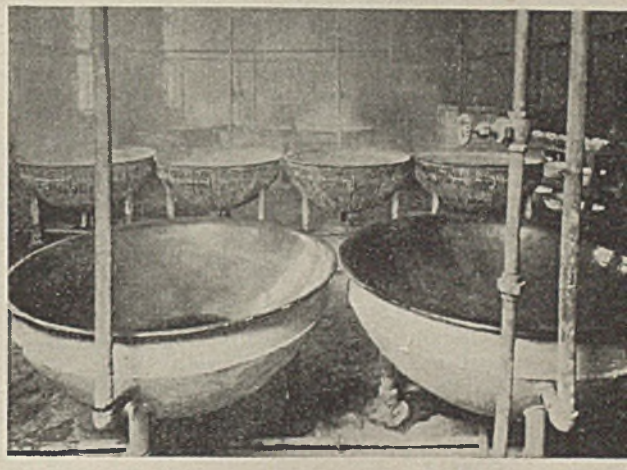
Prospects for this year are that there will be equally as much mixed fertilizer available as was sold last year. With the nitrogen conservation program in effect (*Chem. & Met.*, Aug. 1942, p. 118) it will be possible to mix more fertilizers this year than were sold last year.

The history of fertilizer prices is interesting. Without going into detail the prices to the farmer in September 1942 were only 12 percent more than they were in 1910–14. Also, according to the index numbers of the U. S. Department of Agriculture the wholesale price of most inorganic fertilizer material has shown no increase during the last year. The other side of the picture is that farm prices on February 15, 1943, were 78 percent above their 1910-14 base. It can be concluded from these figures that although the farmers are handicapped by shortages of machinery they do have a relatively high purchasing power and fertilizer demand is above normal.

YOUR PRODUCTION DRIVE STARTS WITH YOUR EQUIPMENT

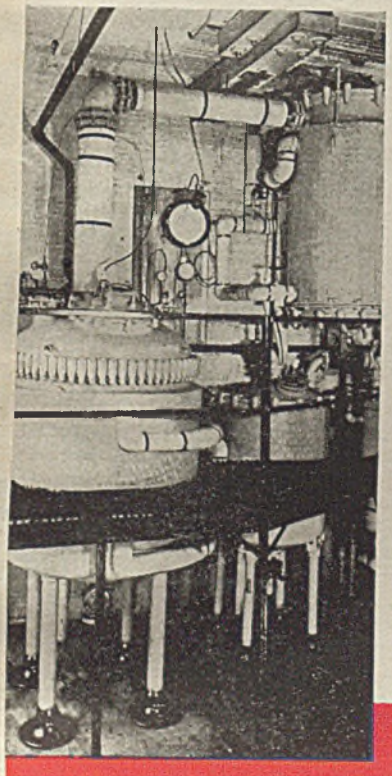
Increase yield

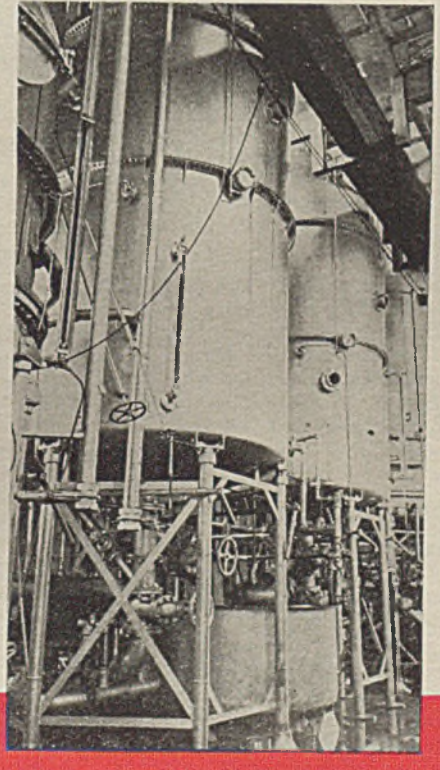
WITH GLASS-LINED STEEL EVAPORATORS



PFAUDLER offers Glass-Lined Steel Evaporation Equipment which eliminates contamination of the product from dissolved metals, high depreciation from corrosion, undesirable catalytic action and reduced yields.

Glass-Lined jacketed open evaporating pans are recommended where purity is essential to the finished product or where excessive corrosion is caused by the action of strong acids. Available in standard capacities of 12, 60 and 150 gallons, with or without glass clad agitators. A very common use is in the preparation of C.P. laboratory reagents.





For distillation, a complete glass lined steel assembly permits you to start and finish your product in glass. This includes a steam jacketed closed still, a double jacketed water cooled condenser, and a vacuum receiver, all interconnected with glass lined pipe, fittings, and valves. Such assemblies are frequently used for high-purity products such as vitamins and biologicals.

Pfaudler Glass-Lined Vacuum Evaporators are available for either batch or continuous operation. Evaporators equipped with vertical short tube heat exchangers are rated for capacities ranging from 4,000 to 18,000 pounds (or more) per hour. Coil or jacketed evaporators are also available and all types are built to withstand full vacuum.

We suggest that you submit your evaporation problems to our engineering staff. Their specialized experience is yours for the asking.

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INTERPRETING WASHINGTON

EDITOR'S NOTE: *Copies of the orders, rules and regulations covered in this installment may be obtained by writing to the appropriate federal agency, citing the order number or release date.*

COAL TAR

Conservation Order M-297, effective May 1, 1943, provides for the recovery of phenols, cresols, xylenols and any homologues of these from coal tar. Coal tars containing one-half to five percent of low-boiling acids may not be used or delivered except for distillation unless authorized by the WPB. All tar oil produced or received prior to May 1 must be processed to a point where the low-boiling acid content is less than one percent. Application on Form PD-602 may be made to the WPB for permission to use or deliver these oils for other purposes.

CALCIUM

Order M-303 places metallic calcium under allocation. Form PD-600 must be used to obtain calcium metals which contain less than 15 percent of other metals.

COBALT

Order M-39, as amended on March 9, places cobalt on a straight allocation basis, deliveries being permitted only on specific authorization of the Director General for Operations. Persons desiring an allocation must file Forms PD-581 and 582 with the WPB not later than the 20th day of the month next preceding the month in which delivery is scheduled. However, deliveries of 25 lb. of contained cobalt to any one person in any one month, or deliveries of any amount to subsidiaries of the Reconstruction Finance Corporation may be made without specific authorization.

Prior to this amendment the use of cobalt was prohibited except for eleven purposes which were listed in the Order. These prohibitions eliminated the use of the metal for many necessary products, including certain items required by the Army and Navy.

RECOVERED MOLYBDENUM

An official interpretation of the molybdenum order M-110 was issued on March 11, covering explanation of what is meant by commercially recoverable molybdenum. In general, the only chemical compounds from which molybdenum is considered to be commercially recoverable for the purposes of administering order M-110, are primary chemical compounds, such as those which are required to be reported on Form PD-359, prescribed pursuant to the Order, viz., calcium molybdate, molybdenum oxide, molybdenum oxide briquettes, molybdenum trioxide, molybdenum sulphide, molybdenum silicide, ammonium molybdate and sodium molybdate. On the other hand, molybdenum is not considered to be commercially recoverable from secondary chemical products resulting from the further processing of one or more of the primary forms of molybdenum bearing chemical compounds such as, for example, ink and manufactured colors.

All persons engaged in transactions in these types of primary molybdenum chemicals are required to comply with the provisions of General Preference Order M-110, and entitled to the applicable exemption set forth in Supplementary Order M-110-a.

BISMUTH CHEMICALS

General Preference Order M-295 was issued on March 11, establishing allocation control over Bismuth chemicals. This step was necessary because of the increasing demand for their use in medicines and for controlling blue mold in growing tobacco.

QUEBRACHO

Conservation Order M-277 was amended on March 15, to permit the use of quebracho or urunday extract (vegetable tanning materials) by the petroleum industry for drilling wells. Previous to this amendment, the petroleum industry had been granted appeals from the restrictions of the Order.

FIBROUS GLASS

General Conservation Order M-282, issued March 24 and effective April 1, places fibrous glass textiles under allocation. It is expected that fibrous glass used alone, or in combination with other materials, will be used in larger quantities to meet the needs of the armed forces.

ANTIMONY

General Preference Order M-112 was amended on March 8 to remove the limitation on the use of antimony in the production of alloys and automotive batteries, and to increase the weight limit for small deliveries of antimony to any one person. Restrictions previously applied to the antimony content of inorganic pigments, toys, decorative objects and ornaments remain unchanged. A provision of the previous Order that prohibited the use of antimony in any form for the manufacture of white pigment opacifiers, or frits for non-acid-resisting ceramic enamels has been eliminated. The purpose of this change is to permit the substitution of antimony in place of other more critical materials now being consumed for these uses.

Unallocated deliveries to individual customers may not exceed a total of 2,240 lb., or one long ton, in each monthly period. Relaxation of the restrictions on antimony is due to the fact that other conservation measures have curtailed the production of antimony consuming products.

FERROCOLUMBIUM

Issuance of General Conservation Order M-296 by WPB on March 25 placed Ferrocolumbium under allocation along with the other critical materials which have been completely allocated by WPB.

COKE

General Preference Order M-292 issued on March 12, provides for the allocation of coke made from bituminous coal if and when such allocation should be necessary. The order makes mandatory the previously voluntary practice of filing monthly production, distribution and inventory reports with the Bureau of Mines on Form BE or BY. It is estimated that due to the limited coke plant capacity, the supply will be slightly below requirements for both 1943 and 1944.

ZINC DUST

Continuance of zinc dust allocations after March 31 under provisions of General Preference Order M-11-1 was authorized by WPB with issuance of an amendment on March 23, extending the life of the Order.

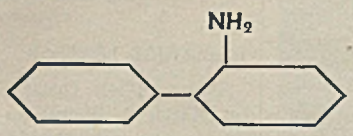
ZINC OXIDE

Amendment to General Preference Order M-11-a, issued March 20, relieves consumers of zinc oxide of the necessity of furnishing written statements to suppliers certifying that receipt of any further shipment by the consumer will not increase his inventory of zinc oxide in excess of the necessary minimum working supply. However, the amended Order does not remove basic limitations upon the permissible size of a consumer's inventory.

PAPER AND PAPERBOARD

General Conservation Order M-241 was amended on March 12 to include List B items in those products, 2 percent of which must be reserved each quarter for disposition by the Director General for Operations.

New Product Report



O-AMINODIPHENYL
(TECHNICAL)

A useful, low-priced intermediate

INTERESTING CHARACTERISTICS:

To many manufacturers, O-Aminodiphenyl, technical, offers possible relief from a shortage of aniline oil. It may also be used in resin compositions, in the manufacture of quinoline yellow type dyestuffs and as a plasticizer.

AVAILABILITY:

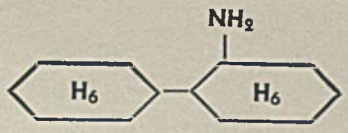
Now in commercial production and plentiful quantities are available at low prices.

SUGGESTED USES:

1. In resin compositions. **2.** In dyestuff synthesis to produce dyestuffs of quinoline yellow series characterized by their fastness and a shade of yellow having a green tone. (U. S. Patent 2,211,662, assigned to Monsanto.) **3.** As a plasticizer. **4.** As a replacement for aniline.

PHYSICAL PROPERTIES:

Appearance: purplish crystalline mass.
Molecular Weight: 169.1
Crystallizing point: 47.0°C. min.
Distillation range: 295.0°C. min. to 310.0°C. max.
Solubility: Only slightly soluble in water. Soluble in alcohols, esters, ketones, benzene, chlorinated aliphatic and aromatic solvents, pine oil, turpentine, vegetable oils, and to a limited extent in mineral spirits.



O-AMINODICYCLOHEXYL

A strong, primary amine

INTERESTING CHARACTERISTICS:

O-Aminodicyclohexyl promises to be of particular value in reactions where an essentially water-insoluble, strong, primary amine is required.

AVAILABILITY:

Now available only in experimental quantities.

SUGGESTED USES:

1. As an intermediate in chemical synthesis. **2.** In reactions where an essentially water-insoluble, strong, primary amine is required.

PHYSICAL PROPERTIES:

Molecular Weight: 181.19
Appearance: colorless liquid.
Specific gravity: 0.936 at 25°/25°C.
Refractive index: 1.493 at 25°C.
Boiling point: 262.5°C.
Solubility: Only slightly soluble in water. Miscible with alcohols, esters, ketones, benzene, chlorinated aliphatic and aromatic solvents, pine oil, turpentine, vegetable oils, and mineral spirits.

"E" FOR EXCELLENCE—The Army-Navy "E" burgee with two stars, "representing recognition by the Army and the Navy of especially meritorious production of war materials" over a two-year period flies over Monsanto.

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SERVING INDUSTRY...WHICH SERVES MANKIND

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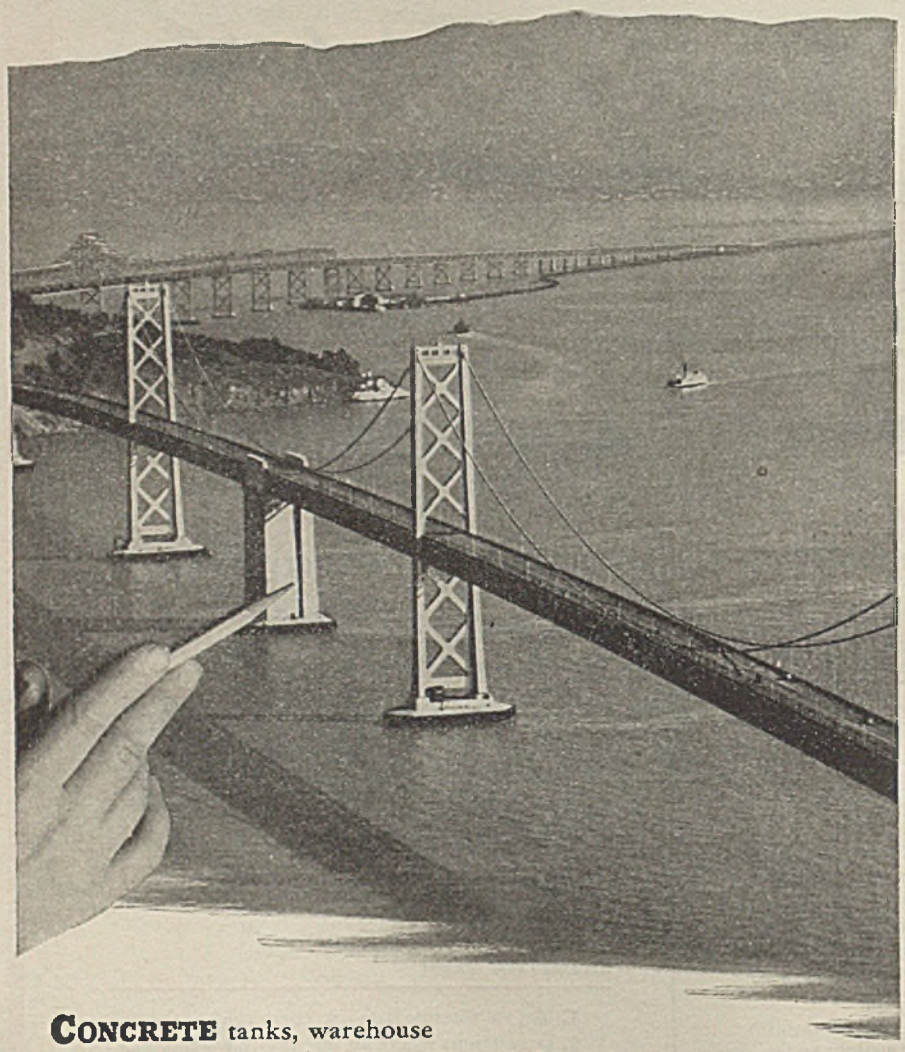
Please send me experimental quantities of
☐ O-Aminodiphenyl ☐ O-Aminodicyclohexyl

Name _____

Firm _____

Address _____ *City* _____

CONCRETE SAVERS—PQ SILICATES



CONCRETE tanks, warehouse floors, runways and concrete structures are "expendable".

Increase their span of life with a surface coat of PQ Silicate of Soda. In addition, the silicate treatment is a time-saver because it is easy to apply either by brush or spray.

Applied in proper consistency to the surface, PQ Silicate reacts chemically to form insoluble films in the concrete. Thus, the structure is protected and made to last longer. Let us know the area to be treated and for what service. We'll suggest the correct quantity of PQ Silicate needed.

Acidproofing: Silicate renders concrete resistant to attack not only by acids, but by other deteriorating solutions, such as sugar and salt.

Waterproofing: Treatment of concrete walls, tanks, building blocks, reservoirs, stops up the pores, making the concrete less permeable.

Oilproofing: Protects against disintegration by oil penetration of storage tanks, floors, runways.

Wearproofing: Stop wear of the surface and dusting by the PQ Silicate Treatment.

PHILADELPHIA QUARTZ CO.

Established 1831 . . . General Offices and Laboratory: 125 S. Third Street, Philadelphia, Pa. Chicago Sales Office: Engineering Bldg. Sold in Canada by National Silicates Ltd., Toronto, Ont.

THERMOPLASTICS

General Preference Order M-154 was amended on March 2 revising the list of civilian products for which thermoplastics may no longer be used.

An exemption is provided which permits the use of thermoplastics in restricted articles if on hand prior to the date of restriction contained in the Order. Exemption is also granted on specified uses for the Army, Navy, Coast Guard, Maritime Commission or the War Shipping Administration.

HORSEHIDE LEATHER

Conservation Order M-141, amended on March 2, liberalizes the restrictions on the use of horsehide front leather, so that tanners and converters may now process horsehide of military quality into leather suitable for products meeting any military specifications. Previously all such leather was processed for use in military riding gloves. Leather made from horsehide fronts of non-military quality is confined to use in the manufacture of work gloves, garments for heavy-duty workers, footwear, trusses, physical supports, artificial limbs, orthopedic products, and sporting goods.

HARNESS LEATHER

Conservation Order M-273-a, which temporarily prohibited deliveries of harness leather in the hands of tanners and dealers, except for use in making harness for farm and draft animals, was revoked on March 24 by WPB.

LABORATORY EQUIPMENT

Deliveries of laboratory equipment to be used in college training programs of the armed services have been further restricted by issuance of an amendment to Limitation Order L-144. Application for laboratory equipment for the college military training program must be made on Form PD-620 irrespective of the value of the item desired. Previously, only those items costing more than $50 required specific approval for purchase.

RUBBER PROCESSING EQUIPMENT

Order L-143-a, issued March 27, places under the control of the Office of the Rubber Director all right to acquire, manufacture, deliver, recondition and rebuild rubber processing machines and equipment.

PLASTICS MACHINERY

Allocation Order L-159 was amended on March 2 by WPB placing fixtures for plastic molding machinery under allocation control.

UTILITY CONNECTIONS

Supplemental Utilities Order U-1-b gives advance approval of limited utility connections for construction or remodeling projects permitted under L-41. To qualify for such automatic approval, ma-

terial for an electric gas, or water connection must cost less than $1500 in case of underground connections, or $500 in the case of other constructions. In addition, in the case of an industrial or commercial consumer, not more than 60 lb. of copper may be used in an electric connection, or 250 lb. of iron and steel for gas or water service. Previously such connections were granted upon individual application to the WPB.

STEEL PLATE

Standard specifications for carbon steel plate, reducing the number which may be produced from several hundred to approximately 25, were established by the WPB in Schedule 8 of Limitation Order L-211 issued on March 22. Carbon steel plates which were produced or fabricated prior to March 22, or plates so processed prior to March 22 that conformance to the specifications would be impracticable are exempted from the above restrictions.

FATTY OILS

Petroleum Administrative Order No. 10, issued Mar. 27, prohibits the use of fatty oils in excess of fifty percent by weight of the combined fatty acids and oils consumed in the production of lubricating greases. Sales to the Army, Navy, Lend-Lease, etc., are exempted from the Order, also greases in which one-half or more of the soap base is a sodium, barium or lithium soap.

FOOD DISTRIBUTION ORDERS

Food Distribution Orders 31 to 39, inclusive, released March 22, transfer authority over the principal fats and oils from WPB to the Department of Agriculture.

FDO No. 31 supersedes WPB order M-238, and places Cacahuanache oil and Laceta oil under same allocation control as Oiticica nut oil.

FDO No. 32 covers castor oil.

FDO No. 33 replaces WPB order M-193, becomes effective March 24, and reduces the permitted glycerine content of soaps to 4/5 of 1 percent.

FDO No. 34 supersedes WPB order M-58 and covers the allocation of glycerine.

FDO No. 35 replaces WPB order M-77 and tightens the control over rapeseed oil and mustard seed oil.

FDO No. 36 supersedes WPB order M-66 which governed the use and the delivery of cashew nut shell liquid and inedible industrial oil used in war production.

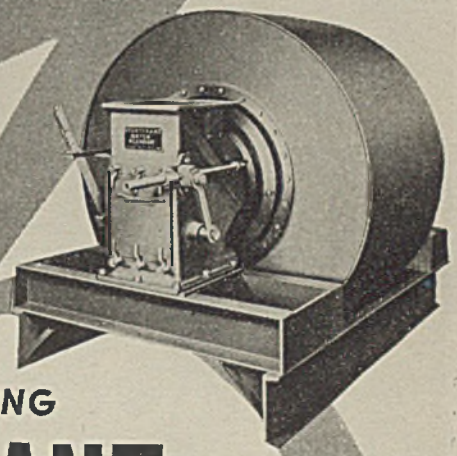
FDO No. 37 controls the use, processing and delivery of sperm oil.

FDO No. 38, effective Mar. 24, replaces WPB order M-59, and controls the use of palm oil.

FDO No. 39, effective March 24, places tung oil under closer control and makes it necessary to obtain specific authorization to deliver or accept delivery of tung oil.

The movement of peanut, soybean, cottonseed and corn oil into commercial

HERE IS DUST-LESS!



TRIPLE ACTION

NON-SEPARATING

STURTEVANT

DRY BLENDING

No matter what the weights, densities, fineness or consistencies: When you want to blend light substances, you don't want them to float, and remain unblended. They *can't* do that in the Sturtevant Dustless Dry Blender—*because of the exclusive 3-way action.* (1) Revolving buckets carry entering material up and into the incoming feed. (2) The *revolving* action still further blends materials. (3) Materials are forced from *both sides* to the *middle* of the drum—every step is a *blending* action; no separation possible! This equipment scientifically blends materials (a) to a definite chemical analysis, (b) various *sizes* together and (c) *colors* to precise exactness. Leak-proof. No *internal* moving parts to break down original composition of materials. Absolutely no loss of dust. An opening for both intake and discharge. Drum capacities: 1000 and 2000 lbs., with 3,000, 5000 and 7500 lbs. available in modified design. Also Dry Batch Mixers. SEND FOR BULLETIN 080 B.

RECEIVING

DISCHARGING THROUGH SAME OPENING

STURTEVANT WHIRLWIND CENTRIFUGAL AIR SEPARATOR

Remove fine dust particles from milled materials or in original form. Increase mill capacity 25 to 300%. Lower power consumption by 10 to 50%. 40 to 400 mesh range covered with unlimited capacities. We'll be glad to help you with your problem—write today. SEND FOR BULLETIN 087.

★ BUY WAR BONDS

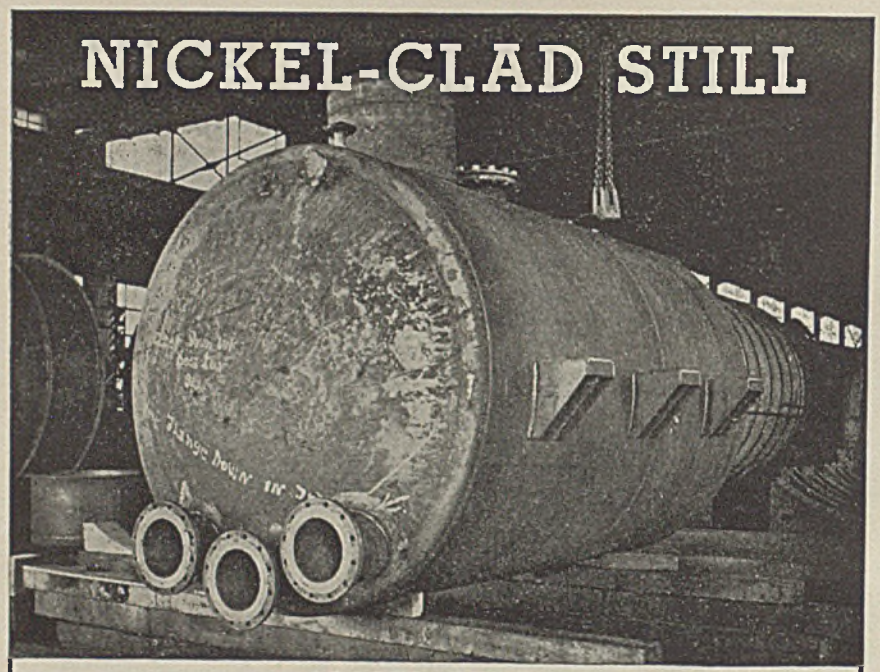
Sturtevant MILL COMPANY

HARRISON SQUARE BOSTON, MASS.

CRUSHERS • GRINDERS • SEPARATORS • CONVEYORS

MECHANICAL DENS and EXCAVATORS • ELEVATORS • MIXERS

NICKEL-CLAD STILL



LEADER BUILDS
TANKS — KETTLES — FRACTIONATING COLUMNS
HEAT EXCHANGERS and SPECIAL EQUIPMENT
OF
STEEL — STAINLESS STEEL — NICKEL — MONEL
INCONEL — COPPER — EVERDUR — HERCULOY
HASTELLOY — ALUMINUM and CLAD STEELS

LEADER IRON WORKS, INC.
2200 N. JASPER DECATUR, ILLINOIS

SPRACO Center-jet NOZZLES

deliver a solid full cone spray of uniform distribution over the area covered. They are particularly suited to processes involving quenching, cooling, washing, and spraying. We can furnish these nozzles in brass, bronze, stainless steel, or any other machinable metal specified, in a wide range of sizes and capacities.

Other types which we manufacture include nozzles to produce hollow cone sprays and flat fan-shaped sprays, together with two fluid nozzles for mixing two fluids, or a fluid and a gas. For complete descriptions and performance data write for NOZZLE CATALOG.

SPRAY ENGINEERING CO.
115 CENTRAL ST. SOMERVILLE, MASS.

channels will be controlled on monthly allocation basis, effective April 16, as directed under FDO No. 29.

OPA RULINGS

MPR-108 was revised on March 10 to include control over ammonium nitrate, ammonium phosphate, castor pomace, calcium cyanamide, fish oil, fish meal, nitrate of soda-potash, sulphate of ammonia and urea compounds, when marketed or sold as an aid to the growth of crops or plants. Manufacturers and dealers are permitted to establish maximum prices to consumers by adding a specified dollars and cents margin above their cost of the material. The Western States, exempted from the original regulations, are now covered. In accord with the established practice of the industry and in recognition of the high cost of distribution, fertilizer manufacturers in the West are allowed margins higher than those in the East. As permitted in the old regulation, fertilizer manufacturers and dealers may pass along actual transportation costs incurred by them, including the recently imposed federal transportation tax of three percent thereon. A fixed maximum price to consumers is assured by the fact that the manufacturer's or dealer's margin is applied to the maximum price which may be charged him. The manufacturer's margin may be increased only if he is able to purchase his raw material at less than their maximum price.

Amendment No. 12 to MPR-112, effective March 24, establishes a maximum price of $1.80 per ton for anthracite in sizes smaller than buckwheat No. 3 when used in manufacture of calcium carbide, graphite or activated carbon.

Revised MPR-135 issued March 22 modifies the maximum prices to dealers and consumers of mixed fertilizer, superphosphate and potash in certain localities and under particular conditions. Under the new amendment, a dealer must observe the manufacturer's price to consumers only when the manufacturer's price schedule specifically suggests that such a price be charged by dealers, or, if the schedule recommends dealer's margins, these must be observed. Otherwise a dealer may add to his cost for fertilizer, a margin no greater than that provided in Appendix C of the regulation. The amended appendix now allows dealers a maximum margin of ten percent above cost in Mississippi and Louisiana east of the Mississippi River. The new amendment clarifies the method to be used by fertilizer manufacturers in establishing maximum prices for any new grades of fertilizer approved by the Secretary of Agriculture, subsequent to Dec. 31, 1942, and clearly defines the method of price adjustment required when any change is made in the fertilizer by reduction of its organic nitrogen content. Florida manufacturers are permitted to use that one of their schedules which was first issued between July 1 and November 30, 1941. Specific provision also is made for the establishment of maximum prices for specialty fertilizers as distinguished from ordinary agricultural fertilizers.

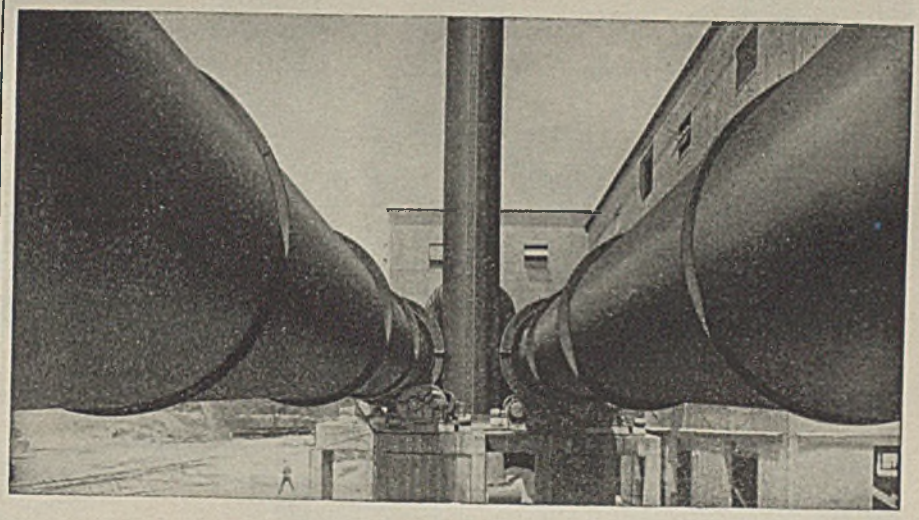
Amendment No. 3 to MPR-192, effective March 24, establishes a maximum producer's price of 72.8 cents per gal. for imported grade A cresylic acid.

Amendment No. 1 to MPR-205 was issued on March 15. Transportation charges have been reduced in cases in which the producer warehouses his sulphate of ammonia, since the customer will only be required to pay transportation charges from the nearest inland oven to the point of ultimate destination. The consumer is relieved of paying transportation charges from the point of production to the point of warehousing. The amendment also permits producers, importers, or primary jobbers who ship sulphate of ammonia from the producers plant (or, in the case of an importer, from the point of discharge to a warehouse situated at a point other than the place of production or discharge), store the sulphate of ammonia in a warehouse, and then reship it in bags to add a charge of 50 cents per ton in addition to the charge of $1 plus the cost of the bags, already permitted by the regulation when the commodity is sold in bags. This provision will be of particular help to those producers who ship sulphate of ammonia to Memphis for reshipment to the Delta areas of Mississippi and Arkansas. Sales of sulphate of ammonia for shipment to destination points in most of the Far Western States are left subject to the General Maximum Price Regulation. The new amendment does not apply to sales of sulphate of ammonia for industrial use. Sellers are expressly authorized to charge their customers the three percent additional transportation tax levied by the Revenue Act of 1942 on all transportation charges paid by the buyer.

MPR-354, issued Mar. 29, provides new ceiling prices for copper sulphate calculated on a base price of $5.00 per hundredweight for 99 percent crystals. To prevent undue hardship to resellers who purchased stocks at higher prices, the new regulation is not to affect sales by them until 30 days after it became effective for manufacturers on April 3. Excluded from the regulation are sales at retail for use as an agricultural insecticide or fungicide. Sales of less than 100 lb. to agriculture are covered by MPR-144.

Revised Price Schedule 53 (Amendment No. 25), fixes dollars and cents maximum prices for certain raw and acidulated soap stock at West Coast points at the same levels and ceilings set previously for these products when sold in the Midwest. The new ceilings specified include cottonseed foots, soybean foots, soybean oil and acidulated cottonseed foots. Certain ceiling price increases were granted in the new amendment for some distilled fatty acids, because maximums originally set were out of line with other competing products. A clause also has been inserted in the new amendment concerning distilled fatty acids, providing that the usual or normal differentials for grade shall continue to apply. This will take care of differentials for any grades which are not specifically listed.

Adjudged BEST
in many industries!



TRAYLOR
kilns — coolers — dryers

★ In Paper Mills—Paint Factories—Sea Water and Brine Chemical Plants—Explosive Plants—Mining Plants—Cement Plants—Lime Manufacturing Plants—Metal Reduction Plants—in many miscellaneous process industries, among "the greatest," you'll find Traylor Rotary Kilns, Coolers and Dryers used, and highly esteemed.

Any unit of mechanical equipment is preferred when it returns full and overflowing value for its cost. In Traylor Rotary Kilns, Coolers and Dryers, this return means maximum production at minimum cost for operation and maintenance, both amply justifying the initial capital outlay.

There's more to Traylor Rotary Kilns, Coolers and Dryers than mere tons of the finest metal. Besides expert craftsmanship, there's an intangible ingredient without which these Traylor units would be just like ordinary ones, except, perhaps better fabricated. That ingredient is *the accumulated knowledge and experience of Traylor engineers, who are intimately acquainted with the work to be done, and the problems to be encountered.* This ingredient is built into every Traylor unit.

TRAYLOR
ENGINEERING & MANUFACTURING CO.
MAIN OFFICE AND WORKS — ALLENTOWN, PENNA., U.S.A.

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B. C. EQUIPMENT CO., LTD. 551 Howe St., Vancouver, B. C.
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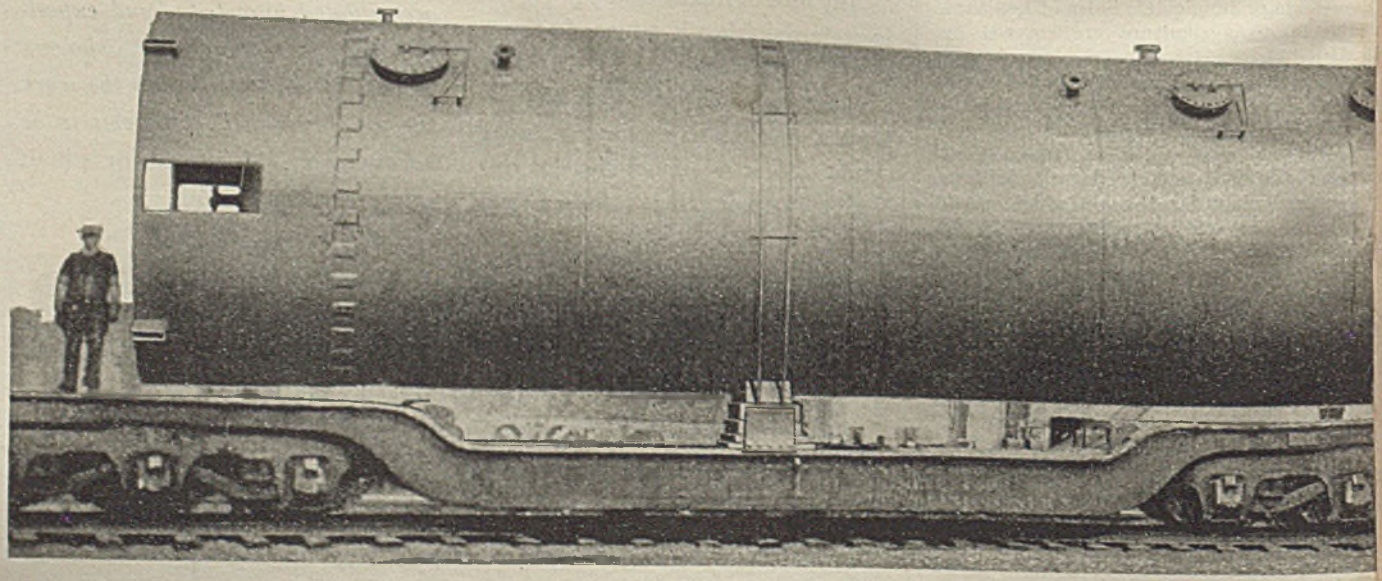
No Job TOO BIG for B&W

advanced methods in the MANUFACTURE of MODERN

PROCESS EQUIPMENT

The constant demands made upon Babcock & Wilcox for high-temperature, high-pressure vessels of new design, and for new uses, has tested the ingenuity and skill of our engineering staff. But we have met each new assignment with confidence in our ability to deliver. No technical problem has been too great; no manufacturing task too difficult for our production facilities. B&W high-temperature, high-pressure process equipment is recognized for its quality, durability and efficiency.



This horizontal Autoclave is a good example of B&W fusion welding. It is 4 ft. 9 in. in diameter, 9 ft. long, with walls 1 7/16 in. thick. All welds are subjected to the B&W X-ray inspection and stress-relieving treatment.

One of the unusual jobs produced by B&W fusion welding. This bubble tower and gas-oil accumulator is 12 ft. in diameter, and 93 ft. long; made of 1¼ in. steel plate to withstand a pressure of 150 lb. per sq. in., at a maximum temperature of 700 degrees F. The completed job weighed more than 325,000 pounds.

NEW PRODUCTS AND MATERIALS

PLASTICS FROM SAWDUST

The foundations for a future wood-using industry in Texas were laid at Lufkin recently when the forest products laboratory operated by the Texas Forest Service turned out its first all-wood plastics which were also the first wood plastics to be made in that state, according to a recent issue of the *Chemurgic Digest*. Small disks, dark brown in color, 2 inches in diameter were pressed out under a pressure of 4,000 lb. per sq.in. from pine sawdust previously ground to the consistency of flour. The plastic disks were hard and shiny. Testing for strength, flexibility and durability will be carried on as soon as a quantity of the various types of plastic is fabricated.

CATALYST FOR HIGH-OCTANE GASOLINE

Development of a new catalyst that may step up the quality of high-octane gasoline to the point where it would give 23 to 35 percent more power to supercharged aircraft engines or mean a 13 to 3 percent increase in the yield of aviation gasoline base stock from given crudes was announced recently by Socony-Vacuum Oil Co., Inc., New York. The new agent, a synthetic product, is known as a "bead catalyst" because it is in the form of small spherical particles resembling glass beads. It is translucent and although extremely hard and resistant to wear, is very porous. The function of the bead catalyst is to break down the molecules of crude oil and permit a greater yield of high-octane fuels.

WATER REPELLENTS

Treating clothes with a chemical making the garments shed water and resist stain soon may be a common operation for dry cleaners and laundries, the Fine Chemicals Division of E. I. du Pont de Nemours & Co., Wilmington, Del., recently announced. Two improved water repellents, one for use with dry cleaning fluids and the other with wet washes make readily available for civilian garments a protection which already is extensively employed in care of clothes for the armed forces. Clothes may be made water and stain resistant by dipping them in a solution after washing or dry cleaning. The chemical treatment of the fabric cannot be seen or felt, has no odor and does not impair the appearance or draping qualities of the garment. A fabric made water repellent by these chemicals does not prevent normal evaporation from the human body as does the waterproofed fabric such as the rubberized raincoat. Treated garments usually clean more easily, saving time and preserving materials. Maintenance of the original properties of the fiber, conservation of clothes and added health protection for those who must be outdoors in bad weather are among the advantages claimed for repellents. Aridex L water repellent is the emulsion type which is diluted with water and applied in a laundry wheel after wet cleaning or washing. Aridex DCS is the solvent type which is diluted with the cleaning solvent and applied either in a standing bath or washer after dry cleaning. Both these and others in the Aridex line which textile mills have used for several years to treat fabrics are manufactured by the du Pont company and are now available in quantity.

WATER-REPELLENT

An invisible "raincoat" which can be formed on cloth, paper and many other materials by exposing them to chemical vapors from a new compound, thereby making them water-repellent has been developed in General Electric's Research Laboratory at Schenectady, N. Y., by Dr. Winton I. Patnode. One of the most important uses for Dri-Film so far is the treatment of ceramic insulators for radio equipment being made for the armed forces. It is about nine times more effective than the wax used at present as a water repellent and its results are permanent. Dri-Film is a clear liquid composed of various chemicals which vaporize at a temperature below 100 deg. C. Articles to be treated are exposed in a closed cabinet to the vapors for a few minutes. Then they are taken out and if necessary are exposed to ammonia vapor. This is to neutralize corrosive acids which may collect during treatment. An extremely thin film is formed on the surface. The film cannot be seen under a high powered microscope.

SYNTHETIC ELASTOMER

Among the new materials is Styraloy 22, a Dow Chemical Co., synthetic elastomer of the hydrocarbon type, especially designed to replace rubber in many applications which are vital to the war effort. Its excellent electrical and mechanical properties, low temperature flexibility, resistance to oxygen and ozone, and low cold flow at elevated temperatures make it eminently suitable for electrical applications where both low and high temperatures are encountered. While ignition cable and low frequency coaxial or other electric cable insulation is the most pertinent use for this material, its general characteristics suggest a wide variety of applications for extruded, injection molded, and compression molded products. Styraloy is predominantly hydrocarbon in nature but contains a small amount of added antioxidant. It has a tendency to self-vulcanize with consequent decrease in thermoplasticity and gain in solvent resistance when held at elevated temperatures for long periods. This fact naturally affects the manner in which it should be handled during fabrication. It is a free-flowing gray powder which is supplied in several types depending on the hardness desired. The following designations apply:

		Durometer Hardness (Room Temperature)	
Designation	Type	"A" Scale	"C" Scale
Styraloy 22	Regular	>100	70–80
Styraloy 22-A	Soft	85–95	50–60

Mechanical Properties of Compression Molded and Extruded Styraloy

Property	Styraloy 22	Styraloy 22-A
Tensile strength, lb./sq. in.	1,000–1,200	700–800
Elongation at break, %	200–250	175
Hardness, durometer A scale	>100	85–95
durometer C scale	70–80	50–60
Compression set by constant deflection method, 22hr. at 200° F., % deformation		96.2
Compression set by constant local method, 6 hr. at 158° F., % deformation		21.5

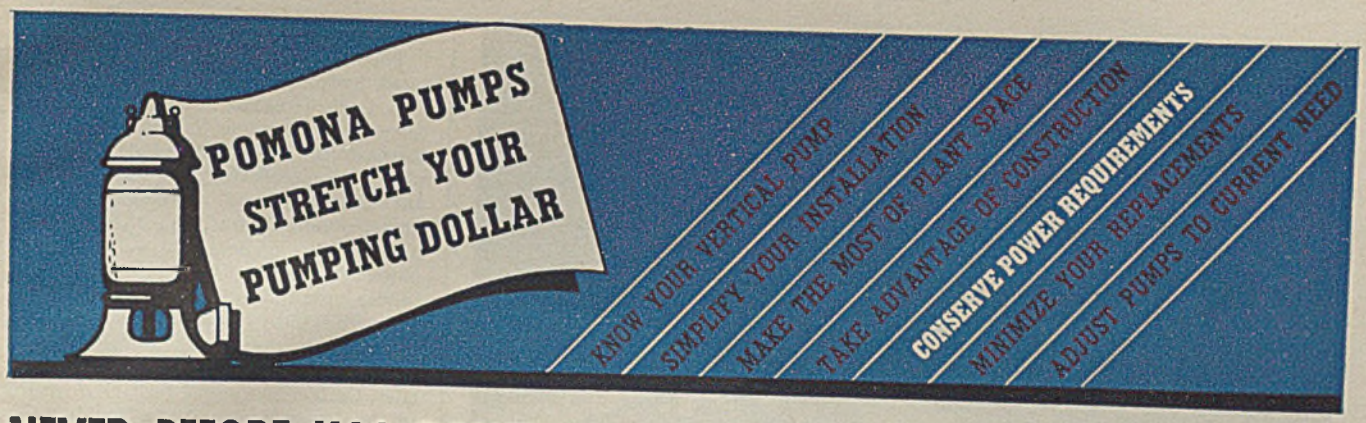
Injection Molded Properties of Styraloy 22

Tensile strength, lb./sq. in.	1,000
Elongation, %	16–20
Weld strength, lb./sq. in.	500
Impact strength, ft. lb. per in. of notch	1.2–1.8
Heat distortion, ASTM, °C	62–65
ASTM flow*	S4 (266° F.)

*Temperature required to produce one inch of flow in two minutes under 1,500 p.s.i. load.

SYNTHETIC PLASTIC

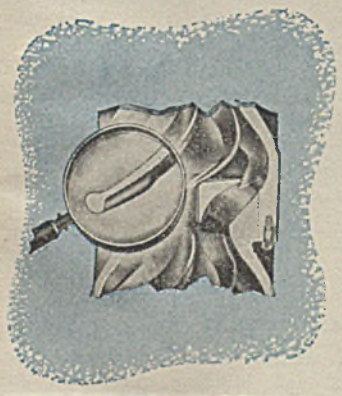
Airplane production will be increased by 50 percent it has been predicted as a result of the development of the new plastic Thermo-Cast. This material was developed in the chemical engineering laboratories of Columbia University according to the announcement of Prof. James M. Church. The tough characteristics of the plastic, such as high impact strength, hardness, low compressibility and durability make it rival steel in many respects, but with only one-fifth of its weight, he pointed out. It possesses the unique property which permits it to be melted and cast into shapes without the use of pressure somewhat the same as metal, but at much lower temperatures and with more exactness of mold dimensions. Resembling red sealing wax, the product is described as a thermoplastic material which is readily reduced to a molten state by heating to 200 deg. C. The melt can be easily poured into simple molds in the same manner that metal castings are made in order to transform the plastic into the desired shapes for the metal working operations. It has as its base ethyl cellulose and with its other ingredients, resins, pigments and plasticizers, it possesses extremely attractive properties suitable for the job for which it was designed.



NEVER BEFORE HAS POWER CONSERVATION BEEN SO IMPORTANT

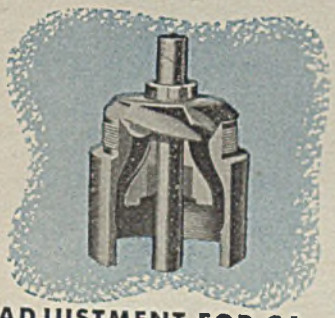
Never before have Pomona advantages been so vital!

Pomona Pumps are singularly able to cut power requirements to a minimum because they embody basic engineering advantages found in no other pumps . . .



BULBOUS VANED BOWLS! This outstanding Pomona Pump development has lifted the already high Pomona efficiencies to a new peak . . . *in some cases above 90%* . . . reducing power requirements to a record low. The bulbous end shape smooths out fluid flow, minimizing turbulence, eddy currents and resultant skin friction. Result — more power goes into actual water pumping!

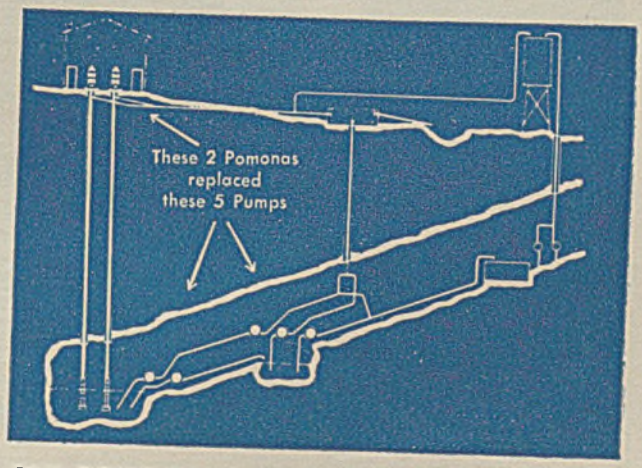
Bulbous vaned bowls are a recent Pomona advancement, and older Pomona Pumps can be re-bowled with this power-conserving feature. However, to save metals, get as much service as possible from your present bowl assemblies before having them changed for the new bulbous-vaned type!



ADJUSTMENT FOR CAPACITY! Here's another vital power-conserving feature that no other pump provides—ability to adjust the capacity to your exact needs *without wasteful throttling*. Unlike conventional pump impellers, Pomona's semi-open impellers can be raised or lowered on their seats to give the exact flow desired, *with proportionate savings in power*. And this adjustment can be quickly made *at the surface* with minimum effort. Raising the impeller gives more clearance between blades and seat—pumping less water and, at the same time, reducing the operating power required.

RESULT—power consumption is proportionate to amount of water pumped.

Contrast this with the valve-throttling necessary in other type pumps to adjust pump flow. Throttling increases the pressure the pump must work against—*increases* the power required in proportion to flow.

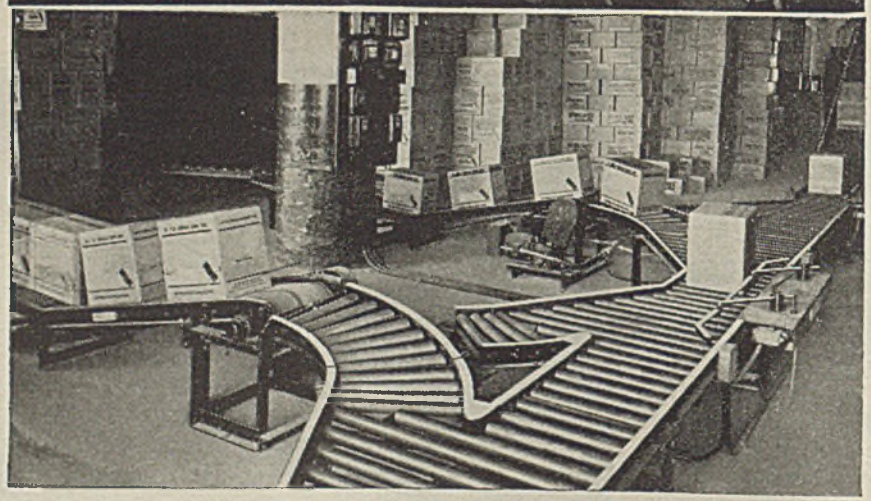


ONE POMONA CAN REPLACE SEVERAL PUMPS— Often a single Pomona Pump will do the job now requiring *several* other-type pumps . . . will do it *better*, with considerably *less* power. Typical is the Pomona installation diagrammed above where two Pomonas replaced FIVE horizontal pumps on a dewatering job. The Pomonas not only eliminated excessive piping and power cables, but did the job on 400 h.p., whereas the 5 pump arrangement had required 675 h.p.—*67% more!* Compare the power *costs*—$19,936 per year with the five-pump set-up . . . $10,750 per year—about HALF—with the Pomonas!

Call in your nearest Pomona representative and have him check over your pumping installation. Perhaps he can help you take fuller advantage of the *many* — and varied — savings incorporated in Pomona Pumps. You'll save power, save money, save maintenance . . . *and save resources vital to our war production!*

POMONA
Water-Lubricated
PUMPS

JOSHUA HENDY IRON WORKS
POMONA PUMP CO. DIVISION
120 BROADWAY, NEW YORK CITY
Plants: 4301 So. Spring Ave., St. Louis, Mo.
206 Commercial Street, Pomona, California



Save scrap to beat the Jap—to hurry Hitler to defeat. Save time and manpower with mechanized material handling. Put Standard Conveyors and Standard equipment to work . . . to convey . . . lower . . . lift . . . pile . . . or tier materials and merchandise in your plant.

If your products are considered necessary to the war effort, Standard Conveyors are available for your needs. Write for full information and a copy of Bulletin CM-4 "Conveyors by Standard"—a valuable handbook on conveying methods.

STANDARD CONVEYOR COMPANY

General Offices: NORTH ST. PAUL, MINN.

Sales and Service in
All Principal Cities

STANDARD

Gravity and Power
CONVEYORS

★ ENGINEERED FOR FASTER PRODUCTION ★

METAL CLEANING SOLVENT

The new volatile water-white, methylated hydrocarbon solvent developed by the Curran Corp., Malden, Mass., is known by the name Carbon Met. It is claimed to be non-flammable, non-explosive, non-corrosive, cheaper, less toxic. Its dissolving and cleaning action on gums, oxidized oils, burnishing compounds, etc., is described as quick and powerful, leaving no film that might induce rust on iron and steel products. Since it is also reported to be considerably faster than naphtha in cutting greasy, gummy and tarry dirt from textiles, Carbon Met seems to have a future in the dry-cleaning field for hand scouring and spotting. However, since much of the dry-cleaning plant machinery has been developed around the use of trichlorethylene, the substitution of a solvent with a different boiling range would be likely to throw operations out of step.

INSECTICIDE PAINT

Newest defense in man's war against insects is 2-Way Invisible Insecticide Screen Paint, a liquid formulated by Hanley & Kinsella Laboratories, St. Louis. If a screen door is treated with it, you are supposed to be able to open and close it as much as you want, because an undisclosed ingredient is said to kill flies, mosquitoes, gnats, moths, ants, etc., before they have a chance to hop off and fly in. If you treat your window screens with it, insects that may be indoors will be killed when they seek an open window. It takes practically no time to treat a screen with a special applicator furnished with each bottle.

GLASS AIDS WELDERS

Glass welders will be permitted to look through blinding glare and see welding operations from beginning to end by use of a newly developed glass according to a recent announcement of Dr. E. D. Tillyer, research director of American Optical Co., Southbridge, Mass. The improved vision speeds a welder's production and the glass protects his eyes by absorbing dangerous invisible rays generated during the welding operation, he said. Previously, flame-welding glare made it impossible for welders to see clearly the welding rod and molten area, a factor which slowed the welding of battle equipment. Dr. Tillyer disclosed that a rare metal, didymium, had been added to standard welding glass to obtain the new welder's window.

EMULSIFIERS

Diversion of petroleum sulphonates from cutting oils required for machining of planes, tanks and guns has been met by use of various soluble rosin derivatives developed by Hercules Powder Co., called Dresinates. This growing group of emulsifiers produced from pine wood has been found effective as extenders and in some cases as complete re-

placements for petroleum sulphonates. Extensive laboratory and industrial tests have enabled chemists to reduce the proportions of war-scarce emulsifiers in cutting oils. It has been found that blends of a Dresinate and petroleum sulphonate are more stable and more efficient especially in hard water than the oil-in-water emulsions obtained with straight petroleum sulphonate. The Dresinates are available without priorities. They are prepared and ready for use thereby eliminating special cooking procedures and tie-up of equipment costing time and labor.

INSECTICIDE BOMB

American soldiers, scattered as they are in every climate of the world, face an unseen foe every bit as deadly as the soldiers of the enemy. Men sleeping in tents in the hot countries must be protected against disease-carrying insects. Planes flying from one tropical region to another must likewise be rid of insects. Surprisingly enough, Westinghouse Electric & Mfg. Co., refrigerator engineers provided the answer by developing an "insecticide bomb" from a device they had used in peacetime to charge the compressors of household refrigerators. The bomb is a dispenser about the size of the average food can, made to withstand high internal pressure. Upon the turning of a screw, the insecticide can be released in ten seconds to kill every mosquito in an airplane, and the fumigation can take place even in flight, without in any way disturbing the passengers.

SYNTHETIC BRISTLE

Development work on a synthetic bristle for paint brushes, marketed under the trade name Neoceta, has progressed satisfactorily during the past year according to the annual report of the Pittsburgh Plate Glass Co. A pilot plant operated continuously and small shipments of brushes were made. The War Production Board has recently approved a moderate addition to manufacturing facilities.

SYNTHETIC RUBBER FROM VEGETABLE OILS

Domestic vegetable oils not considered suitable for edible purposes are the base for a new synthetic rubber that is now being produced commercially by Sherwin-Williams Co., at its plant in Chicago. The product is given the name KemPol. The tensile strength, elongation and abrasion resistance are not on a par with those of natural rubber although in many other properties it compares so favorably with natural rubber as to enable its use in many products such as treads, mats, pads, erasers, gaskets, braided hose, etc. Since no toxic raw materials are used in the manufacture of KemPol, it may be used for such other products as jar rings and various types of seals for food containers. It lends itself readily to emulsification and with certain limitations to solutions so that a number of successful

Simplify

R-S QUALITY PRODUCTS SINCE 1908

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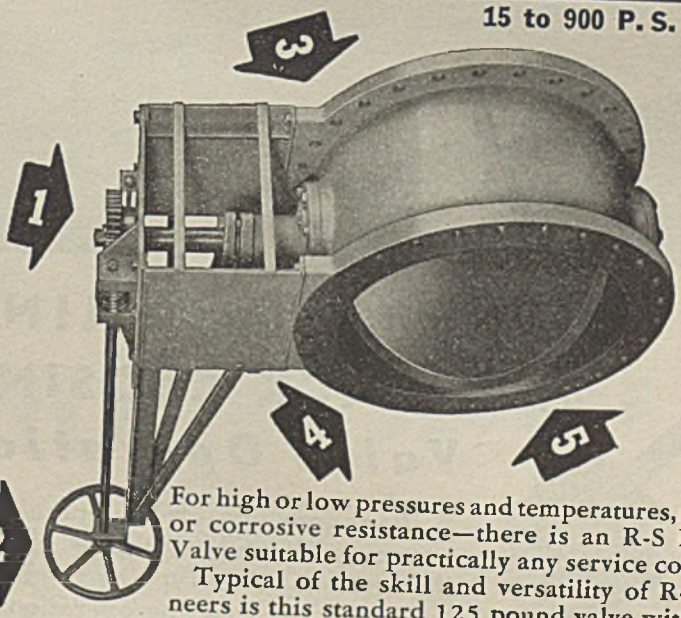
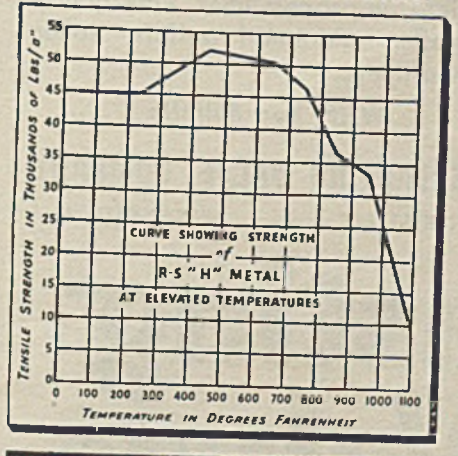
15 to 900 P. S. I.



For high or low pressures and temperatures, abrasive or corrosive resistance—there is an R-S Butterfly Valve suitable for practically any service condition. Typical of the skill and versatility of R-S Engineers is this standard 125 pound valve with extension shaft and hand wheel for inaccessible locations. Consider these outstanding features.

1. Oversize gear and worm.
2. Six hand wheel revolutions complete full vane movement.
3. Husky vane shaft mounted in grease-sealed stuffing box.
4. Body and vane can be cast of special R-S "A" or "Abrasive" metal for extra-long wear.
5. Beveled vane is precision machined—seats wedge-tight against valve body. Constructed to any A.S.M.E. dimensional standard. Sizes to 72-inches.

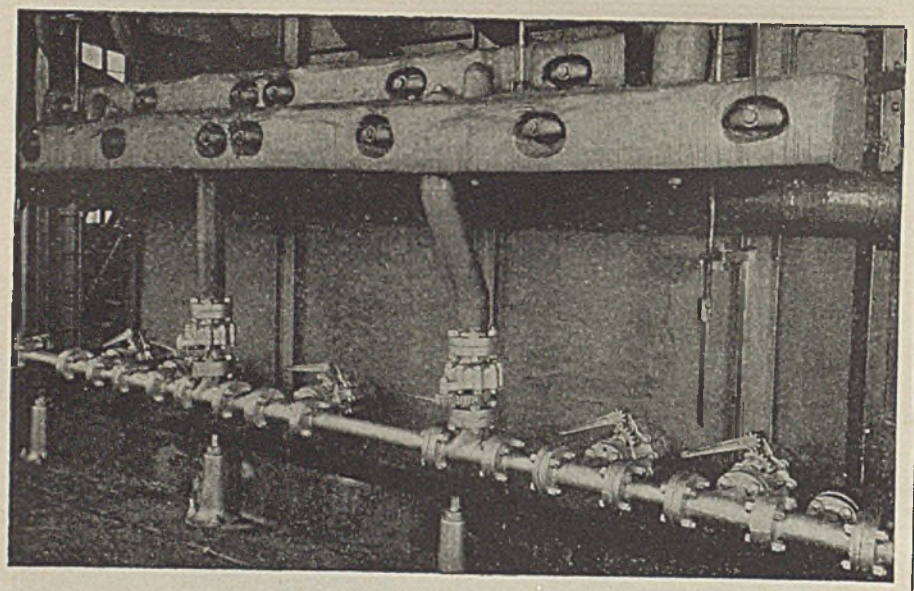
BUTTERFLY VALVE DIVISION
R-S PRODUCTS CORPORATION
4823 Germantown Ave. Philadelphia, Penna.



A SUBSTITUTE FOR STEEL!

R-S Engineers have developed special metals for resistance against heat, abrasion and corrosion. For example, R-S "H" Metal is an alloy semi-steel that machines like cast iron. Tensile up to 50,000 p.s.i. Withstands high pressures and penetration of steam and gases up to 1000°F. Stress relieved up to 1400°F. Request detailed information and Catalog No. 10-B.

R-S Streamlined BUTTERFLY VALVES



For QUICK OPENING and QUICK CLOSING Valve Operation

A 70-degree turn of the operating wrench completely opens or closes the Straight-Lever Type of Everlasting Valve . . . and the operation is easy, because the wrench gives ample leverage.

Add to this valuable time-saving feature the many other important advantages of the Everlasting Valve . . . its drop-tight seal, its self-grinding action at each motion, its provisions against damage to disc and seat, and its "everlasting" wearing qualities . . . and you have a valve that is literally unequalled for many services on process lines, emergency shut-offs, equipment outlets, boiler blow-off, etc.

TYPICAL SERVICES WHERE EVERLASTING VALVES EXCEL . . .

- Outlets of storage and measuring tanks
- Throttles of hammers and hoists
- Presses for plastics
- Washers for laundries, cleaners and dyers
- Spray lines to rolls
- Blow-offs of condensers, economizers, vulcanizers, purifiers, compressed air tanks
- Suitable for acids, alkalies, caustics, cellulose, coal tar, emulsions, syrups, and other liquids; also gases and vapors

Write for Bulletin

EVERLASTING VALVE COMPANY

49 FISK STREET JERSEY CITY, N. J.

Everlasting Valves

for everlasting protection

applications in the field of fabric coating, tapes, adhesives and sealing compounds have resulted. Also, it shows considerable promise as an extender for natural, reclaimed and the buna and butyl rubbers, with all of which it is readily compatible. Tensile strength 300 to 500 lb. per sq.in. Elongation, 100 to 150 percent. Shore hardness, 40 to 70. Elasticity, 50 to 25. After aging 72 hours at 170 deg. F. tensile strength increases about 100 percent; elongation decreases about 33 percent, hardness increases about 50 percent, elasticity decreases about 10 percent. Chemical and solvent resistance are as follows: Water, no effect; alcohol, no swelling, but impaired flexibility; aliphatic hydrocarbons, 50 percent swelling, tender; aromatic hydrocarbons, 200 percent swelling, very tender; dilute mineral acids, very slight swelling; concentrated mineral acids, poor resistance, especially with oxidizing acids; dilute and concentrated alkalis, very poor resistance.

CELLULOSE NITRATE PLASTIC

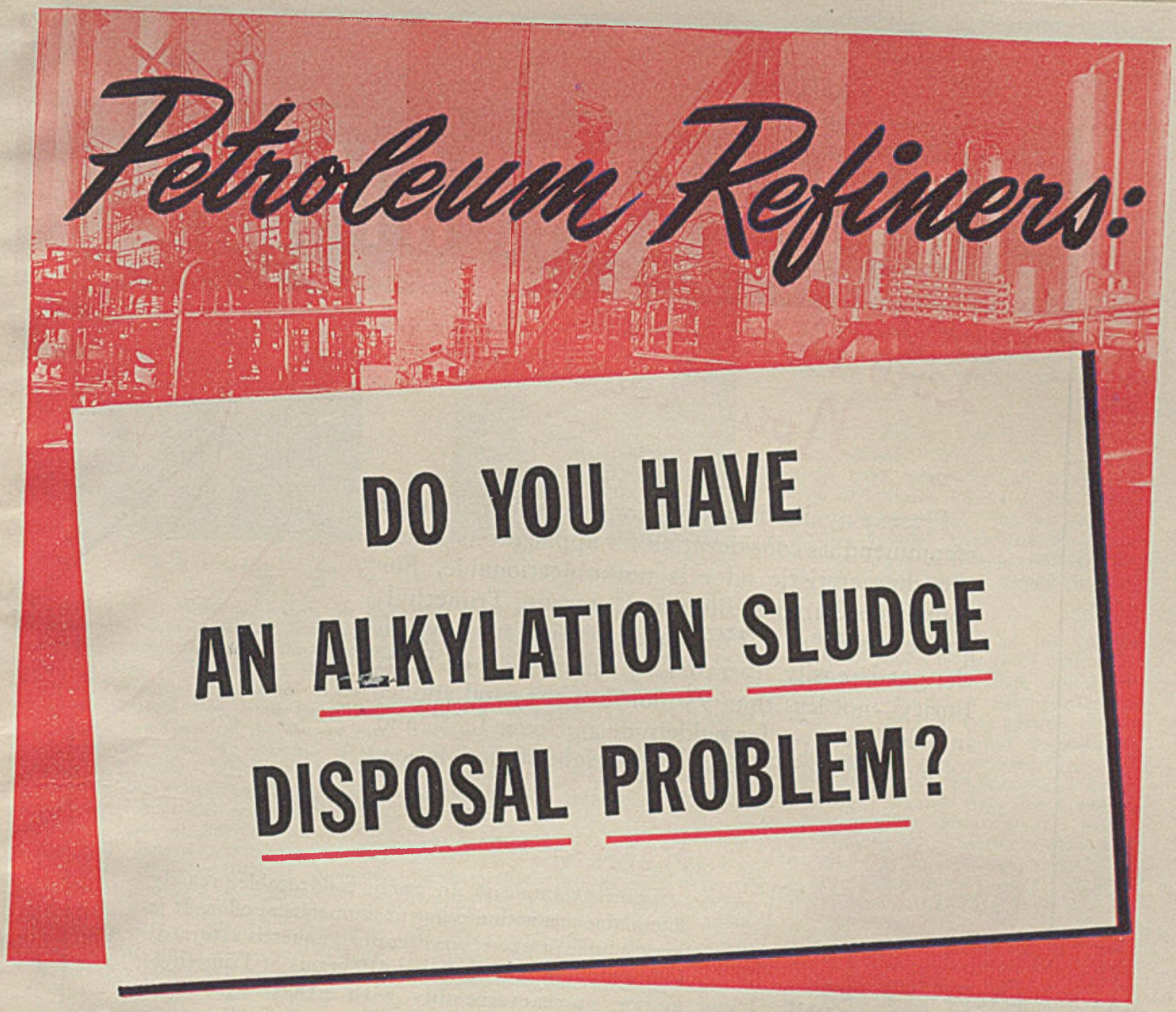
The amount of metal necessarily used in mechanical pencils has been reduced from 70 to 4 pounds per thousand pencils by redesign and substitution of a new cellulose nitrate plastic composition developed by the Plastics Department of E. I. du Pont de Nemours & Co., Wilmington, Del. Large quantities of hard rubber, as well as brass, steel, aluminum and other critical metals, are being replaced in all types of mechanical pencils and fountain pens by this special hard composition of Pyralin cellulose nitrate plastic.

Barrel sections, feeds, bushings, plungers, tips, clip screws and inner caps are being made from the plastic. Other applications are anticipated. These are in addition to the caps and barrels long made from regular Pyralin. Though the plastic parts are much lighter than the former metal parts, there has been no sacrifice in strength.

SYNTHETIC RESIN WINDOW SCREEN

An entirely new window screen, chemically made and containing no metal, will be available to householders after the war. It is made of nylon. Having all of the good characteristics of metal screening, it can be produced in any color, it will not stain the sills, it will not corrode, it requires no painting, and tests indicate it has extraordinary durability. Pencils or other sharp pointed objects can be shoved through it without damage; the strength and elasticity of the strands is so great that they come back into place merely by rubbing them with one's fingers.

In many cases the new screens will not even have to be put up in the spring and taken down in the fall. They will just be rolled up and down on tracks like a window shade. The idea of making screens out of nylon occurred to Du Pont chemists and engineers several years ago, at the time the first nylon toothbrushes were being turned out—even before hosiery was introduced.



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. . . General Chemical Company, one of America's largest producers of sulfuric acid, now offers its cooperation toward solving any alkylation sludge disposal problem you may have at your plants!

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TRIMETHYLAMINE

Low Priced ✓ Now Available ✓

Present availability and low cost of this amine recommend its consideration for applications where the characteristic odor is not objectionable. For convenience in handling and storage, Trimethylamine is sold as a 25% water solution from which the gas is easily liberated by application of heat. Purity—not less than 98 mol % of the total amines in solution . . . formaldehyde not over 0.3% and ammonia not over 0.2% of the weight of the solution.

$(CH_3)_3N$

Properties of pure TRIMETHYLAMINE

Molecular weight	59.11
Specific gravity	0.662 at −5°C
Boiling point	3.5°C (approx.)
Melting point	−124°C
Elec. conductivity	2.2×10^{-10} reciprocal ohms at −33.5°C
Solubility in water	Very soluble
Odor	Pungent, ammoniacal
Color	Colorless

PROPERTIES

Trimethylamine is an easily condensable, readily flammable gas with a pungent ammoniacal odor. It is very soluble in water, one liter of an aqueous saturated solution at 19° C containing 410 grams of Trimethylamine. It reacts readily with either organic or mineral acids.

APPLICATIONS

Technical and patent literature describe numerous uses for Trimethylamine. It is an effective warning agent in bottled gases. It is an insect attractant. Methyl chloride can be readily produced from Trimethylamine, and important derivatives are formed by reactions with halogens or ethylene chlorhydrin. Trimethylamine offers many additional possibilities in synthesis. A sample will gladly be sent on request.

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PERSONALITIES

R. R. Ridgway

Blackstone

C. R. DeLong

✦ RAYMOND R. RIDGWAY, associate director of research of the Norton Co. Chippewa, Ontario, will be the recipient of the Jacob F. Schoelkopf Medal for 1943. The medal is awarded annually by the Western New York Section of the American Chemical Society for distinguished research by chemists of the Niagara Frontier. Mr. Ridgway's outstanding accomplishment is the isolation and commercial production of the hardest material known next to the diamond. This material is known as boron carbide which today is employed extensively in place of the diamond in the drilling of dies for drawing wire, in nozzles used in sand blasting and in the manufacture of wear-resisting plug gages. The Medal will be presented at the May meeting of the Western New York Section, when Mr. Ridgway will give the medalist's address.

✦ NORMAN GAY, formerly with Standard Oil Co. of California's research and development department is now associated with Oronite Chemical Co., San Francisco. This is a subsidiary of the Standard Oil of California. He is in charge of the research and development department of the new company and also acts as technical advisor for the marketing department. The company will produce and market a wide variety of industrial chemicals.

✦ BENJAMIN W. ROBERTS has been appointed chief of the Tanning Materials Unit, Tannery Section, W.P.B. He is a partner of Moves and Gregg of Philadelphia, dealers in dyestuffs, chemicals and materials used by the tanning industry.

✦ EUGENE D. FILMORE has been appointed chief of the Tannery Supply Unit of the Tannery Section of W.P.B. He is superintendent of the Gloversville, N. Y., plant of the Richard Young Co., manufacturers of leather goods.

✦ C. R. DELONG has been elected president of The Chemists' Club, New York, N. Y. The new resident vice-president is N. C. Babcock and the newly elected non-resident vice-president, L. W. Bass. The other officers include: A. J. Weith, suburban vice-president, Robert T. Baldwin, Secretary, Ira Vandewater, treasurer. Mr. DeLong is and has been a consulting chemical engineer in New York since 1935.

✦ WALTER C. MENDENHALL retired on February 28 at the age of 72 from the directorship of the U. S. Geological Survey, after more than 48 years' service in that organization. Dr. Mendenhall is temporarily succeeded by one of his administrative assistants, Dr. Julian D. Sears, who will act as director until a permanent appointment can be arranged.

✦ DEAN A. POWERS has been appointed to the research staff of Battelle Memorial Institute, Columbus, Ohio, where he will assist in electrochemical and electrometallurgical research. He is a graduate of the University of Toledo.

✦ GUY C. PHINNEY has been appointed superintendent of the Devoe & Raynolds Co.'s Brush Plant now located in Princeton, Ind. Mr. Phinney has been associated for the past 26 years with T. S. Simms & Co. of Canada.

✦ WILLIAM W. LEWERS, who has been engaged in research and development work for the E. I. du Pont de Nemours & Co. for the past 17 years, has been appointed chief chemis[illegible] charge of research for the Griffin [illegible]nufacturing Co., Brooklyn, N. Y., man[illegible]acturers of shoe polishes, leather dressings and allied products.

✦ JOHN F. FOSTER, former research chemist for the General Electric Co., Pittsfield, Mass., has been appointed to the research staff of Battelle Memorial Institute, Columbus, Ohio. He will be connected with the divisoin of fuels research. He holds a Bachelor of Arts degree from Ohio Wesleyan University, a Master of Science degree from Syracuse University and a Doctor of Philosophy degree from Stanford University. At the present time he is engaged in research on the development of improved methods for the manufacture of gas from coal.

✦ C. J. PETERSON and C. LYNN PETERSON, formerly of Eimco Corp., Salt Lake City, have established an engineering firm of Peterson Filters & Engineering Co., Salt Lake City. The company will provide a broad service on mechanical filtration running from consulting, tests, specifications, custom design to field service.

✦ ROBERT E. CONWAY of the Chicago Office of Fritzsche Brothers until July, 1941 when he was drafted, recently returned from active participation in some of the heaviest fighting of the South Pacific. Sergeant Conway was with the 19th Bombardment Group, the most decorated outfit in the U. S. Army. He was decorated three times and in addition wears three stars for having participated in the battles of Java, New Guinea and Port Moresby. He is at present stationed in Texas training recruits for the Air Corps.

✦ W. CARLISLE BURTON of Richmond, Va., has been appointed assistant sales manager of Rumford Chemical Works, in charge of the Richmond district of his company, including Virginia, West Virginia, North Carolina, Kentucky and Tennessee.

✦ C. J. KRISTER, chemical engineer, who has been active in Cleveland as editor of *Isotopics*, has been transferred to Wilmington, Del., by his employer, the Grasselli Chemicals Department of E. I. du Pont de Nemours & Co.

✦ W. M. WILLIAMS, the newly appointed resident manager of the Paper Makers Chemical Department of Hercules Powder Co.'s plant at Stoneham, Mass., will also head the Industrial Chemical Division sales group of this department in Boston.

✦ HAROLD MOORE has been awarded the Institute of Metals Medal. He was president of the Institute of Metals from 1934 to 1936. Dr. Moore has had a long and distinguished metallurgical career and received the medal as one who has rendered outstanding service to non-ferrous metallurgy.

✦ HOY O. MCINTIRE has joined the research staff of Battelle Memorial Insti-

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When you pack your product in Bemis Waterproof Bags, it is well dressed in *two* ways. It has eye appeal to help *sell,* if you're still competing for business . . . to help keep your brand *alive* if you're oversold. And it is well-dressed in these bags because they are *extra strong* to stand the added strain of today's capacity loading of trucks and freight cars.

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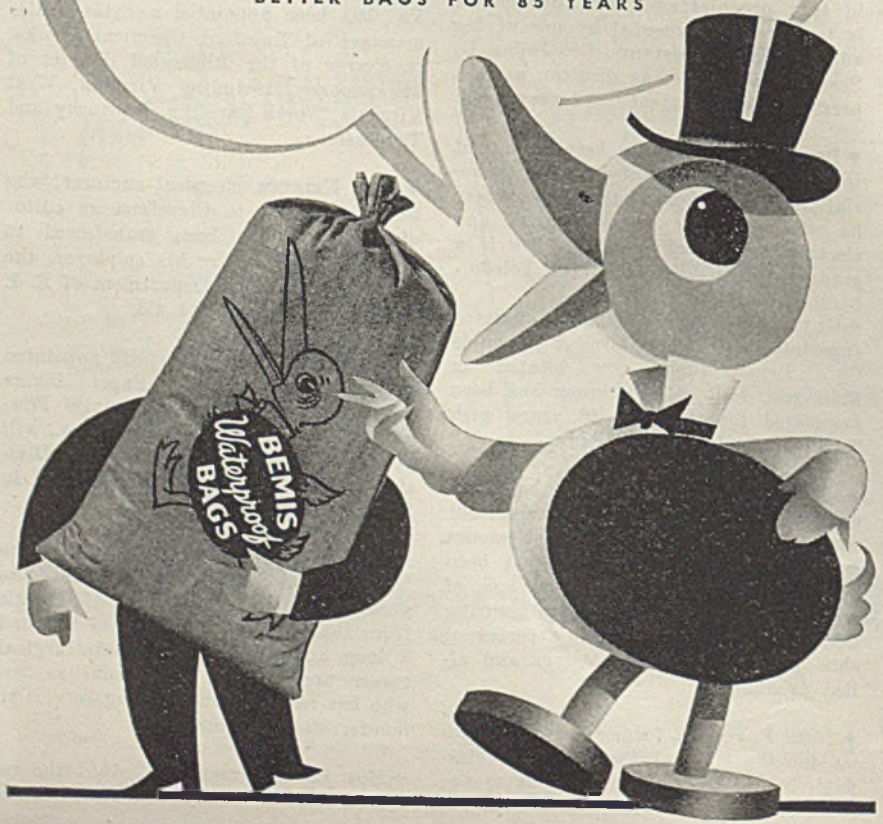


tute, Columbus, Ohio, where he will be engaged in metallurgical research and development. A graduate of Manchester College, North Manchester, Ind., Mr. McIntire holds a Bachelor of Arts degree in chemistry and has had post-graduate work in industrial metallurgical processes at Purdue University.

✦ DAN R. RANKIN has been appointed acting chief engiener of the Food Machinery Corp. Mr. Rankin has been associated with Peerless Pump Division of the Corporation for the past five years and previously was assistant to the chief engineer. He is a graduate engineer holding both the degrees of B.S. and M.S. from the University of California.

✦ GROSVENOR JONES, assistant director of the Bureau of Foreign and Domestic Commerce retired for reasons of health after 33 years of service with the Federal Government, chiefly with the Department of Commerce.

Underwood & Underwood

Ralph W. Shafor

✦ RALPH W. SHAFOR has joined the staff of Amino Products Co., division of International Minerals & Chemical Corp. Mr. Shafor has had many years of research, design, operating and management experience in the beet sugar industry and other chemical fields. For the past 13 years he has been manager of the beet sugar division of Petree & Dorr Co. of New York and was formerly for many years with Great Western Sugar Co., Denver, first as head of the research laboratory and later as assistant to the superintendent of the operating division. He is a graduate of the chemical engineering school of Ohio State University.

✦ F. CARL HIRDLER, JR., recently joined the Los Angeles Laboratory staff of Turco Products, Inc. A graduate of the University of Oklahoma in 1936, where he received his B. S. degree in chemical engineering, Mr. Hirdler is 28 years old. Following his graduation he worked as a chemist in mid-western steel mills and other industrial laboratories before joining Lockheed and finally the Turco staff.

✦M. J. Blish was appointed chief of the Research Laboratory of Amino Products Co., division of International Minerals & Chemical Corp. He is stationed at the Amino plant at Rossford, Ohio. Dr. Blish has been chief of the Protein Division, Western Regional Research Laboratory, U. S. Department of Agriculture, Albany, Calif., since 1939. For 17 years previously he was chairman of the Department of Agricultural Chemistry, University of Nebraska, Agricultural Experiment Station, Lincoln, Neb.

M. J. Blish

✦William L. Batt, vice-chairman of the War Production Board, and president of SKF Industries, Inc., Philadelphia, has been awarded the Bok Award, a medal and a $10,000 check, not only for his service to the nation in leading industrial mobilization of the war, but as a citizen who performed the most distinguished service for Philadelphia in 1942.

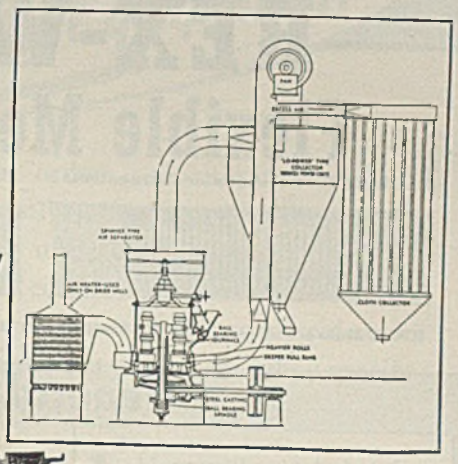
Ernest A. Winter

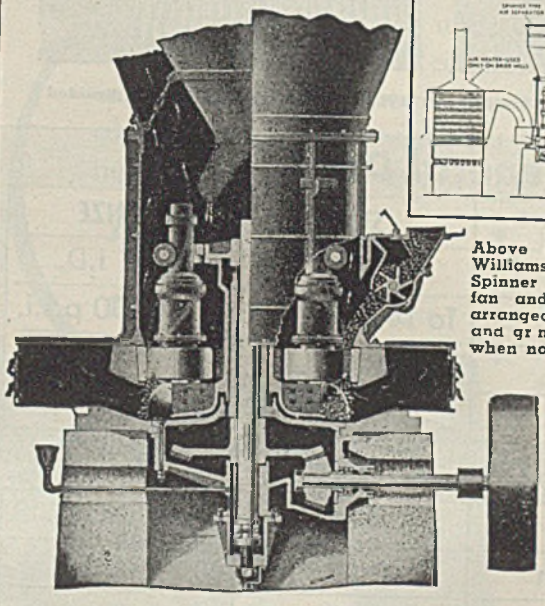
✦Ernest A. Winter, formerly senior research engineer of Johns Mansville, has joined the research department of the Tennessee Copper Co., Copperhill, Tenn. Dr. Winter received his Ph.D. degree in chemical engineering at Columbia University in 1939. He worked under direction of Dr. Ralph H. McKee.

✦W. M. Billing is now general manager of the Synthetics Department of

WILLIAMS
FINE GRINDING AND AIR SEPARATING EQUIPMENT

Economical in Power Consumption and in Maintenance . . . . .





Above shows general layout of Williams Improved Roller Mill with Spinner Air Separator, collector, fan and cloth auxiliary collector arranged for simultaneous drying and grinding. Air heater is omitted when no drying action is involved.

Sectional view showing heavy duty construction of the Williams Roller Mill, conceded to be the most practical for medium and extremely fine grinding. Not only has the mill the ability to grind fine, but due to air separation, provides a positive check on the size of the product.

HIGH OUTPUT ON UNUSUALLY FINE PRODUCTS . . ANY FINENESS FROM 20 MESH TO MICRON SIZES . . . . .

When grinding to extreme finenesses Williams Improved Roller Mills give unusually high output with a minimum of power per ton ground. Any fineness from 20 mesh to micron sizes can be obtained with Williams Air Separators. Instant changeability from 70%–100 mesh to 99.9%–325 mesh.

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Your Conversion—Assembly—Production

with

REX-WELD

Flexible Metal Hose

Rex-Weld Hose—Annular Corrugations

RW-80 Unbraided ——— RW-81 Braided

Rex-Weld Hose—Helical Corrugations

RW-90 Unbraided ——— RW-91 Braided

General Data

	STEEL	BRONZE
Sizes	To 4" I.D.	To 4" I.D.
Pressures	To 14,500 p.s.i.	To 14,500 p.s.i.
Temperatures	To 1000° F	To 450° F.
Lengths	To 50'	To 50'

Use Chart

	*STEEL	BRONZE
Saturated Steam		✓
Superheated Steam	✓	
Sulphur Bearing Oil	✓	
Oxygen		✓
Ammonia	✓	
Carbon Dioxide	✓	
Sulphur Bearing Grease	✓	
Critical Vibration		✓
Non-Sparking		✓

*Protective Coatings Can Be Applied for Corrosion Protection (To Conserve Critical Copper Bearing Alloys).

Couplings: REX-TITE Mechanical (Re-attachable) Couplings; Solder Couplings; Brazed and Welded Couplings and Flange Assemblies for Rex-Weld Flexible Metal Hose.

Ask for Engineering Recommendations

CHICAGO METAL HOSE CORPORATION

General Offices: MAYWOOD, ILLINOIS

Factories: Maywood and Elgin, Ill.

Hercules Powder Co., which has been expanded to an operating department.

✦ J. W. GREENE is now head of the department of chemical engineering at Kansas State College of Agriculture and Applied Science, Manhattan.

Charles Belknap

✦ CHARLES BELKNAP, chairman of the executive committee and vice president of Monsanto Chemical Co., has been elected president. Edgar M. Queeny, for 15 years president, was elected chairman of the board.

✦ FRANK E. HUGGINS, who for nearly 17 years has been active in the experimental development and engineering selling of Dopp kettles and mixers has resigned from Sowers Manufacturing Co., and is now with Niagara Machine & Tool Works, also of Buffalo.

Frank E. Huggins

✦ JOHN F. BRYNE has been elected vice-president of Koppers United Co. Mr. Byrne is general manager of Koppers United Co.'s blast furnace division, Granite City, Ill., and will continue in that position.

✦ GEORGE W. MCCARTY, for business and personal reasons, is returning to Atlanta where he will resume his former position as vice-president of Ashcraft-Wilkinson Co. He is not severing his connection with the government completely, but will continue to serve as a consultant

to the nitrogen unit of WPB. He has been assistant chief of the hydrogen unit for more than a year.

✦ HAROLD HIBBERT, E. B. Eddy Professor of Industrial and Cellulose Chemistry, McGill University, Montreal, has been awarded honorary membership in the Society of Chemical Industry, London. In making the award the president announced that the Council, in deciding to bestow this honor selected with great care one they considered worthy, for his career illustrates to a remarkable degree the great influence which a man of high scientific attainments can exert on industry and on the well-being of the community.

✦ EARL S. PARKS has been appointed General Superintendent of the American Wringer Co., at Woonsocket, R. I. He formerly was in the planning department. John J. Creeden succeeded Mr. Parks.

OBITUARIES

✦ W. M. WEIGEL of the Industrial Development Department, Missouri Pacific Railroad, died at his home in St. Louis, March 26. Mr. Weigel was mineral technologist for the Bureau of Mines in Washington from 1921-1926. He joined the Missouri Pacific in the latter year. After getting a B.S. degree from the Missouri School of Mines and Metallurgy in 1900 and an E.M. three years later, he started as chemist at the National Lead Co's smelter at Collinsville, Ill., advancing to assistant superintendent and superintendent in four years. He was born in Montrose, Ill., and was 62 on April 7.

✦ J. W. GARDNER, after a long illness, died recently. Born Aug. 19, 1863, Mr. Gardner was associated with the Gardner-Denver Co. from 1881 until his health forced him to withdraw from active participation in business several years ago.

✦ WILLIAM F. MADILL, vice-president and one of the founders of Everlasting Valve Co., died at his resident in Nutley, N. J., on January 9. Mr. Madill was born in Canada in 1878. After completing his education, he went to Chicago where he became associated with Scully Steel and Iron Co. Here he became successively private secretary to the president, then president of a subsidiary company, and later manager of one of the branches of the company. In 1908 he joined John H. Allen in the development and marketing of the valve.

✦ WALTER W. PLECHNER was killed in action on March 4 in the North African area. Lieutenant Colonel Plechner had been assistant director of research of the Titanium Division of National Lead Co.

✦ MARTIN SCHIFF, chief engineer of the Century Electric Co. in St. Louis, died suddenly on Feb. 15. He was born in New York City on Oct. 7, 1890 and graduated from Cornell University.

This Brochure Will GUIDE YOU In Buying Stainless Steel Processing Equipment

With war orders reducing the speed of delivery—with all emphasis on getting equipment that will stand up in the emergency—with all efforts directed toward conserving metals and alloys—engineers will make frequent use of this ready reference covering *all* the facts about what to look for when specifying stainless steel processing equipment:

1. What grade will you order?
2. What finish will serve you best?
3. How will you design for economy and for conservation of steel?
4. How can you be sure of sound welds?

These and other questions, important to your production, are answered in the new informative brochure issued by S. Blickman, Inc.

SEND NOW FOR THIS BOOK

What to look for
when you specify
STAINLESS STEEL
for your
PROCESSING EQUIPMENT

EST. 1889

S. BLICKMAN, INC.
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TANKS • KETTLES • CONDENSERS • AGITATORS
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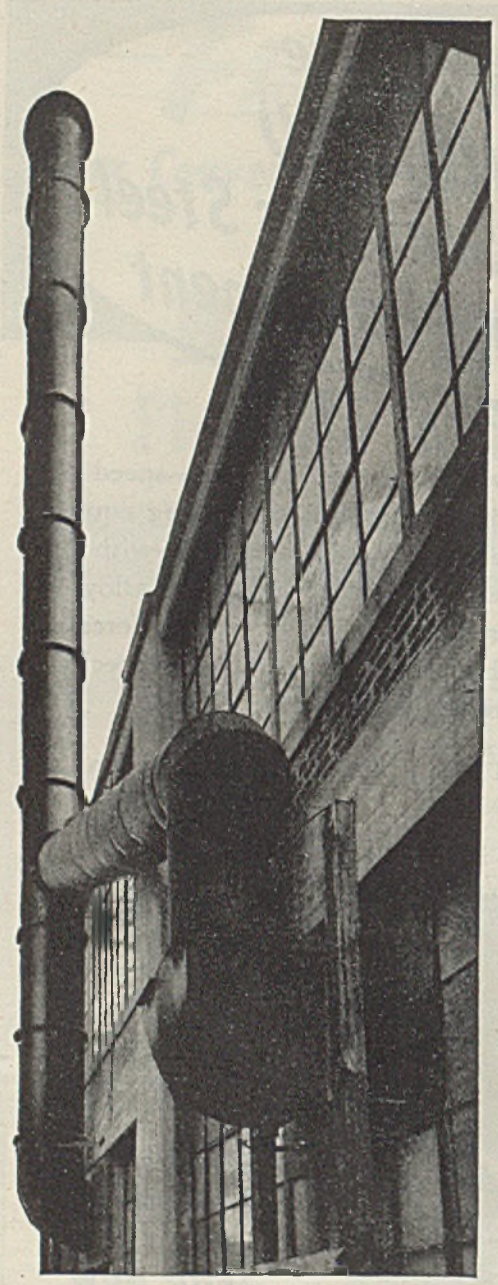
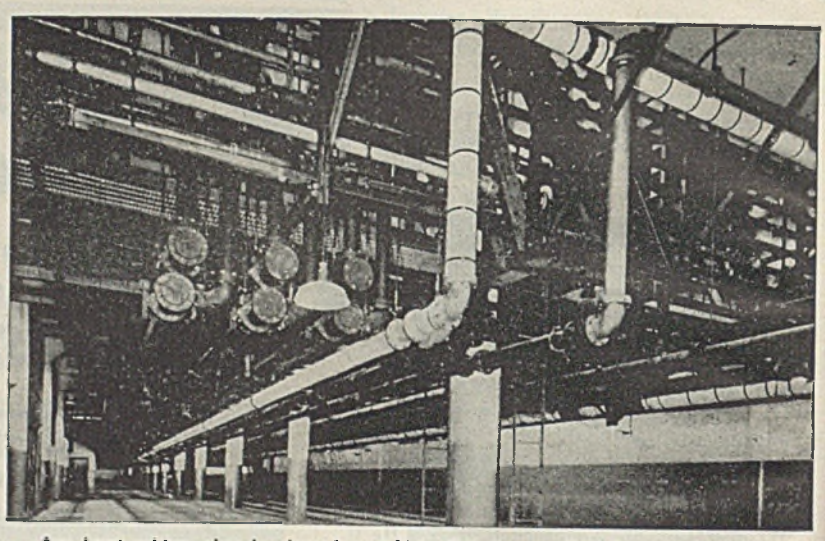


Ace rubber lined Stacks and Flue Ducts together with Ace rubber covered and lined blowers for carrying off acid fumes.



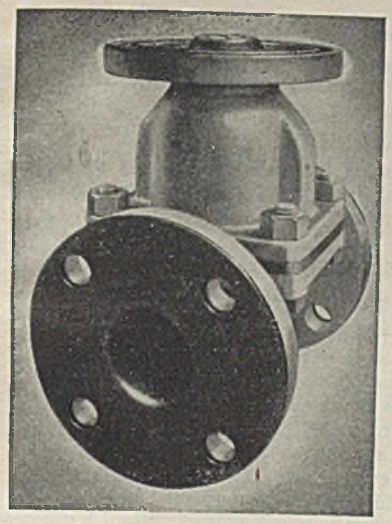
Ace hard rubber pipe in sizes from 1½ to 8 inches in the above installation. New technique of installation has removed many of previous limitations of hard rubber pipe and fittings.

Back

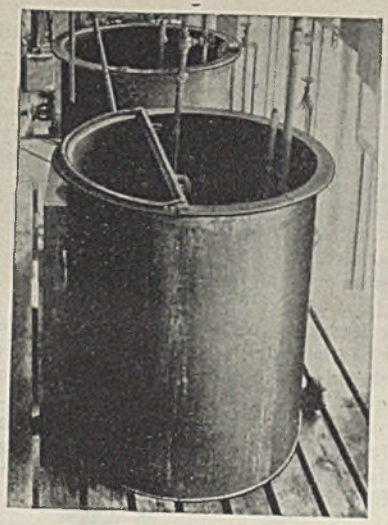
• Ace is Hard Rubber headquarters for rugged and precision parts . . . some smaller than a dime . . . some large as a desk . . . . . all with these advantages: Dependable and Economical Alkali and Acid resistant • Highest electrical and radio insulation properties • Non-Hygroscopic Easily machined, turned, finished.

Ace hard rubber Flexible Pail. 3 gallon size. Will not chip, crack or give trouble in normal service.

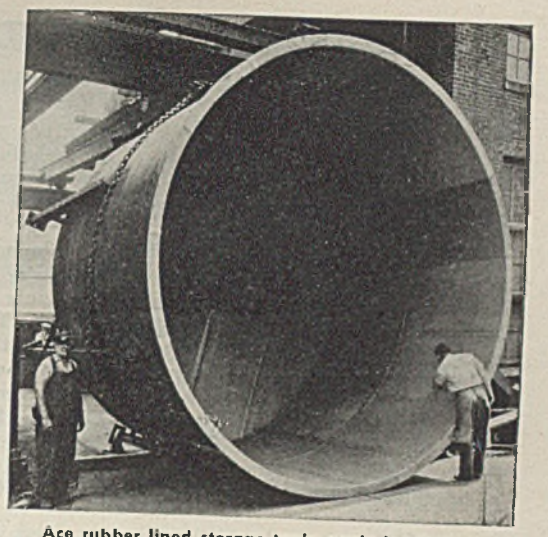
ACE



Ace hard or soft rubber lined diaphragm valve. Sizes from 1 to 12 inches.



Ace rubber lined bleach and caustic solution tanks.



Ace rubber lined storage tanks made in all sizes for safe storage of expensive chemicals.

of the lines... ACE prevents corrosion

★ Tanks, tank cars, pipe lines, valves, pumps, pipe fittings, ACE rubber lined—or lined and covered—offer

. . . . . positive protection against corrosion and contamination
. . . . . rubber compounded to meet specific requirements
. . . . . wide temperature range
. . . . . smooth, non-porous surfaces—easily cleaned

Synthetic rubber linings, including Thiokol, Neoprene, etc., are also available
SARAN* Pipe and Fittings, iron pipe size; Injection Moldings; thin wall Tubing and Fittings.

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READERS' VIEWS AND COMMENTS

WORK WEEK PLAN

To the Editor of Chem. & Met.:

Sir:—With the Presidential order regarding a 48-hr. work week for some phases of industry, we have found that some of our neighboring plants have been concerned about a suitable working schedule. Thinking that perhaps it may be a bothersome problem to a great many concerns in the country, we are submitting a copy of our work schedule to you in the hope that you may find it of interest for publication for the benefit of those plants which may find it suitable.

As you will note in the accompanying schedule sheet, it is set up on two jobs or processes with the relief man working equal time at both jobs.

The outstanding feature of the schedule is that over the seven-week span all seven men work the same number of hours and have the same number of days off. This leaves no basis for argument that they had been discriminated against in the schedule makeup.

Some question may be raised regarding the men working seven consecutive shifts. Our legal department has investigated this angle and we find that when acceptable to the men themselves it is within the law. We solved it by having the men vote on its acceptance.

J. W. WELCH

Sharples Chemicals, Inc.,
Wyandotte, Mich.

(For other work-week plans see *Chem. & Met.* Jan. 1942, p. 86; Mar. 1942, p. 140.—*Editor.*)

W. LEE LEWIS

To the Editor of Chem. & Met.:

Sir:—When a man passes away, some friend of his writes a necrology. It is the usual thing to do, but in the case of W. Lee Lewis the task is difficult. It is too hard to believe that a life so full of vigor, a mind so full of creative power could ever cease. His memory vibrates so vividly in those of us who knew him

WORK SCHEDULE
48 Hours Work per Week per Man

Process 1

Shift Hours	First Week							Second Week							Third Week							Fourth Week						
	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W
7 AM — 3 PM	X	X	X	C	C	C	C	C	C	C	B	B	B	B	B	B	B	A	A	A	A	A	X	X	X	C	C	C	C
3 PM — 11 PM	C	C	B	B	B	B	B	B	B	A	A	A	A	A	A	A	X	X	X	C	C	C	C	C	C	C	B	B	B
11 PM — 7 AM	B	A	A	A	A	A	A	A	A	X	X	X	C	C	C	C	C	C	B	B	B	B	B	B	B	A	A	A	A

Shift Hours	Fifth Week							Sixth Week							Seventh Week						
	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W
7 AM — 3 PM	C	C	C	C	C	C	B	B	B	B	B	B	A	A	A	A	A	A	X	X	X
3 PM — 11 PM	C	C	C	B	B	B	B	B	B	B	A	A	A	A	A	X	X	X	C	C	C
11 PM — 7 AM	B	B	B	B	B	A	A	A	A	A	A	X	X	X	C	C	C	C	C	C	C

Process 2

	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W
7 AM — 3 PM	F	F	F	F	F	F	E	E	E	E	E	E	D	D	D	D	D	D	D	X	X	X	X	F	F	F	F	F	F	E	E	E	E	E	E
3 PM — 11 PM	E	E	E	E	E	D	D	D	D	D	D	X	X	X	X	F	F	F	F	F	E	E	E	E	E	D	D	D	D	D	X	X	X	F	F
11 PM — 7 AM	D	D	D	D	X	X	X	X	F	F	F	F	F	F	E	E	E	E	E	E	D	D	D	D	D	D	D	X	X	X	F	F	F	F	F

	Fifth Week							Sixth Week							Seventh Week						
	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W
7 AM — 3 PM	F	F	F	E	E	E	E	E	E	E	D	D	D	D	D	D	D	C	C	C	C
3 PM — 11 PM	E	E	E	D	D	D	D	D	D	D	C	C	C	C	C	C	C	B	B	B	B
11 PM — 7 AM	D	D	D	C	C	C	C	C	C	C	B	B	B	B	B	B	B	A	A	A	A

Relief Man's Schedule
(As shown above, but set apart for easy following)

	T	F	S	S	M	T	S	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W
7 AM — 3 PM	X	X	X																																
3 PM — 11 PM													X	X	X	X	X	X	X	X	X	X	X												
11 PM — 7 AM				X	X	X	X	X	X	X														X	X	X	X	X	X	X					

Two jobs (designated "Process 1" and "Process 2") are covered by seven men. Three men (A, B and C) work regularly in Process 1. Three other men (D, E and F) work regularly in Process 2. Man (X) relieves regular operators in both processes.

that to talk of him in the past tense is well-nigh impossible.

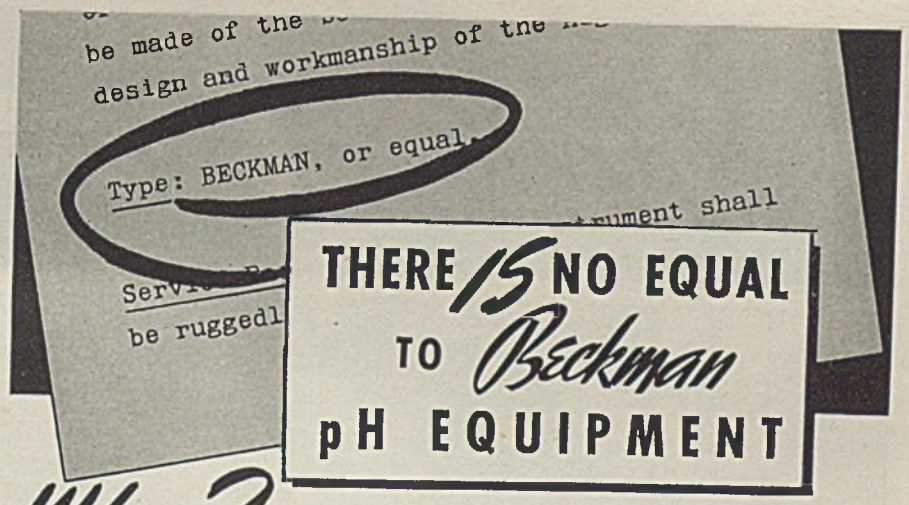
Lewis was a great chemist, but he was a great many other things besides. He was a poet, a humorist and a musician. He played the guitar with the skill of a virtuoso. In his lighter moments he took to the harmonica which as a student he had often played for hours in lumber camps in exchange for a meal or two. In later years he would often entertain friends with it at his home. These entertainments were occasions to which all his students looked forward with delight, for Mr. and Mrs. Lewis were ideal hosts and managed to make everybody feel at home. Every student to whom I talked remembers his visits to the Lewis residence with mingled pleasure and nostalgia. Much common sense advice flowed into the conversations when Lee participated in them and his formula "Get on the soap box and toot your own horn" is still vividly remembered by many Northwestern graduates.

Children would always crowd around Lewis, with the sure instinct which guides them toward those who understand their little joys and troubles. And Lewis did understand and love them, as he also understood birds and bees and everything that came from the great laboratory of Nature.

Lee could laugh over a joke even if it was at his own expense. He often told of what he considered the most embarrassing moment in his life. It appears that once he had been invited to a formal party and, having no proper attire in his wardrobe, he borrowed a frock coat from one of his friends. Unfortunately, his short overcoat did not cover the formal suit and therefore he pinned the tails to the shoulders. When he took the coat off in the cloakroom, he forgot to unpin the tails. "You should have heard the crowd laugh," he would say in concluding the episode, "it was the best entertainment I ever gave." Another story of this kind concerns an experience that Lewis had while sitting on the platform at an assembly service. He used to carry cough candy and potassium chlorate with him to ease his throat and they happened to have been put in the same coat pocket. Suddenly the mixture caught fire and he had to flee in a trail of smoke and flame. It was his most dramatic exit, he commented.

Lee's own interests rested on a broad, cultural basis and he tried to install similar principles into those around him. Discussing chemistry, he contended, did not depend on chemical knowledge alone. It took rich soil on which to grow specialized achievements and even after people had become chemists, it was well for them to develop hobbies which would take them into different fields to provide new foods an active brain required. What he preached he practiced. W. Lee Lewis was really a multiple personage, and if he had been permitted to live more than one life, the world would have been richer by a creative chemist, a splendid musician, a fine speaker and a gifted poet.

OTTO EISENCHIML



Why? ... *because* with no other make of modern pH equipment can you maintain *continuous* pH control on boiling-hot liquids!
Only Beckman has developed High Temperature Glass Electrodes that can be immersed directly in tanks, flow lines, etc. (no sampling devices required) for continuous operation in process solutions up to 212° F. (100° C.).

... *because* with no other make of pH equipment can you maintain *continuous* pH control in highly alkaline solutions, *even in the presence of sodium ions.*
Beckman alone has perfected High pH Glass Electrodes which permit accurate pH control in the high pH ranges even when sodium compounds are present. This important feature has extended the usefulness and benefits of modern pH control to entirely new fields where alkaline solutions, in combination with sodium ions, have heretofore presented difficulties.

... *because* with no other make of pH equipment can you maintain *continuous* and automatic check on as many as SIX different pH stations with only ONE pH instrument.
Only Beckman has perfected an Automatic Multiple Glass Electrode Switch for use with multiple station recorders to record pH from as many as *six* stations through *one* Beckman Automatic pH Indicator.

THESE are only a few of the *many* exclusive pH developments made by the Beckman research staff ... developments that are so fundamental and far-reaching that they antiquate all other pH equipment. So for your own protection, when you specify pH equipment, make sure you get BECKMAN. *There is no "equal"!*

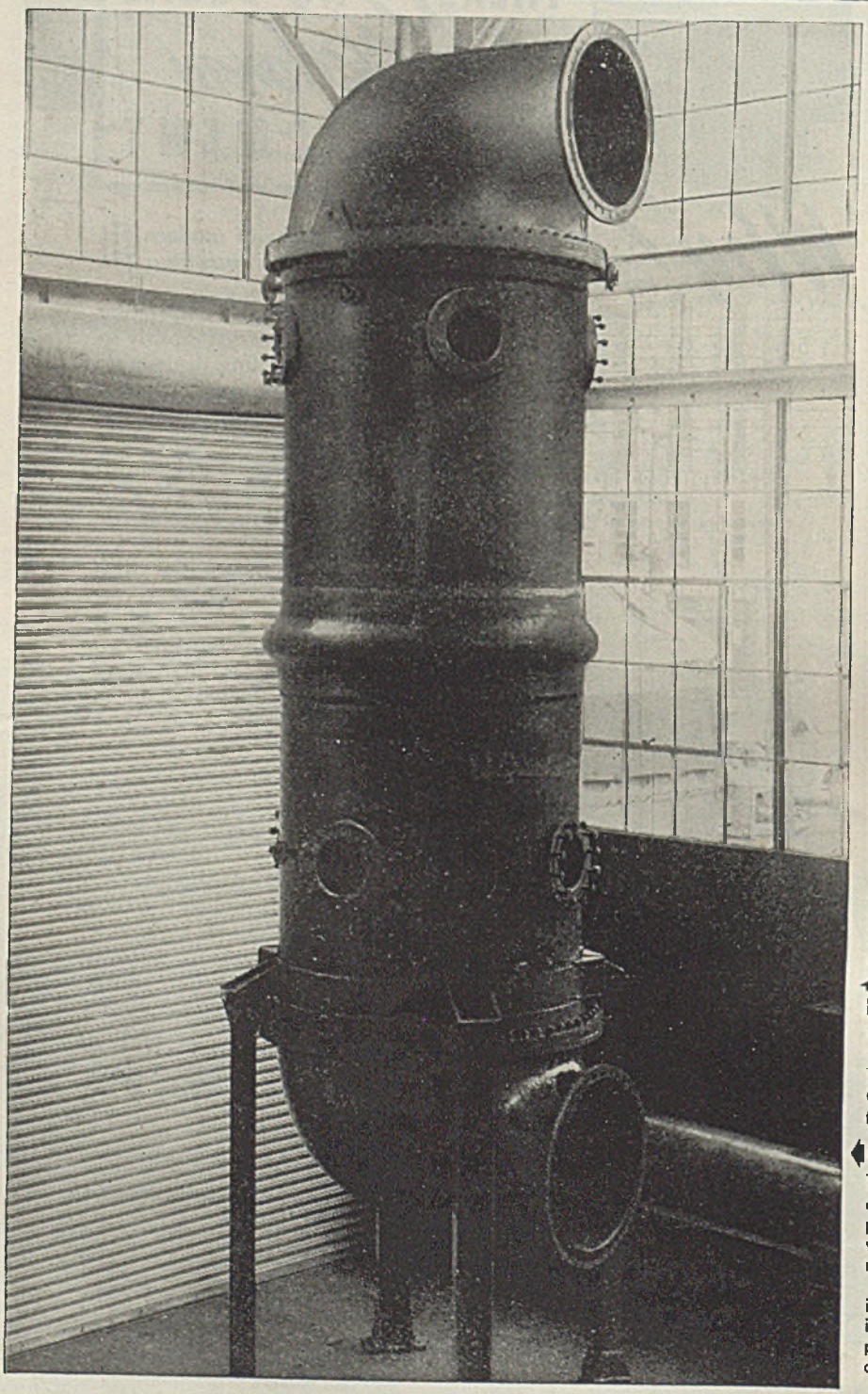
LET OUR ENGINEERING STAFF HELP YOU in adapting Beckman pH control to speeding up your production ... cutting waste ... reducing corrosion ... and increasing the overall efficiency of your processing operations. If you use water or water solutions anywhere in your plant operations, investigate! **Beckman Instruments Division, National Technical Laboratories, South Pasadena, California.**

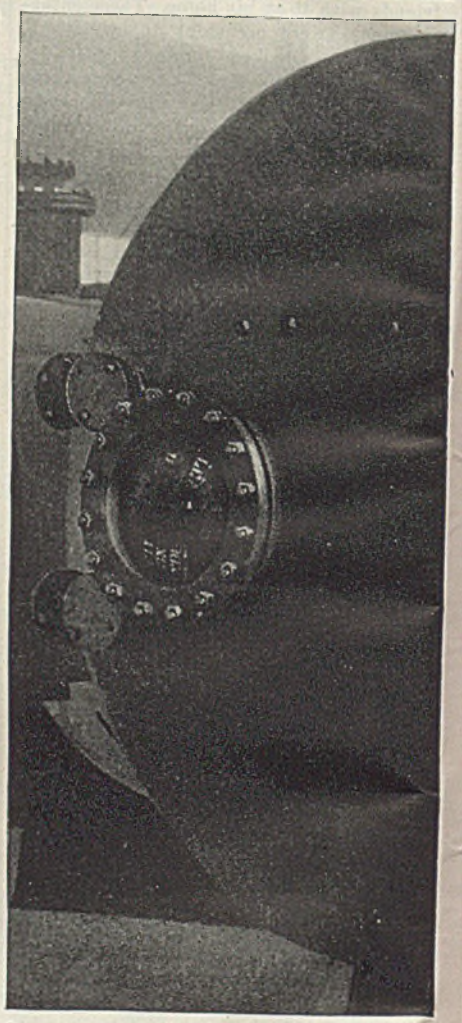
What Every Executive Should Know About pH

Send for this helpful booklet that explains the fundamentals of pH control—what it is, how it's used, where it fits into modern production processes. IT'S FREE!

BECKMAN INSTRUMENTS CONTROL MODERN INDUSTRIES

Metal at work





EVERDUR* STILL KETTLE

With a diameter of 8 feet and a length of 18 feet, this still kettle is fabricated of Everdur. The working pressure developed is 50 psi. Coil working pressure is 125 psi. Manufactured by Leader Iron Works.

EVERDUR CALANDRIA OR REBOILER

This big reboiler is 56" in diameter with an overall height of 18', 4". Fabricated of rust-proof, corrosion-resistant Everdur, it is fitted with 522 copper tubes, expanded in 1½" rolled Everdur tube sheets.

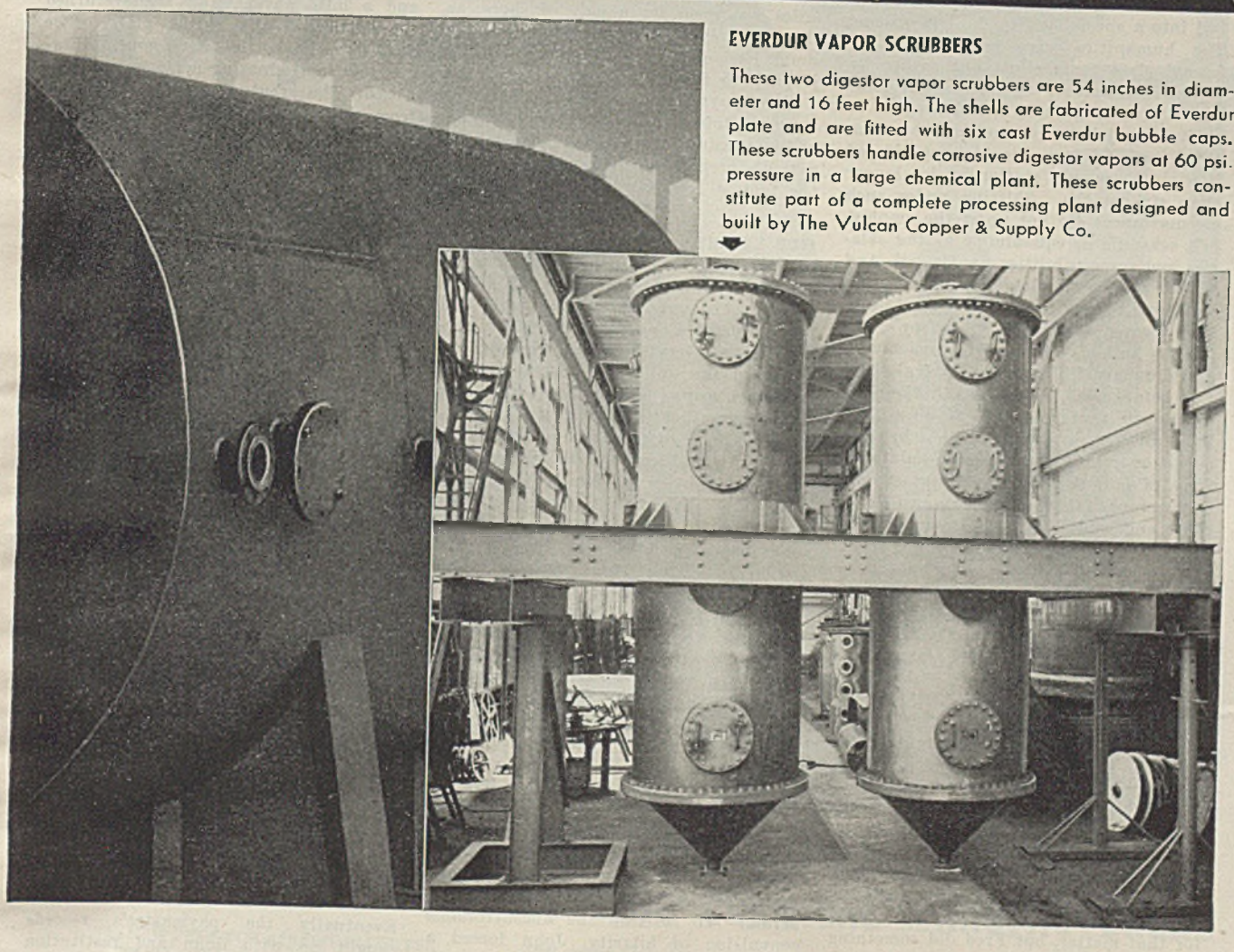
The reboiler, of the natural circulation type, is used at the base of a fractionating column in a huge chemical plant. Shell pressure is 40 psi. Designed and fabricated by The Vulcan Copper & Supply Co.

*Reg. U. S. Pat. Off.

ANACONDA from mine to consumer

Anaconda Copper & Copper Alloys

. . . for Victory!



EVERDUR VAPOR SCRUBBERS

These two digestor vapor scrubbers are 54 inches in diameter and 16 feet high. The shells are fabricated of Everdur plate and are fitted with six cast Everdur bubble caps. These scrubbers handle corrosive digestor vapors at 60 psi. pressure in a large chemical plant. These scrubbers constitute part of a complete processing plant designed and built by The Vulcan Copper & Supply Co.

Everdur Metal and other Anaconda Copper Alloys are serving in war-front equipment all over the globe—and in countless industrial applications behind the fighting fronts . . . meeting the performance standards that 24-hours-a-day production schedules demand.

We offer this three-fold service to those engaged in the war effort:

1. **Special Engineering Counsel** . . . cooperation in finding the solution to special metal problems involving copper, brass and other Anaconda Metals.
2. **A Laboratory You Can Call Your Own** . . . technical information plus laboratory facilities to help you fit the right metal to the job.
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FROM THE LOG OF EXPERIENCE

THE COLLEGE GRAD of 1900 was not a specialist, but was expected to find or fall into a specialty after he left college. The humanities were not covered by formal class room effort but rather by professorial precept. Since industrial activity was vigorous, it was possible to shift from job to job to acquire versatility, and, in fact, the boys considered it a sin to remain stationary for longer than six months. Shifting under such circumstances did not upset the employer's schedule or equanimity as the salaries and responsibilities were small. And so, at the completion of the Croswell, Michigan Sugar House in '02 the Chronicler located a vacancy in Jeffrey's, the famous builders of conveying machinery at Columbus, Ohio. Upon arrival there just before noon, I was told by the chief draftsman that his crew of 50 college lads dwelled gregariously nearby and subsisted under the kindly administrations of a little motherly widow who set a generous table. He motioned to a chair and said he would presently send for a sort of bell-wether of the flock who took it upon himself to pilot newcomers about and see to it that they wrote home regularly. When the midday whistle blew, lo, there came Fred Buffum (MIT '00), the pilot, whom I had met a couple of years earlier during a vacation assignment in the structural design department of Cambria Steel in Johnstown, Pennsylvania. He was the samaritan who somehow felt responsible for the welfare of his fellows. The good old widowed landlady was feeding 50 ravenous draftsmen at $4 per week, and by working with her daughter long into the night seven days per week, eked out a bare existence. Fred didn't like it, nor did the others for that matter, but Fred did something about it. He talked the boys into raising the rate to $5 and then broke the news to the widow by telling her that the boys had decided they would no longer pay $4. Hereafter it would be $5! Not long after that, the widow's house was quarantined because of the illness of her daughter, whereupon Fred collected every man's weekly five-spot and gave it to the health guard for transmission to the old lady. That lasted three weeks and was the only time the little woman ever collected a surplus.

ONE OF THE LEADING designers at Columbus was Dufour, also, by avocation, the drafting room humorist. The draftsmen, inexperienced in traveling conventions, were occasionally sent out on a job, and for their benefit Dufour posted a schedule of perquisites proportioned to the mileage. His tabulation advanced in multiples of 100 miles. The minimum expense account for a 100 mile trip could easily conceal a necktie, 200 miles would cover a hat, provided the wearer was not too ambitious and 500 miles was good for a pair of shoes, as shoes went in 1903. A trip to Salt Lake could harbor a suit of clothes and a journey to far-off Seattle was good for a down-payment on a lot. The boys accused Dufour of personal application of his schedule on the basis that telling a truth preposterously tends to conceal the facts.

OUR EXPERT ARTIFICER in iron, known at the time-office as John-the-Blacksmith, acquired his trade in Poland. His boss was the community wheelwright and proprietor of a one-man shop which provided repair service to the neighborhood tillers of the soil. The outstanding inconvenience was a naggin' wife. Her duty was to get the blacksmith and apprentice John to the job and keep them there. At daybreak she delivered breakfast to the shop in family size bowls containing respectively, soup, potatoes, sauerkraut and salt pork which was sometimes alternated with dried smoked spare-ribs. There were no individual plates. The fingers and a spoon served ad libitum from the common bowl. When the bowls were arranged for convenient reach, the wife called the craftsmen to refreshment, meanwhile sitting on the anvil to judge the temperature which was a measure of the performance. Low temperature indicated low output and in such a case she meted out a severe reprimand directed at the boy but intended for the "old man." One morning the blacksmith prepared the anvil by the application of hot plates. The effect was electrifying but the craftsmen pretended not to notice the vigorous reaction. To restrain the uncontrollable convulsion of hilarity, John forced a handful of sauerkraut into his mouth and nearly choked. The boss rebuked him for eating too fast!

STEALING CONTINUES even as it did in ancient Sparta where it developed into a recognized art, to be disparaged only if awkwardly practiced. In a Santiago distillery, where our master distiller formerly operated, there was an exasperating dribbling away of small machinery parts of brass. One day the Señor discovered a dark corner used as a temporary concentration point. Stealthily he covered the parts with silver nitrate, and the very next day the convicting evidence of black fingers brought the culprit to light.

Señor the Master Distiller occasionally finds some bottles missing out of a carton. Last week he found two bottles of "Gold Seal" cached away. After the plant operatives had departed for the day, he carefully loosened the seal, exchanged the contents with a solution of water, coloring matter, a dash of rum and a mild physic, and then returned the bottles to the hiding place. The next day the bottles were gone. However, no incriminating evidence was disclosed. The eventual cocktails prepared from the stolen goods may discredit a famous label but will be good medicine for the thief or his accessory.

HOUSE FOREMAN, John Lobay, developed abcesses under his two lower wisdom teeth which required their removal. However, his dentist suffered the upper ones to remain and maintained them by an occasional filling at John's expense. After a few years it dawned on John that inasmuch as there were no lower millstones, it was useless to have upper ones. Straightway he consulted a competing dentist and had the offenders removed.

In 1917 John took leave of the refinery to enlist in the A.E.F. While he was acquiring the military art in one of the New Jersey camps, he was given 24 hours' surcease to bid farewell to Philadelphia friends. Four days later he returned to camp to find that his company had embarked for the front. He was retained in the guard house till another company had been assembled and then sent to a chemical plant near Paris where he served as pipefitter "for the duration." On account of the confusion following his AWOL, the paymaster was not providing the periodical honorarium. However, John had two American dollars left when he reached his destination and with these he bought a flatiron and thus was able to provide a service to his fellows that brought an income of five dollars every fortnight. Eventually the paymaster's records caught up with John and restitution was made. After the armistice, John volunteered for service with the White Russians where he served for four months. Then the army returned him and his newly acquired Russian wife to Philadelphia, and he reported at the refinery with his overalls 23 months from the time he had left.

MANPOWER in the sugar house is no longer naturally masculine. The owner-driver of the molasses tank truck occasionally has his wife substitute as a driver. Her helper answers to the name of Rastus, being a gentleman of color. She wields the pipe wrench in making the hose connection to our line while Rastus stands by obsequiously. At the same time another driver who is drawing a tankload of molasses from our loading rack nearby is distracted by the performance and floods the pavement with molasses at 18 cents per gallon.

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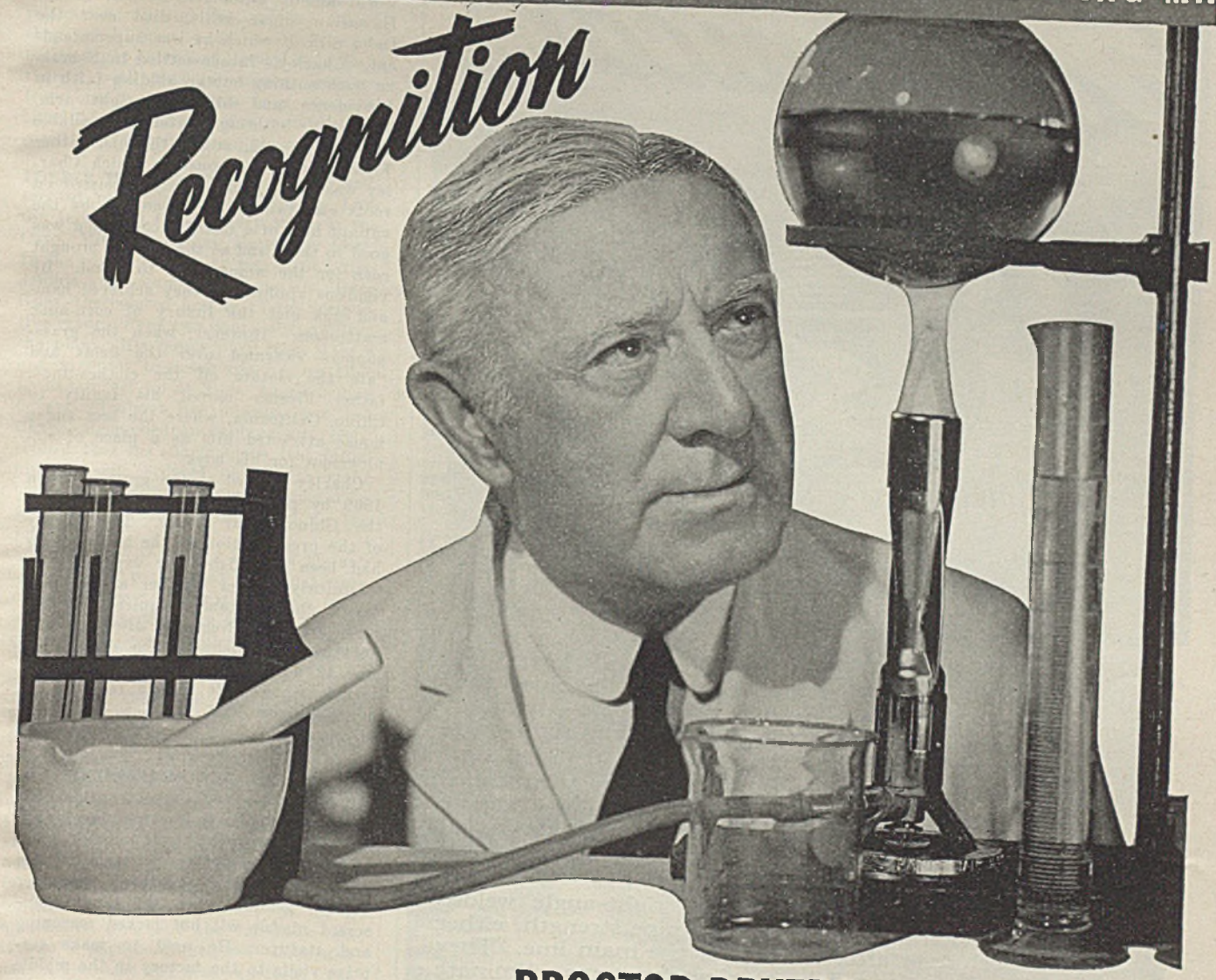
Recognition



PROCTOR DRYERS are RECOGNIZED by LEADING CHEMICAL MANUFACTURERS

Just as the chemist *recognizes,* from experience, the fundamental reactions of the chemicals with which he works—leading chemical processors, from experience, *recognize* PROCTOR Dryers for drying their products correctly and with absolute uniformity. Scores of chemicals of every nature and description are being correctly dried on Proctor Machines every day. Dryers developed by Proctor engineers in recent years are in many cases drying materials that never before could be dried mechanically. Then too, many dryers have been designed by Proctor specifically for handling new chemicals unheard of until recently. Whether it be for food, tobacco, soap, plastics, paint, textiles, synthetic rubber, veneer or a score of other major products, PROCTOR Dryers are custom-built to do each job right. If you have a drying problem, now is the time to have Proctor engineers consider its solution toward that day when other-than-war products can be purchased. Naturally, if your product is vital to the war effort, we can supply you new machinery today.

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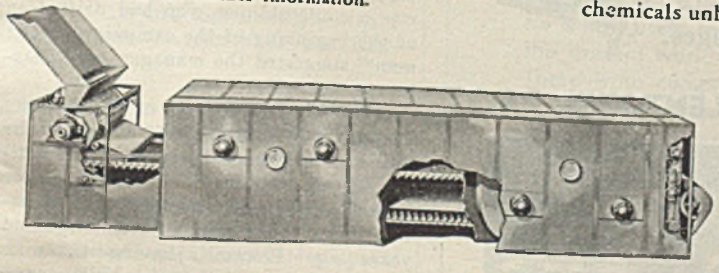
The NEW PROCTOR AERO-FORM DRYER ... one of the many PROCTOR Dryers for the chemical process industries. An entirely new, automatic, continuous method of air-drying for a wide range of wet-solid materials after filtering, settling or other preliminary treatment. The material to be dried is pre-formed into small sticks of uniform size, shape and density...ideal for speedy, efficient, uniform and economical drying as well as subsequent processing. There's a Proctor Dryer designed to solve your chemical drying problem. Write today for further information.



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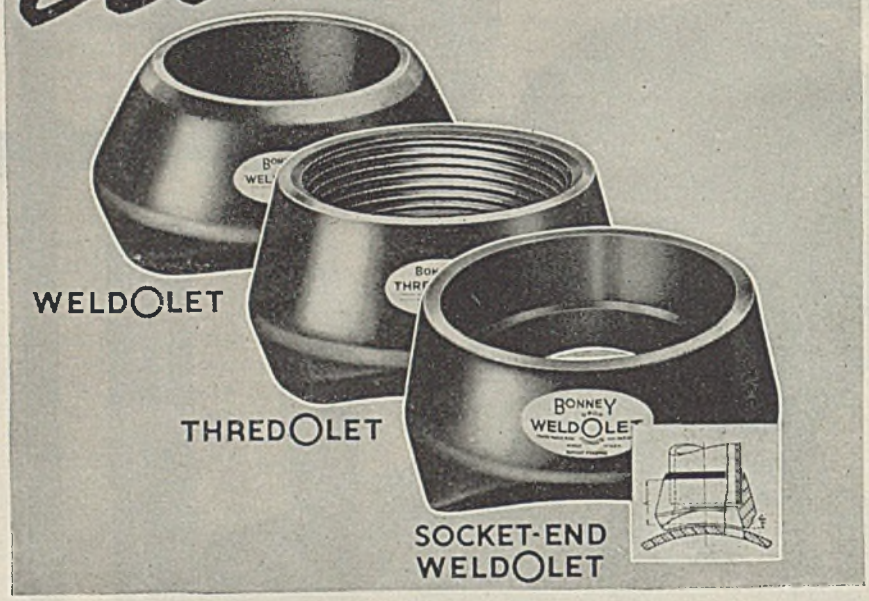
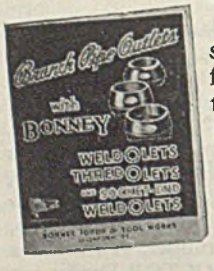
Economical



WELDOLETS, ThredOlets and Socket-End WeldOlets are economical because they cost no more—in many cases less—than any other type of fitting for making right-angle branch pipe outlets.

They are economical because they are installed by electric-arc or oxy-acetylene welding—because they reduce installation time by eliminating all cutting, threading, forming and fitting of the main line to install a tee.

They produce leakproof, right-angle welded branch pipe outlets of full pipe strength, either before or after erection of the main line. They reduce the weight of piping systems, eliminate the need for extra braces at the junction. Because of their wide, funnel-shaped intake aperture they improve flow conditions, reduce turbulence and friction to a minimum.



Made for all standard pipe sizes, they are suitable for every type of piping installation and for all commonly used pressures and temperatures. Stock fittings are of drop forged steel, but can be made on special order of Everdur, Monel, brass, wrought iron, Toncan Iron, etc.

Write for Bulletin WT31 giving full details of all their advantages.

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THREDOLETS

Welded Outlets for Every Piping System

ONE AFTER ANOTHER of the oldtimers is passing. Charley Fleener, outstanding of the wizards who have evolved the world-famous automatic devices in the Hawaiian sugar mills, died near the Oahu mill of which he was superintendent. Charley's father settled in Nebraska with nothing but an abiding faith in Providence and his good right arm. The only building material available was prairie sod, and with this, father Fleener built the house in which Charley was born. The family subsisted on roots and rabbits, supplemented by the valiant help of a faithful cow. God was good to them and so the harvest brought corn for the women folk to grind. By vigorous application they achieved ham-and-eggs and the luxury of corn-husk mattresses. However, when the grasshoppers swarmed over the fields and "ate the clothes off the clothes-line", father Fleener moved his family to Chino, California, where the beet sugar house attracted him as a place of employment for his boys.

Charley started at the grass roots in 1899 by pulling filter press frames in the Chino sugar house. The efficacy of the press station as the bottom rung had been established by experience as it quickly proved whether a man possessed the substance required for the long pull. The Nebraska discipline had deflated squeamishness. The daily stint was 12 hours except at fortnightly intervals when shift change required 18 hours—almost half of a New Deal week in one day!

ONE OF THE ACCOMPLISHMENTS in which Charley took special pride was his participation in the training of his first manager who had jumped some numbers in seniority by favor of his birthright. The youthful manager (whose father owned the plant) possessed nimble wit but lacked seasoning and stature. He used to make surprise visits to the factory in the middle of the night and on one occasion he observed the carbonator operator open a certain valve contrary to the usual order. He jumped up on the platform, slammed the valve and then joined in argument with the operator. The operator declared that he was following orders from Charley Fleener and would stand for no interference. This seemed reasonable and the manager moved on, but when he caught up with Charley he inquired about the antecedents of the carbonator man. Charley replied that he was a mule skinner who had drifted in at the beginning of the campaign. "Good man," suggested the manager, and Charley agreed.

TROUBLESOME SURPLUSES during the late era of peace have called forth antidotes from everybody but the producer himself. He prefers to let bountiful nature take its course. Seven thousand years ago Pharaoh, having taken a market tip from Joseph, built warehouses for the excess grain. Our politicians of the 1930's disposed of the annoyance by destroying the surpluses. Later, "benefits" were substituted by

way of recompense for curbing the urge to produce. Now come our carefree Ethiopians with a practical application of this proposition. For a means of relaxation during the midday pause, they break open a de luxe carton of petite sugar cubes and decorate the faces thereof with dots in varying numbers from one to six. Thus they show the trend of their minds and provide "Ersatz" for the critical supply of ivory.

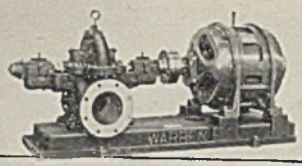
PONDER THE CHANGE in master-and-servant relationship since Charlie Layton supervised the masonry work at the Caro, Michigan Sugar House in 1899! In the course of time he moved to Philadelphia and became yard foreman. 'Gene Giles, the colored hostler of the locomotive cranes, lived two hours distant from the plant. His hours were from 6 to 6 and in order to reach his job on time he had to get up at 3:30. One morning he arrived about five minutes late and Charlie demanded an explanation. 'Gene replied that his alarm clock had failed him. Charlie ordered him to go right back home and get his clock in operating condition so that he could get to the job on time!

On another occasion a crew of his ash men covered with sweat and dust were caught in the act of sitting down for a bit of surcease from toil! When Charlie came upon them he hollered, "Hey . . .! don't let that sweat dry up on you!"

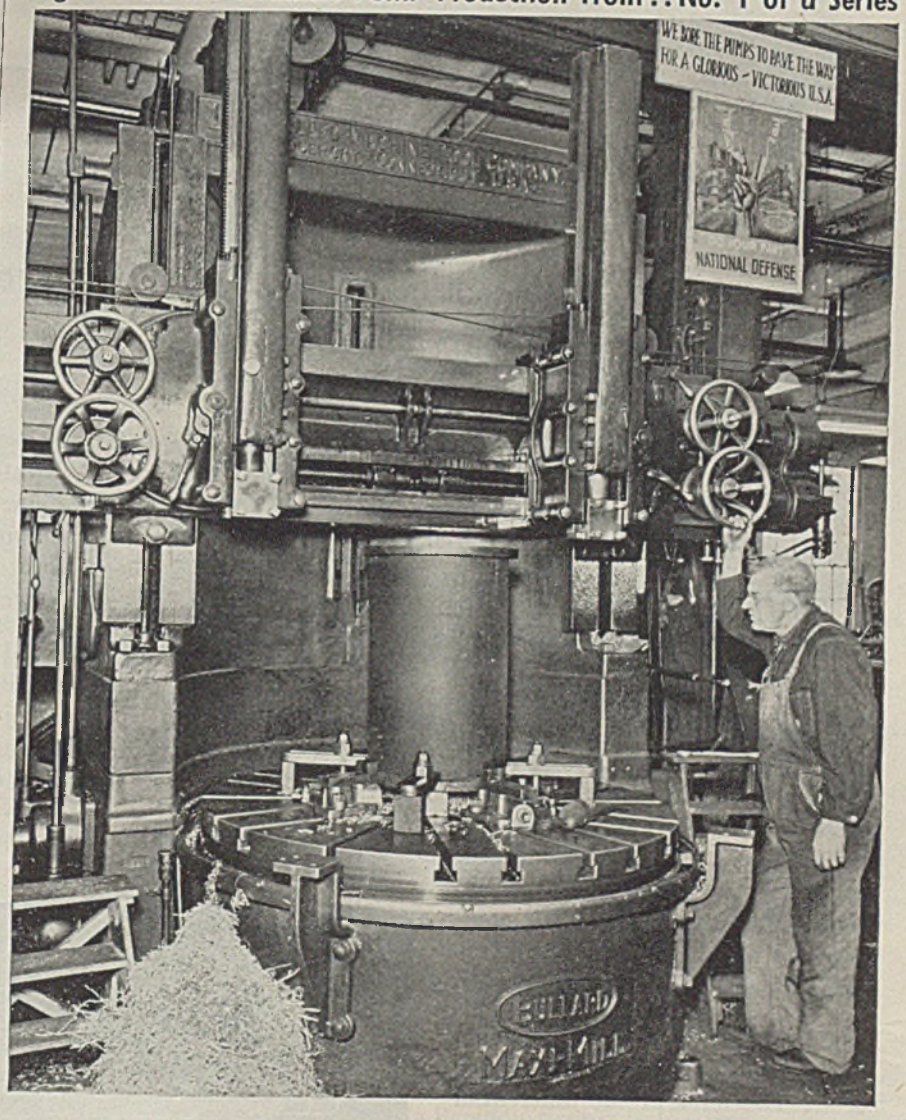
A BUFFALO CHISELER sent a letter to Señor the Master Distiller complaining that a draft of his rum had caused him great suffering and a disconcerting bill for medical services. The suffering could now be endured in the past tense but the balancing of his budget was morally and legally up to the distiller. Señor requested the return of the bottle. It contained only a few drops of its original contents which were not enough for a qualitative test, but the lot of which it was a part contained 600 cases and nary a headache had been reported! The Master Distiller therefore suggested that the draft might have been to generous. If a thing is good, more should be better, but this does nto follow in the case of stimulants or asperin. The customer replied that he had not been immoderate. He had quaffed only a half quart and the balance had been used by his chemist!

"There ought to be a law" making the distiller responsible for the effects of indiscreet use of his product. The customers would then become perforce allergic to C_2H_5OH, and distillers would retreat to the fastnesses of the Kentucky mountains.

SANDWICHED IN THE LOG of operating statistics of the former powdered coffee department, there is recorded an important occurrence as of April 12, 1932, to wit: This morning the steam plant ash basin was filled with water and the janitor dumped several cartloads of spent coffee grounds therein. The wind spread the grounds over the surface of the water. Then Tom's ash man walked out on it and sank to his Adam's apple. Tom reports the bath did him good.



Fighters on the WARREN PUMP Production Front . . No. 1 of a Series



"BIS" MANNED THIS "BATTLE STATION" ALL THROUGH THE LAST WAR, TOO . . .

"Bis Gould has been a skilled pump maker — at the Warren Steam Pump Co., Inc.— for 40 years. All during World War I, "Bis" operated the same vertical boring mill (shown above), which, today, he is now using to help turn out Warren Pumps needed to help bring the present world tyrants to their knees.

There is no compromise in the quality and skill of Warren workers . . . no compromise in the quality of Warren pumps. Whether Warren Pumps are used for gruelling 24-hour duty in war plants . . or for active duty with the United States Navy, the Coast Guard, or the Merchant Marine, every piece of Warren equipment can be counted on for efficient, reliable, and economical performance.

WARREN PUMPS

WARREN STEAM PUMP COMPANY, INC.
WARREN, MASSACHUSETTS

★ ★ ★

A New Pneumatic Transmitter

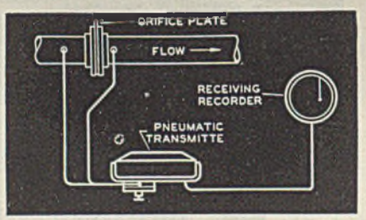
FOR MEASURING FLOW AND LEVEL

Operating on the Force-Balance Principle

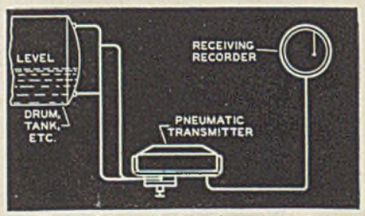
The Republic Differential Pressure Transmitter is an entirely new type of pneumatic meter which has been thoroughly field tested during the past two years. It is a simple pneumatic device for converting a differential pressure, such as is produced by the flow of a fluid through an orifice or by liquid level in a vessel, into an air pressure which varies proportionately with the differential pressure.

This air pressure is used as a direct measure of the differential pressure and can be conducted to a remote location by means of tubing. A gage or receiver connected anywhere in this transmission line will show the variations in the differential pressure and may be graduated in terms of the flow or level which it represents. The pressure can also be utilized as the impulse for actuating a controller.

The Republic Pneumatic Transmitter operates exactly like a weigh scale. The force of the differential pressure on a measuring diaphragm is the value being weighed. This force, multiplied by its lever length, is balanced by the force on a reaction diaphragm times its lever length. The pressure on the reaction diaphragm represents the weights used on a scale and is merely a means of automatically accomplishing this weighing process and transmitting the results.



Typical installation for measuring flow.



Typical installation for measuring liquid level.

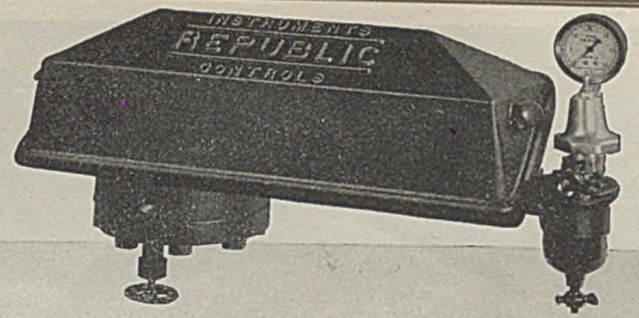
RANGES—standard ranges are available from 0.9 in. to 25 in. of water differential, for working pressures up to 15 psi.; 7 in. to 50 in. of water for working pressures up to 25 psi.; and 13 in. to 800 in. of water for working pressures up to 600 psi. Special heads can be provided for working pressures up to 2000 psi.

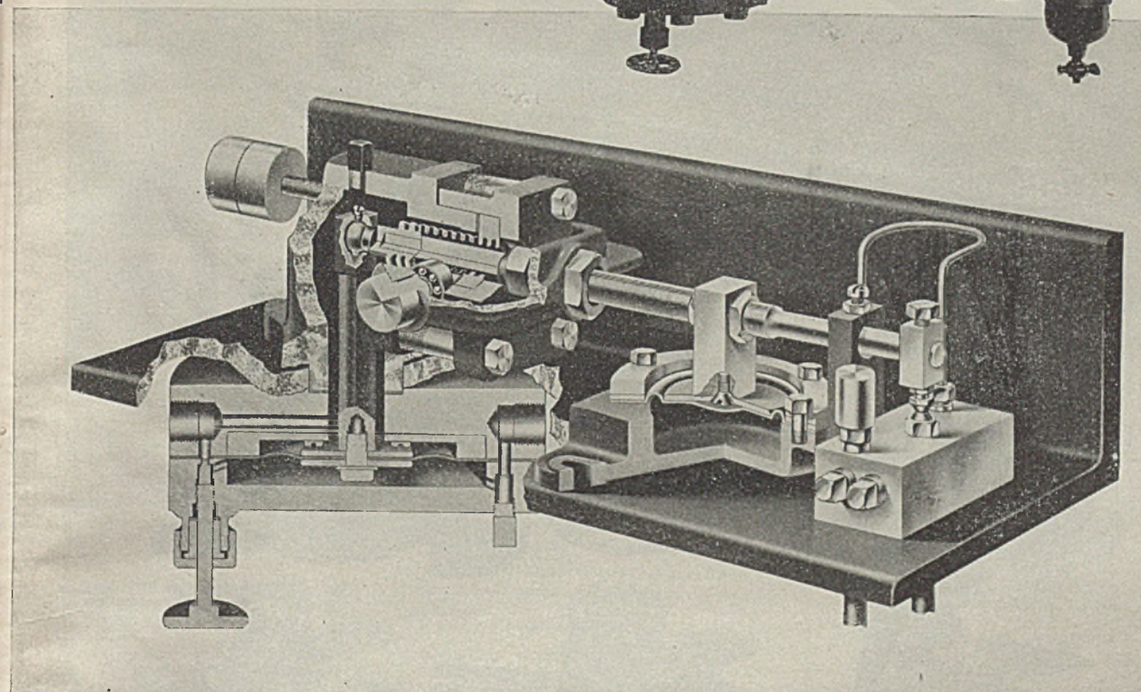
RANGE EASILY CHANGED—the range of a Republic transmitter can be readily changed by making a few minor adjustments or substituting a few simple parts. For example, a transmitter with a differential range of 50 in. of water can be changed to any range up to 100 in. of water by merely changing the position of the reaction diaphragm.

DIAPHRAGM MATERIAL—diaphragms for the Republic transmitter can be made from practically any material including rubber, synthetic rubber, Saran, brass, stainless steel, Monel, silver, etc. This is possible due to the extremely small motion required. (.010 in. for full scale reading). The material is specified in accordance with the solvent or corrosive action of the measured fluid.

●

For complete details write for Bulletin No. 43-4





Exterior and cut-away view of the Republic Pneumatic Transmitter.

PERFORMANCE FEATURES

ACCURACY of the Republic force-balance method of measurement is higher than can be consistently secured and maintained with any other method. Transmitting pressure vs measured differential is guaranteed within ½ of 1% of meter range.

SENSITIVITY — due to the negligible motions required for complete operation of all parts for full scale change, no appreciable hysteresis results from reversal of direction of measurement change. The hysteresis loop is so small that it is undetectable by ordinary means, being less than 1/20 of 1%.

RESPONSIVENESS — due to the fact that there is virtually no volume displacement, the Republic Pneumatic Transmitter is able to follow flow changes almost instantaneously. The time required to produce full output pressure at the transmitter is in the nature of fractions of a second, after the differential is imposed. Therefore a receiving instrument installed adjacent to the transmitter will show flow changes almost instantly. With 500 feet of ¼ in. O. D. tubing, the full value of the change will have registered on a Republic receiver in 15 seconds. This is the overall lag in the system not merely the transmission lag.

NO TEMPERATURE EFFECT — the effect of ambient temperature variations on the accuracy of a Republic transmitter is negligible. Since all parts are equally affected by temperature changes, force and leverage relationships are not disturbed and accuracy is unimpaired.

NO VIBRATION EFFECT — the Republic transmitter is unaffected by any normal frequency of vibration ordinarily encountered in industrial or process plants.

AIR CONSUMPTION — the air consumption of the pneumatic system is .20 cfm. maximum at 20 psi. supply pressure, when differential is zero. At maximum differential consumption is zero and is inversely proportionate to intermediate, differentials.

REPUBLIC FLOW METERS CO.

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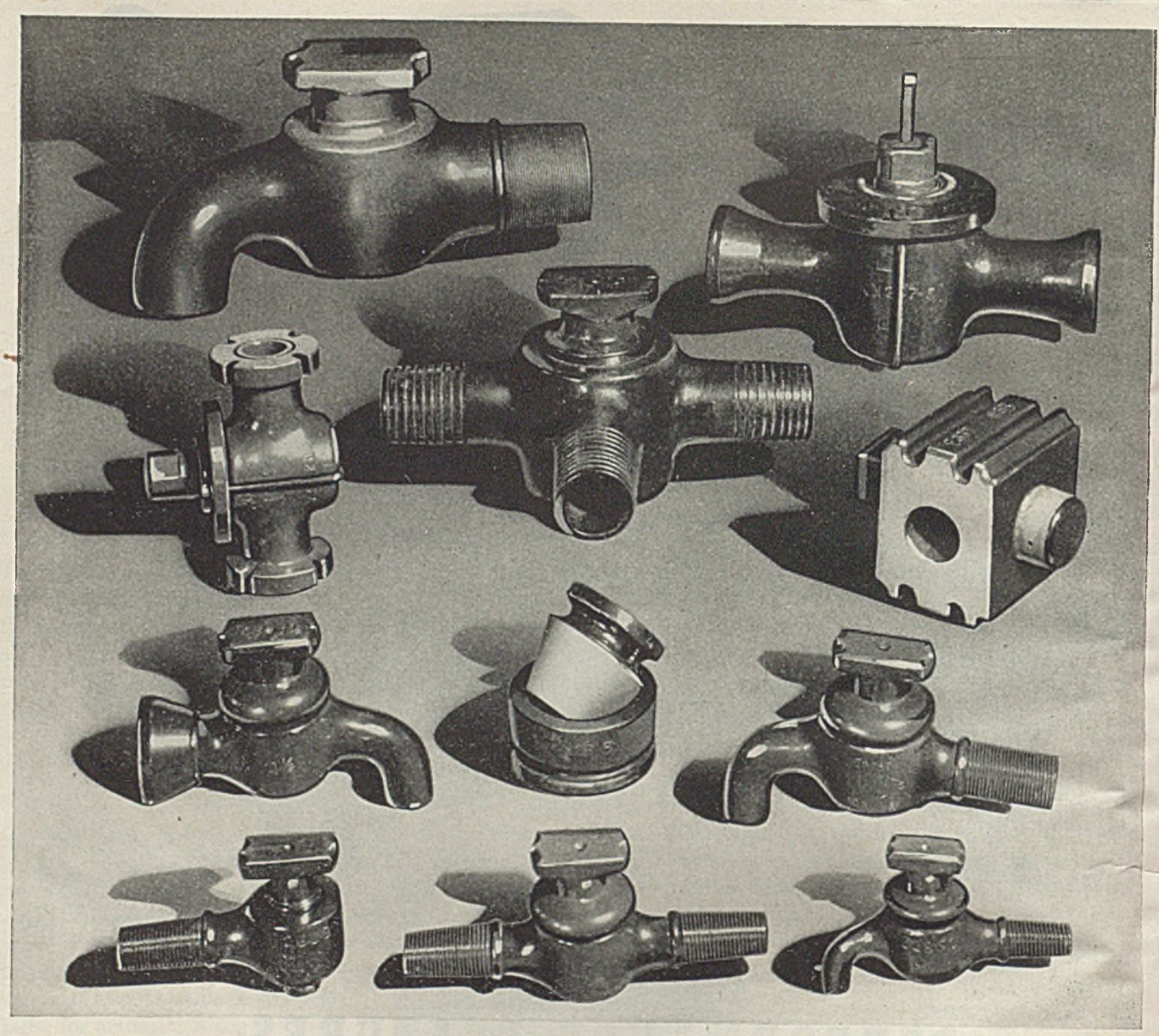

ACID-PROOF VALVES

Maurice A. Knight supplies stoneware piping and valves for pipe lines, tanks and other installations where acids or corrosives are handled. The entire body of Knightware valves is acid-proof.

Shown in the picture are straightway types, bibs, a block cock, drop valve, spigot and two Knight Nordstrom lubricated plug cocks. Each valve is hydraulically leak-tested. There are no metal parts for acids to corrode. Flanges may be either conical or bolt-hole type with standard ASME or special bolt holes.

Threaded connections are for use only with lead, rubber, wood or similar soft materials into which the stoneware can cut its own threadway.

When writing for estimates on Knightware acid-proof valves, piping or stoneware, please give us engineering data and the purpose for which they are to be used.

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KNIGHTWARE
CHEMICAL EQUIPMENT

MEETINGS AND CONVENTIONS

American Institute of Chemical Engineers To Meet in New York

ELECTROCHEMICAL SOCIETY MEETS IN PITTSBURGH

ELECTROCHEMISTS from all parts of the country and Canada met in Pittsburgh April 8–10, with headquarters at the Hotel Roosevelt. Among the scientific-technical sessions there was one on dielectrics, another on corrosion and a third on automatic control.

Prof. Edwin M. Baker, of the University of Michigan, delivered an address on Thursday evening in his capacity as retiring president of the society. At that time the Young Author's prize and the Book prize were awarded to Dr. Sidney Speil, an associate non-metals engineer at the technical laboratory, U. S. Bureau of Mines, Norris, Tenn. He and Mr. M. R. Thompson, also of the U. S. Bureau of Mines, contributed an outstanding paper on "Electrophoretic Dewatering of Clay," at the Nashville meeting of the society in April, 1942.

CHEMURGISTS HEAR ABOUT RUSSIAN RUBBER IN UNITED STATES

ACCORDING to Dr. H. L. Trumbull, research expert of the B. F. Goodrich Co., before the opening session of the ninth annual conference of the National Farm Chemurgic Council in Chicago, seeds of the rubber-bearing Russian dandelion were planted and grown in 100 different test locations in the United States last year. Two other promising rubber-bearing plants are also being cultivated experimentally. One fact established by the tests on kok-sagyz was that the crops grown in the northern tier of states were successful in a number of cases, although it had been widely believed that rubber-producing trees and plants require a tropic climate. According to the last report, the Russians are cultivating this plant on a two-million-acre area as a recognized source of crude natural rubber.

AMERICAN ASSOCIATION OF CEREAL CHEMISTS TO MEET IN ST. LOUIS

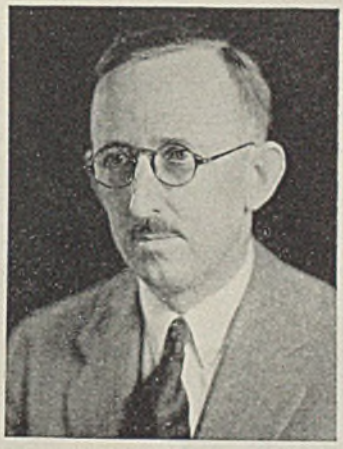
THE 29TH ANNUAL meeting of the American Association of Cereal Chemists will be held at the Hotel Jefferson, St. Louis, Mo., May 17-19. The five different phases of cereal technology that will be discussed have been classified into the following broad subjects: (1) symposium on industrial utilization of cereals; (2) agronomy and milling technology; (3) brewing and malting technology; (4) baking laboratory methods and baking technology; (5) symposium "On the Firing Line with Cereals."

One of the highlights of the meeting will be a talk on the opening day by ex-governor Herbert H. Lehman of New York on "The Problems of Feeding Starved Nations." Thirty-eight papers are scheduled for the program, and the industrial utilization of cereals is emphasized throughout.

AMERICAN CERAMIC SOCIETY HOLDS ANNUAL MEETING

THE WAR CONGRESS or 45th annual meeting of the American Ceramic Society will be held at the William Penn Hotel, Pittsburgh, Pa., during the week of April 18. Programs for the General Session are being developed and will include a number of important speakers. Douglas Whitlock of the Structural Clay Products Institute will report on the War Council of that institute. N. W. Taylor will give a report on "The Role of Ceramic Engineers in the War Effort."

Dr. Norman L. Bowen of the University of Chicago will deliver the Edward Orton, Jr. fellowship lecture on Monday afternoon on the subject of "Petrology and Silicate Technology." The Local Committee is planning a reception for Sunday night following an illustrated lecture and demonstration by Alexander Silverman on "Postwar Glasses".



Dr. R. M. Burns, new president of the Electrochemical Society

ELECTROCHEMISTS ELECT OFFICERS FOR COMING YEAR

NEW OFFICERS for the coming year elected by members of the Electrochemical Society at the 83rd annual meeting of this organization in Pittsburgh included R. M. Burns of Bell Laboratories, New York, N. Y., as president; K. G. Soderberg, Udylite Co., Detroit, Mich.; H. H. Uhlig, General Electric Co., Schenectady, N. Y., and H. E. Haring, Bell Laboratories, Murray Hill, N. J., as vice presidents.

Newly elected managers included S. Swann, Jr., University of Illinois, Urbana, Ill.; M. J. Udy, Chromium Mining & Smelting Co., Niagara Falls, N. Y.; R. H. Brown, Aluminum Co. of America, New Kensington, Pa. W. W. Winship, Thermal Syndicate, New York, N. Y., was elected treasurer while Colin G. Fink, Columbia University, New York, was re-elected secretary.

Dr. R. M. Burns, born in Colorado, received his degrees from Colorado State University and Princeton University. In 1918 he was commissioned Second Lieutenant in the Chemical Warfare Service. After the war, Dr. Burns investigated the catalytic oxidation of hydrocarbons for the Barrett Company until 1922, when he joined the engineering department of the Western Electric Co. which in 1925 became the Bell Telephone Laboratories. He is now acting chemical director of this organization.

CALENDAR

APRIL 12-16	American Chemical Society, 105th meeting, Statler and Book-Cadillac Hotels, Detroit, Mich.
APRIL 13-16	Packaging Exposition and Wartime Container Conference, Hotel Astor, New York, N. Y.
APRIL 19-23	American Ceramic Society, annual meeting, Pittsburgh, Pa.
APRIL 26-28	American Society of Mechanical Engineers, spring meeting, Davenport, Iowa.
MAY 10-11	American Institute of Chemical Engineers, 35th semi-annual meeting, Waldorf-Astoria Hotel, New York, N. Y.

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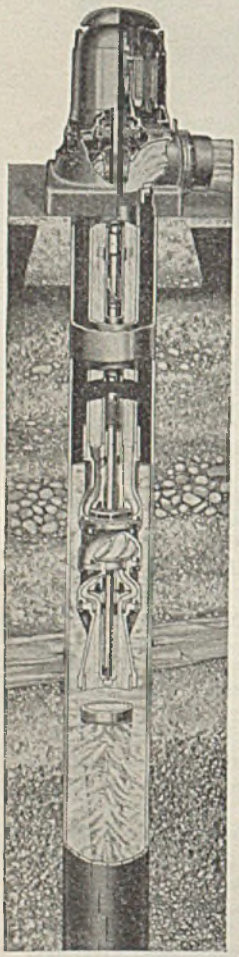

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SELECTIONS FROM CONVENTION PAPERS

DETERIORATION OF MOLASSES IN STORAGE

UNDER NORMAL conditions, interest in changes in the composition of blackstrap during storage is largely confined to distillers of molasses, whose experience has convinced them that over long periods of storage there is a slow but certain decrease in total sugars in blackstrap, and that old molasses is more difficult to ferment efficiently than that from a new crop. Under the present conditions it would seem that the most important phase of this problem is how to salvage the enormous volumes of impounded blackstrap which, as a result of overtaxed storage conditions, must either be stored in improvised facilities or diverted to waste.

Deterioration of blackstrap may be placed in the following categories: (1) bacteriological, (2) biochemical, and (3) chemical. The first may be further subdivided into (a) changes produced by mold fungi, (b) changes produced by bacteria, and (c) those produced by yeast.

At normal densities, blackstrap is practically immune from the deteriorative action of bacteria, as their maximum limits for growth are considerably below the concentration represented by any molasses. Stratification of solids in blackstrap is always operative in stored molasses, but even at its maximum the activity of bacteria would be excluded from consideration. Surface absorption of moisture would tend to provide a substrate more suitable for bacterial growth, but even here the writer has never been able to observe any measureable increase in the bacterial population.

The mold fungi can adapt themselves to limits of density not far below that of blackstrap molasses as is abundantly demonstrated in the deterioration of raw sugars when the factor of safety rises above 0.250, which connotes a ratio of non-sugar to moisture and hence a density identical with that of a low purity molasses. Taking into consideration the absorption of moisture on the surface film of blackstrap, some deterioration from the activities of mold fungi may always be expected, as regards sucrose losses at least.

Activities of the saccharomycetes are not entirely suppressed by the densities of commercial blackstraps, and slow fermentation by torulae or pseudo yeast occurs normally in these products. This fermentation is largely at the expense of the hexose sugars, but Browne has observed that these changes over long period of storage are characterized by a loss of sucrose as well as of invert sugars.

Chemical changes are believed to be operative in almost all blackstraps, and may vary in intensity from the almost imperceptible evolution of gas to the intense foaming and frothing sometimes observed in sugar factories, and always experienced in some degree in the canning of even high-grade molasses. These changes may progress over a period of years to the complete combustion of the sugars originally present and to a charring of the molasses in which they occur. Hucker and Brooks have published significant data on the factors conducing to these spontaneous changes, generally known as frothing or foaming of blackstraps.

Under the limited facilities now available for properly storing the large volumes of blackstraps accumulating in Cuba and Puerto Rico particularly, the question arises as to the minimum safeguards required for salvaging this raw material. In the previous World War a considerable volume of blackstrap was impounded in earthen reservoirs for long periods of time, and the percentage of loss incurred was much lower than had been anticipated. At that time it was supposed that the bacteriological changes in blackstrap were most costly in sugars and hence that the dangers involved in the reinfection of molasses stored in reservoirs of the above type would make such methods of storage prohibitively expensive as a result of these sugar losses. Results of these attempts at storage improvisations were less disastrous than predicted. Surface dilution had resulted in microbial development and sugar destruction, but net losses were less than had been anticipated. Furthermore, there was less evidence of foaming as a result of spontaneous decomposition of the lower layers of the blackstrap than was usual under the usual conditions of storage in tanks, owing to the lower temperatures that existed in these reservoirs.

William L. Owen, Baton Rouge, La., before the 105th annual meeting of the American Chemical Society, Detroit, Mich., April 12–16, 1943.

CHEMICAL INDUSTRY ADVANCES IN BRAZIL—CORRECTION

DR. C. F. BONILLA, author of this article which appeared on pages 96-99 of our March issue, has pointed out to us that the caption to one of the photographs provided by the Editors is misleading. The view of the Caffelite pilot plant states that it "is helping to turn out several million pounds per year of coffee-derived plastic material." Dr. Bonilla wishes to point out that this plant has not yet been put into regular operation.—*Editors.*

FURNACELESS HEATING METHODS

FURNACELESS heat-treating is not entirely new, having been introduced perhaps a decade or so ago. But due to indifference, skepticism, or unwillingness to experiment, very little has been done to develop its full possibilities until recently. There are no textbooks on the subject, and very few papers or pamphlets are available.

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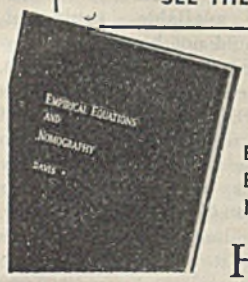

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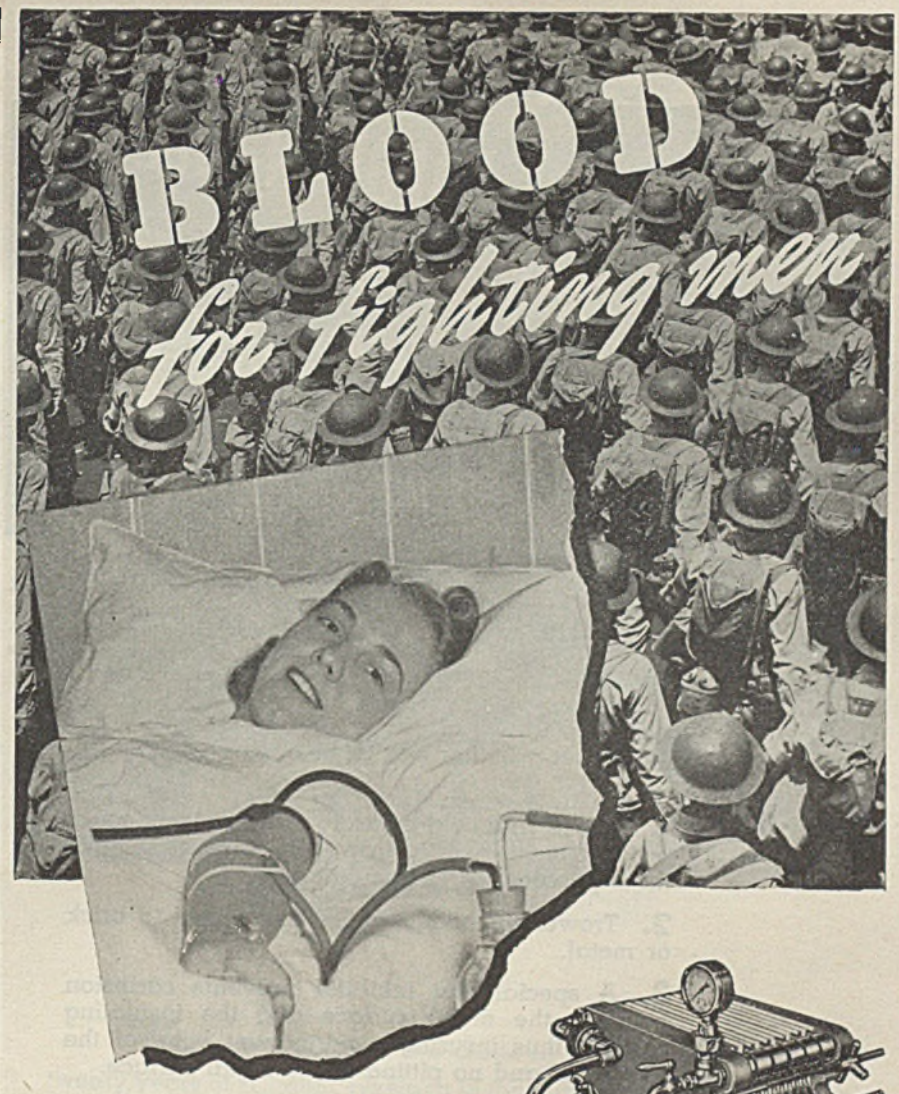

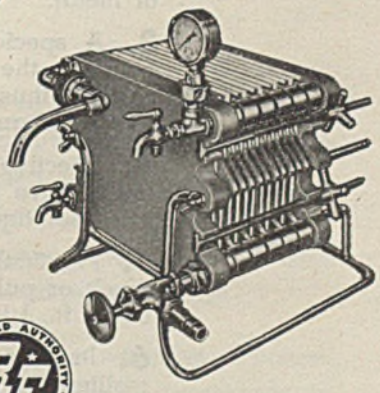

A soldier is gravely wounded. Shock . . . which took such a heavy toll in the last war . . . might set in with fatal consequences. But now his life can be saved with blood plasma, thanks to the thousands of women and men who patriotically donate their blood to that noble cause. Plasma must be finely filtered under sterile conditions. Republic Filters, with its wide experience in ultra filtration, developed a blood filter with special Republic-process sheets, which are aiding the army and navy medical staffs to safeguard human life. While Republic Filters is now occupied with war phases of filtration, our laboratory technicians are always ready to serve you.

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6. Its base is B-H Black Rock-Wool which is fine, resilient, high-fusing, light-weight, and extremely permanent.

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engineers that burners for furnaceless heating machines must use not only the convected heat from 100 percent combustion, but also should incorporate the speed advantage of radiation. That, plus still higher manifold pressures, thought to be impractical today, will probably be used in order to obtain great concentrations of heat in relatively small areas.

Recent installations using air indicate that a majority of jobs can be handled with present available equipment, whereas they could not have been a few years ago. And, with improvements, ultimately 95 percent of all furnaceless heating jobs will eventually be worked out without the use of oxygen. This can be envisioned by the fact that we now have furnaceless burners that deliver at the rate of 40,000,000 B.t.u. per hr. per cu.ft. of combustion space, whereas a few years ago it was only possible to deliver a maximum of about 4,000,000 B.t.u. per hr. per cu.ft.

The importance of furnaceless heating during the present war can readily be seen by the ever-increasing demand for "selective heat-treating" of ordnance and parts of war machines. This has been accomplished in open flame heat treat machines where time and temperature conditions of the selected sections can be finely controlled. This is in contrast to conventional furnaces which have in these cases proven unfit for the precise demands of that selection.

When peace finally comes, the enormous back-log demand for consumer goods now accumulating will call for many new applications of furnaceless heating. That is where flexible open gas burners as developed for war work can be quickly converted to the needs of peace-time goods.

Fred W. Marklin, Philadelphia Electric Co., Philadelphia, Pa., before the American Gas Association, Detroit, Mich., March 11–12, 1943.

TRINITROTOLUENE WASTES

BECAUSE of the urgent need for some satisfactory economical means of treating large quantites of T.N.T wastes, exploratory experiments on the effects of these wastes on sewage treatment devices, and on possible chemical treatment, were carried out. A typical analysis of the waste showed total solids of 1,700 p.p.m., total ash of 892 p.p.m., and only 29 p.p.m. of suspended solids.

The acidity was 1,700 p.p.m. with 610 p.p.m. of sulphates and 27 p.p.m. of nitrate nitrogen. Although the oxygen consumed value (by dichomate) was 121 p.p.m., the waste showed practically no 5-day B.O.D. Extended B.O.D. incubation tests for a period of 129 days indicated very little biological breakdown and oxidation of this waste. The waste interferes with the ordinary Winkler procedure for dissolved oxygen, though the Rideal Stewart modification may be used on dilutions of the waste up to 4 to 8 percent.

Discharge of the sellite waste with a 1 to 1000 dilution into streams which are used for public water supply would result in a color greater than that per-

mitted by the U. S. Public Health Service drinking water standard and impart an enhanced taste to the water when the water is chlorinated. This was indicated by taste tests with individuals who were unaware of the source of the water they were drinking.

Because the T.N.T. isomers and their derivatives are largely in true solution, neutralization and filtration or treatment of this waste with chemical coagulants is practically ineffective. The quantities of activated carbon required to effectively remove the colored constituents prohibit this method of treatment. Chlorination of the waste results in considerable color reduction and more work is indicated on this treatment.

Experiments in which neutralized T.N.T. waste was added to sewage and treated by activated sludge indicated that 5 percent or more adversely affected the activated sludge process, and that quantities up to almost 25 percent might be tolerated by the sprinkling filter at normal summer temperatures when dosed at a rate of 1,000,000 gal. of sewage per acre per day.

Stuart Schott and R. C. Ruehhoft, U. S. Public Health Service, Cincinnati, Ohio, before the American Chemical Society, Detroit, Mich., April 12–16, 1943.

DIMENSIONAL ANALYSIS OF ION EXCHANGE OF SYNTHETIC RESINS

WHEREAS several fundamental investigations into the character of base exchange have been restricted in large part to the study of systems in equilibrium, the study of the more practical dynamic systems has been neglected. Furnas has proposed a theory of base exchange phenomena in dynamic systems based upon the analogy to heat transfer from a gas stream to a bed of broken solids. Experimental studies have been made which permit an examination of the applicability of the theory to practical problems. The effects of ion concentration, ionic diameter, flow rate, and type of interchanging ions have been examined in a test of the fundamental assumptions of the theory. From an analysis of the concentration history of the effluent from an exchanger column, beyond the point of "breakthrough" very meaningful and useful engineering constants can be derived by the method, provided that a certain critical retention time is not exceeded.

The theory mathematically describes the concentration history in dimensionless terms which can be used to solve for the constants in a simple mechanical operation. The constants permit an engineering approach to the design of multiple countercurrent system, and may serve to characterize the members of a series of different resins. The analysis can be applied to the operating as well as the regenerating cycle.

Exchange of calcium for sodium or hydrogen by two types of resin has been analyzed dimensionally in this manner. Although the basic assumptions of the theory appear to hold for cation exchangers, in the case of acid-binding resins ("anion-exchangers") the failure

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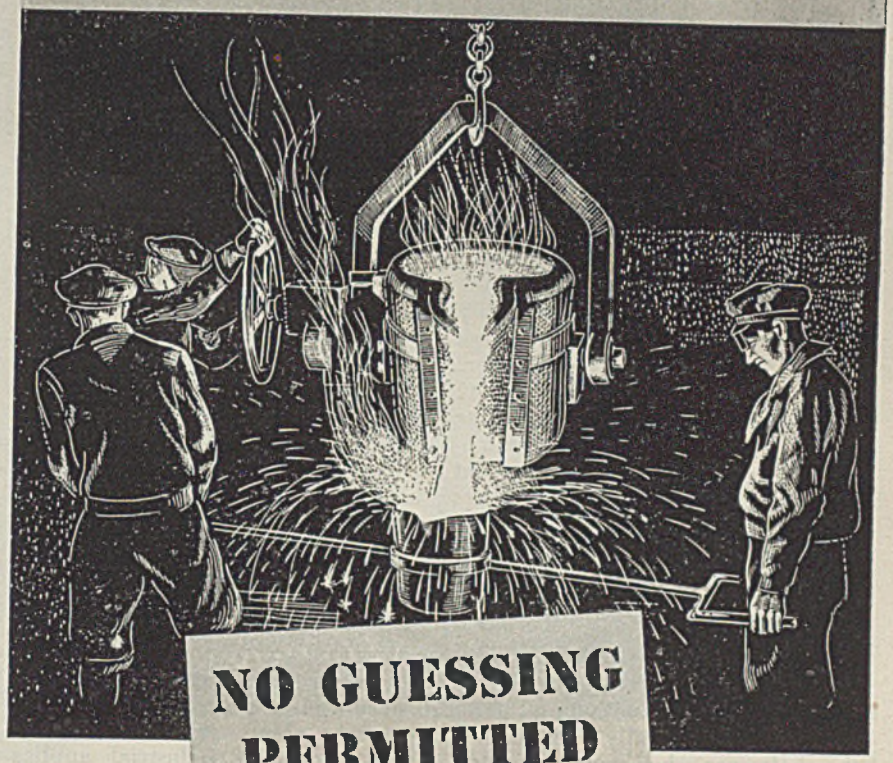

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Trouble-Free Service and Maintenance Time Saving Make This a War Time Pump . . . . . .

The drain on man-power and the need for 3-shift operation day after day call for equipment such as the Amsco-Nagle Centrifugal Pump to minimize replacements and attention.

Made in two distinct units, the water end and the bearing stand, the complete assembly has the rigidity and alignment of single unit design and the flexibility of a "tailor-made" pump. Mounting the water end on the bearing stand by means of tubular supports insures the accurate alignment necessary for easy replacement and efficient operation. The bearings are remote from the abrasive or corrosive materials the pump is handling, and no part of the pump structurally important is otherwise exposed to corrosive abuse.

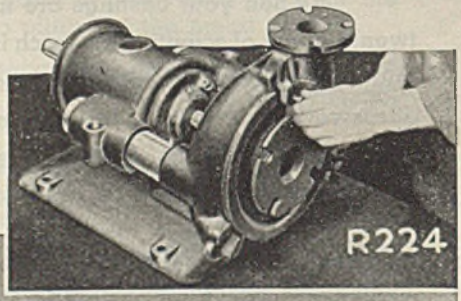
The clamp lug method of fastening the side plate in place in the casing affords quick access to internal parts. The impeller is usually screwed on to the shaft even when manganese steel or other materials difficult to machine are employed.

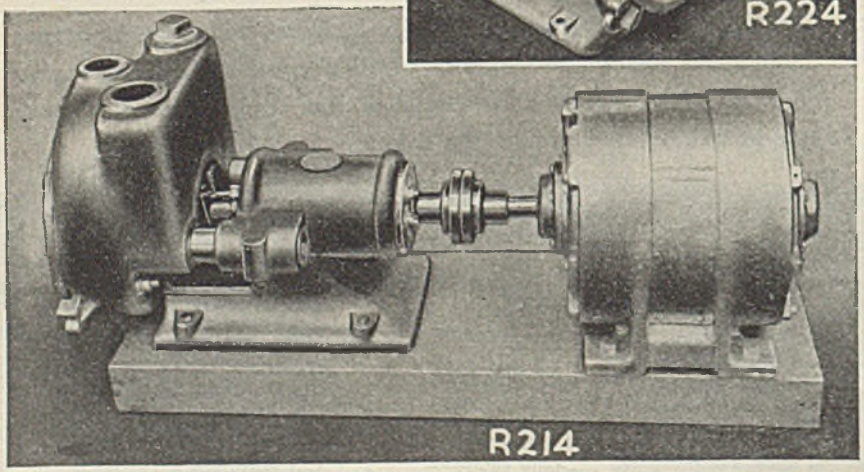
Another advantage of the Nagle design is the accessibility of the stuffing box made possible by the tubular method of assembling. Two corrosion-resisting nuts, accessible either from below or above, with abundant room for adjustment, are provided. Packing glands are made with precision to insure evenly distributed pressure and accurate adjustment. Water ends can be made of alloys suitable for almost any chemical plant application. Our many years' experience in applying impact and abrasion resistant manganese steel and heat and corrosion resistant chromium-nickel alloys, as well as non-ferrous alloys, is of value here. Amsco-Nagle pumps are made in sizes from ¾" to 16" discharge, with impellers up to 38" diameter, having capacities to 12,000 gallons per minute, and for heads up to 200 feet.

Among the oil refineries, chemical and chemical process factories, rock products plants, sand handling systems and other industrial applications where our pumps are employed, problems have been solved by these pumps very likely similar to your own.

Right: Clamp lugs permit quick removal of side plate on this Amsco-Nagle 2" type "T" horizontal shaft pump. Below: Note method of mounting unitary water end on bearing stand by means of lock-in-place tubular supports. A type "A" 1-1/2" self-priming pump.

These design features are characteristic of other Amsco-Nagle Pumps, both horizontal and vertical shaft types.





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to obtain constants from experimental data indicates that the theory may have only limited applicability in the case of the latter. However, the results indicate that the dimensional analysis of base exchange gives not only an accurate picture of the exchange reaction, but also the character of the exchange.

Robert J. Myers, Donald S. Herr, and Robert W. Attebury, Resinous Products and Chemical Co., Philadelphia, Pa., before the American Chemical Society, Detroit, Mich., April 12–16, 1943.

HYDROPHILIC ORGANIC COLLOIDS IN DRILLING MUDS

Two of the most important qualities of a drilling mud are (1) viscosity and (2) filtration of wall-building properties. Both of these factors may be profoundly affected by the addition of hydrophilic colloids.

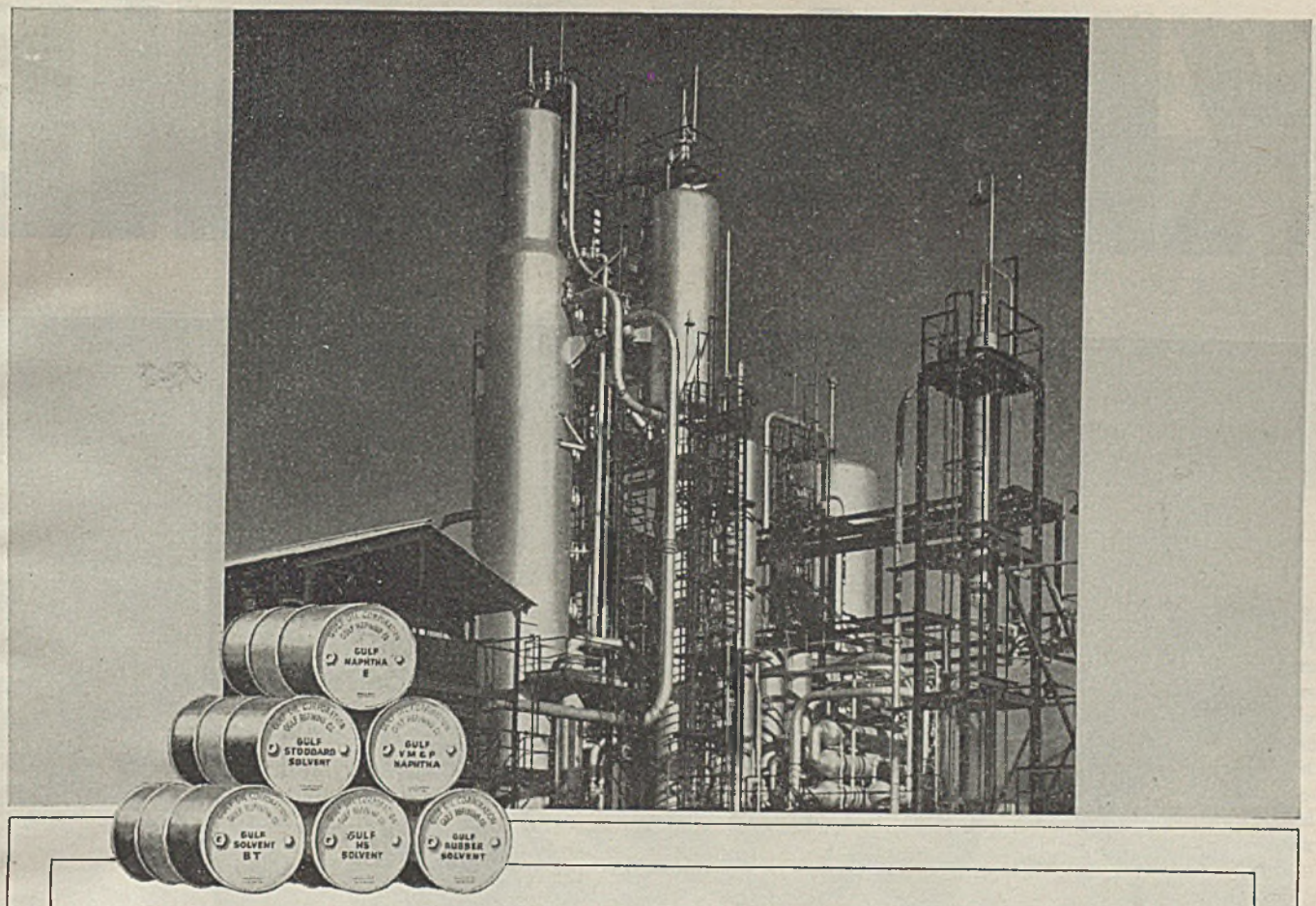
Tannin, in the form of various bark extracts, was one of the first substances used to reduce the viscosity of drilling muds. Within recent years, the deleterious effects of water loss from the mud to the formation have been recognized and efforts have been directed toward reducing filtration. Certain hydrophilic organic colloids have been found to be particularly efficacious in muds made with either fresh or salt water. These materials fall into three groups: (1) natural gums, such as tragacanth, locust bean, ghatti, and karaya; (2) sea weeds, such as Irish moss and Iceland moss, and (3) starches, such as corn, rice, tapioca and potato starch. The quantity of any particular substance needed to bring about the desired wall-building qualities depends on the character of the original mud and may vary from 0.1 to 0.2 percent by weight of the mud.

Laboratory use of these products in drilling mud has been followed by extensive application in field practice. The slight increase in cost involved in the addition of these materials to a poor mud is more than offset by freedom from stuck drill pipe and ease in running casing, without considering the important but less easily evaluated factor or invasion of producing formations by water from the drilling fluid. Qualitatively, the latter benefit is evident in cores, which show far less flushing than when cut with ordinary mud; and the difficulty of bringing low-pressure wells into production is reduced.

George R. Gray, Baroid Sales Division, National Lead Co., Houston, Texas, before the American Chemical Society, Detroit, Mich., April 12–16, 1943.

• • •

The administrative chemical engineer must know how to appraise, not only his technically trained personnel, but those who are charged with accounting and administrative responsibilities, as well with sales responsibilities. Each must understand and appreciate the value of both theoretical and applied research must be able to quickly adapt to his requirements the new development of a fundamental nature in physics and in chemistry, more especially in the various branches of applied physics which we call engineering.



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Too often, however, the full benefits of centrifuging are lost without the engineering skill that is "King of the Whirl".

For instance, in one case the power factor seemed out of line with production. AT&M engineers cut this manufacturer's filtration time in half . . . saved power, too . . . when they found he was running his centrifugals too fast for best results. Four hundred times gravity, *rightly engineered,* did more than eight hundred could do.

In hundreds of other cases, special designs and recommendations from AT&M engineers have enabled men like yourself to get more from their centrifugals than they previously thought possible, save chemicals, cut production time and make better use of available floor space.

Today, though our engineers and facilities are heavily pledged to war production, we will welcome the opportunity to place our experience at your disposal for future planning, as national needs permit. Write us. We keep strict confidence. Address 1415 Hyde Park Ave., Boston, Mass., or 30A Church St., N. Y.

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A T & M's 3-War Veterans

Pattern-Maker, 1875 to 1943

Ed Radford, age 87, who has worked continuously with A T & M since 1875, is one of our veterans from three of America's wars. Foreman of the pattern shop for 45 years, he works to measurements of 1/64th-inch, without glasses. His "kid brother", only 82, is a machinist in a nearby plant. Their father was once President of A T & M.

Back after 48 Years

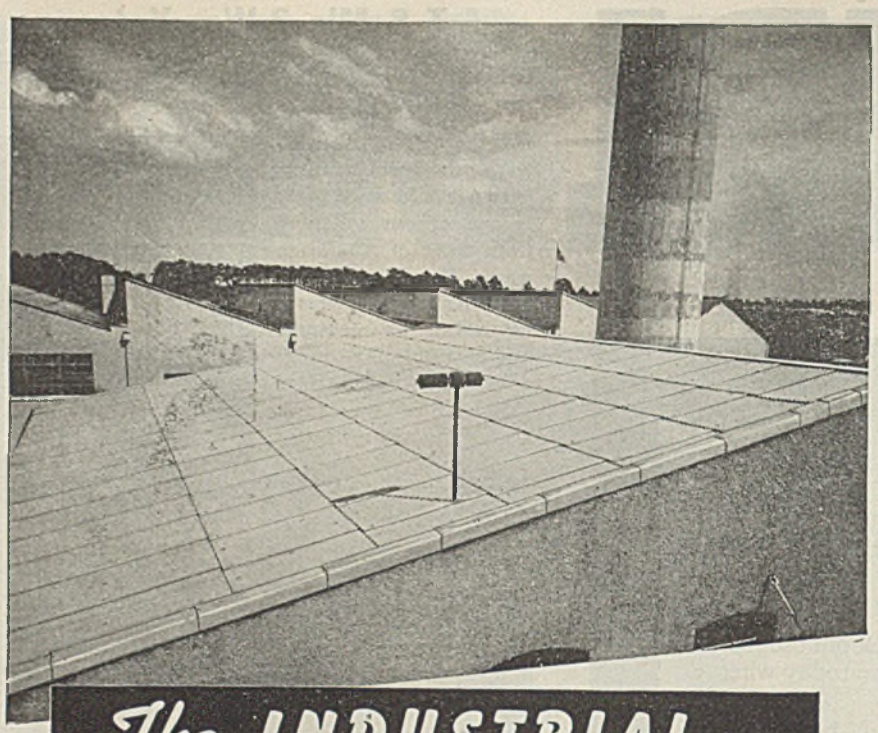
Jim Powers, age 72, started at A T & M 51 years ago. After 48 years in woodworking, carpentry, textile machinery manufacture, he came back to A T & M last year, putting his experience at drilling and general machine work once again into war production.

He Remembers the Gas Lights

Pat Brown, plant electrical engineer, is 74. When he began work with A T & M 50 years ago, the plant was lighted with gas. Pioneering at the very beginning of the electrical age, from 1910 to 1913 he and a Harvard professor developed electrical controls for A T & M centrifugals — used in both World Wars to manufacture smokeless powder.

Answers "Call to the Colors"

Another of A T & M's 3-war veterans, Joseph Groves, decided to retire in 1930 after 38 years with a box machinery company. He was then 61 years old. Today, at 74, he brings his first-class machinist's skill to A T & M, where once again he is on industry's firing line.



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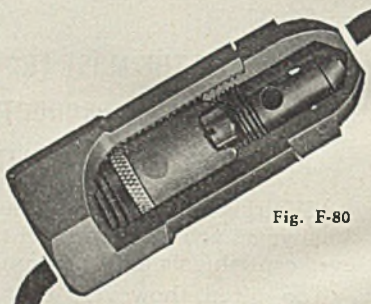

Fig. F-80

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NEWS FROM ABROAD

GENERAL PURPOSE PAINT SUGGESTED AS MAINTENANCE MEASURE IN GREAT BRITAIN

Special Correspondence

PERSISTENTLY high activity is reported from all the major sections of the British chemical industry, and markets retain a very firm appearance while large quantities of chemical products move into consumption. The increase in output has had the result of larger supplies of byproducts becoming available, and where these are not earmarked for essential purposes, somewhat larger quantities have been placed at the disposal of ordinary consumers. This applies, for instance, to certain otherwise neglected coal-tar products. On the whole, however, British chemical manufacturers find it difficult to meet the most urgent demands from essential consumers and have no supplies left over for civilian needs which are not directly connected with the war effort.

Yet there are civilian demands which, though not essential for the war effort, cannot be neglected in the long run. Serious damage to house property owing to neglect of maintenance painting has been reported and led to the suggestion that a general purposes paint should be made and distributed for domestic use. A provisional arrangement for the supply of limited quantities of linseed oil for such paint has been made by the Minister of Supply, and other important raw materials are also to be released for this purpose. Limitation to one kind of paint for all purposes is to help saving raw materials, labor and plant, but it is clear that such a general purposes product will be based largely on raw materials which are not in short supply and thus be of the nature of a substitute product.

"Utility" products of this type are now making their appearance in several British civilian markets and have generally met with a ready reception by consumers. In the textile industry these "utility" materials require a minimum of dyestuffs. Designers have been asked to use light shades as far as possible, and preference is shown for materials in simple colors which do not require special dyes the manufacture of which entails much labor. It has even been proposed to extend the range of "utility" products to the field of fuels. The Scottish Regional Fuel Efficiency and Economy Committee, one of a number of similar bodies in various parts of Great Britain, suggests that small-sized fuel materials such as anthracite and bituminous duff, gas coke breeze, slurry, smoke-box char, etc. be blended with ordinary boiler coal to provide a "general utility fuel". There is no doubt that the chemical industries could broaden their fuel basis considerably by using such a mixed fuel, but if a strain on transport is to be avoided, variations will have to be made according to the materials available in different regions.

In any case it is realized that the industrial chemist is able to play a prominent part in the solution of these and other war problems, and with the increasing interest in industrial research all around it is not surprising that professional organizations pay greater attention to the task of systematic research in war and postwar industry. "The planning of science" itself has been discussed by the Association of Scientific Workers, and the information given with regard to the chemical industry is at least an encouraging indication of future possibilities. A. Dooley, who reported on the position in the chemical industry, stated that in certain fields there was already an improved exchange of information between firms engaged on similar work, as was shown by the collaboration of pharmaceutical manufacturers, for instance, in the development of bacteriostatic materials such as penicillin. A full exchange on anti-malarials was now taking place between the United States and Great Britain, and there was improved linkage of technical establishments in the British chemical industry and government departments. Agreements had been concluded in certain cases for the provision of technical facilities and liaison by specialist teams and laboratories. Recognition was developing of the need for joint consultative committees to stimulate energy in personnel. An "efficiency committee" of chemists, laboratory assistants, and management had just been formed on an elected basis in a research department at Billingham.

Postwar Planning

While these measures which fit into a bigger plan for the utilization of scientific and expert knowledge under the direction of the Government for purposes of the war effort are mainly concerned with immediate industrial problems resulting from import difficulties, raw material shortages, plant limitations, and need for full utilization of available scientific personnel, there is going on at the same time a process of preparation for postwar development. It is being realized that, since so many British industries have had to curtail their activities in order to release labor, plant and raw materials for direct war work, preparations must be made

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Since June 1941, Armstrong's Corkboard and Cork Covering have been reserved for important war jobs where their high insulating efficiency, dependable long-service life, and structural properties were vitally needed. The same characteristics that made cork insulation materials the first choice for war jobs, make them the best value for your requirements.

Armstrong's engineers will be glad to give you the full benefit of their long experience in handling insulation problems. For complete information about Armstrong's Insulations—Corkboard, Cork Covering, Mineral Wool Board, and Foamglas—write Armstrong Cork Co., Building Materials Division, 3304 Concord St., Lancaster, Pa.

ARMSTRONG CORK COMPANY

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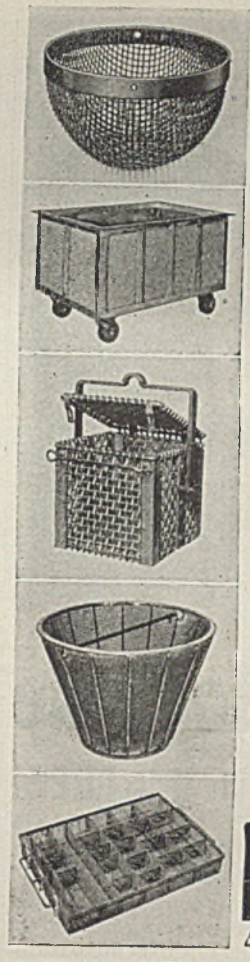
before the end of the war for the redistribution of plant and labor to civilian purposes after the war. This redistribution will not in all cases be identical with a return to conditions such as existed before the war. Telescoping and concentration have ended the existence of many small firms, thus anticipating a development which was bound to take place in any case, though in different circumstances it might have taken a longer time. The adaptation of plant and organization to the production of different products at short call is also a feature which chemical manufacturers will have to regard as more or less normal in the days of peace to come. Cooperation in research and development, reliance on government encouragement and support, contact with scientific laboratories for initiative and advice will certainly be features of future chemical industrial work.

The Board of Trade has now begun an investigation into the prewar position of fifty-two important British trades —including the chemical trades—in order to forecast how development is likely to continue after the war. This investigation has several objects. It will give some idea of the demand for skilled workers and thus provide a basis for re-training of industrial workers now with the services. It will show where and when the extension and repair work omitted during the war should be made up. But it will also allow to make early and suitable use of the wealth of new knowledge which has accrued to industry during the war. In the same direction, points the work of various research organizations and of regional interests. Thus the Scottish Council on Industry has decided to include plastics and fine chemicals in the drive for new industries which is to be made after the war.

Larger Use of Glass

Glass is now meeting with increased interest, partly owing to the shortage of other strategic materials and partly owing to the gradual spread of knowledge about progress in the glass industry during the past fifteen years. By a new British process plate glass is rolled continuously some twelve feet wide, simultaneously ground and polished on both sides. All sorts of differently-shaped articles are now being made entirely by automatic machinery. Conversion into flakes and drawing into threads as fine as silk is carried out at a speed of some 6,000 feet per minute, for use in filtering and for insulation. Since modern processings of tempering have greatly increased the mechanical strength of glass, it is being used on an increased scale for transparent pressure chambers, for high-power electric insulators, as a base on which to spray metal for grids as used as electric radiators, for the tops of hot stoves, in laminated glass plastics, for metal-filament electric lamps, etc.

The British synthetic rubber position still leaves much to be desired. The Director of Tires, under the Rubber



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On the Job
Over 3 Years —and no repairs!

THE PROBLEM: To increase boiler capacity without investing in new boilers and enlarging the building.

SOLUTION: The boilers were built down and fire box capacity increased. A ½-ton *Reading Electric Hoist* with built-in trolley was installed.

RESULT: Boiler capacity boosted ⅓ and ash handling speeded, without adding to the building.

When this **Reading Electric Hoist** *had been on the job for three years, the Plant Manager said, "We have had no repairs on the hoist, just regular oilings."*

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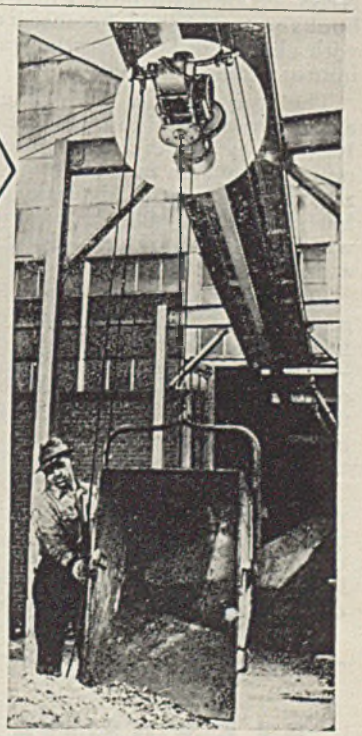

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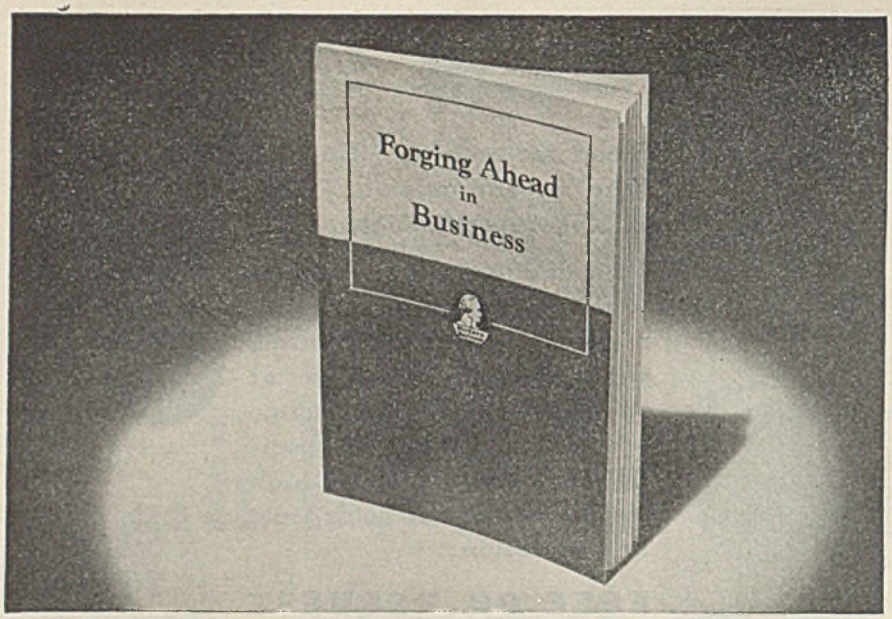

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. . . to the future and improve your product today. Check these recent discoveries . . . they may help solve your problem.

DUROCER

A hard, high melting, synthetic wax, that is heavier than water.

Color	Light tan
Sp. Gr.	1.05 (25°C)
Melting Range	120–127°C
Hardness	Close to Carnauba
Acid Number	15
Luster	Fair

SOLUBLE IN

Hot toluol, naphtha, turpentine and oils. These solutions form gels on cooling.

USES

Insulation, record waxes, waterproofing polishes, etc.

ACRAWAX C

A very high melting synthetic wax.

Color	White—Light tan
Sp. Gr.	0.98 (25°C)
Melting Range	137–139°C
Flash Point	285°C
Sap. Number	21
Hardness	Fair (Non-Brittle)
Luster	High

SOLUBLE IN

Hot hydrocarbon and terpene solvents. Solutions in hot toluol, naphtha and mineral oil gel on cooling.

USES

Acrawax C (10–15%) prevents crystallization of rosin-paraffin wax mixtures and improves their flexibility and coherence. Certain proportions will also improve adhesiveness considerably.

As little as 1% of Acrawax C will prevent tackiness of polyvinyl butyral and other synthetic coatings, on raincoats, life-belts, etc.

• • •

Textiles and paper can be waterproofed with this versatile wax. Such coatings will not be affected by boiling water or direct exposure to the heat of the tropical sun.

It is also used as a lubricant in plastic molding powders, sintered bearings, etc.

It will pay you to investigate these new synthetics. They may aid you in improving your products and enable you to make new and useful products.

Samples and literature describing them are yours for the asking.

If you do not have a copy of our 1942-43 catalog of synthetic waxes, resins, emulsifiers, wetting agents, substitutes, etc., ask for our complete catalog.

GLYCO PRODUCTS COMPANY, Inc.
247 King St. BROOKLYN, N. Y.

Controller, stated recently that Great Britain had already received some synthetic rubber from the United States for experimental purposes, and a small number of motor car tires had been made entirely from synthetic rubber. During his recent visit to America he went over two of the big synthetic rubber plants, but he did not think they were yet producing up to the most optimistic schedule. He thought there was very little doubt that the output of synthetic rubber would be very substantial, but it would be forthcoming a little later than was originally hoped. It had not yet been possible to make the larger tires entirely from synthetic rubber. Britain was working in the closest possible cooperation with the American rubber technologists, and the results of experiments in making tires from synthetic rubber were pooled. Examination of tires from captured German vehicles showed that Germany also had not yet solved the problem of making large tires entirely from synthetic rubber.

The motor fuel problem is still very urgent, and the authorities have made further inroads on permitted road transport in recent months. Among substitute fuels, producer gas now plays quite an important part, all the more obvious to the general public because of the producer plant which is either carried in the place normally reserved for the ordinary motor or drawn by the vehicles as a small trailer on two wheels. Of 11,615 road vehicles running on alternative fuels 1,504 are running on producer gas. Electricity is far more important and accounts for 6,412 vehicles, while about 1,200 run on coal gas and 1,400 on creosote. All these alternative fuels are intended as substitutes for the emergency, and there is no intention yet to retain them after the war, even though careful calculations by important road transporters have shown their efficiency at present prices. In this respect British plans differ from those in countries on the Continent of Europe, where not only Germany and the countries occupied by German troops but neutral countries like Sweden and Switzerland have taken advantage of the producer gas plant for making use of their large forests for the supply of a road transport fuel. If the generator obtains a safer hold in Great Britain, it will be by use of fuels derived from coal. Creosote and other coal products which are still available in substantial quantities and used to be produced in larger tonnages than required before the war would no doubt profit greatly could the use of mobile producer gas plants be continued after the war. Conversion to the use of such fuels is difficult at present owing to limitation of labor and material.

ARGENTINE OILSEEDS EXPORTS EXPECTED TO DECLINE

Argentine exports of both sunflower seed and oil increased notably in 1942, but will be curtailed in 1943. Shipments of seed totaled 34,841 tons, or double the 17,537 tons exported in 1941. Preliminary figures indicate that 63,860 metric tons of sunflower-seed oil were exported in 1942, compared with 11,909 tons in 1941, an increase of more than 400 percent.

Argentina's 1941-42 sunflower-seed crop amounted to 645,100 metric tons according to the last estimate of the Crops Estimates Division of the Ministry of Agriculture. Domestic requirements of seed and oil (using the seed equivalent) are estimated at 310,000 metric tons, and exports from April 1, 1942, through February 18, 1943, are estimated at 240,000 tons. Since carry-over from the 1940-41 crop was negligible, this would leave an apparent exportable surplus of 95,000 metric tons, as of February 18, 1943.

The trade believes, however, that the exportable surplus is not less than 150,000 metric tons, and may be as large as 250,000 tons. This bears out the general belief that the 1941-42 crop actually was close to 800,000 metric tons, or more than double the record 1940-41 crop.

The 1942-43 crop will not be good. Growers had expressed the intention of equaling or surpassing the 1941-42 acreage, but, because of drought at planting time, the area planted was reduced from 1,875,000 acres to about 1,637,000 acres. Growing conditions for the new crop have been extremely unfavorable because of prolonged drought, and yield prospects are very poor.

In view of the possibility that the new crop might not be sufficient, even for domestic requirements (about 300,000 metric tons), the Minstry of Agriculture on February 10, 1943, prohibited the export of sunflower seed or sunflower-seed oil except to fill contracts already made.

CHEMICAL PRODUCTION MAKES HEADWAY IN INDIA

Chemical production has recently shown considerable progress in several of the Indian States.

To provide a steady and increasing flow of supplies to the Defense Services and to meet essential civilian needs, the Mysore State Government has established a Board of Industrial Planning and Coordination. Several State-aided industries have been formed in Mysore during the last 3 years for the production of chemicals and fertilizers.

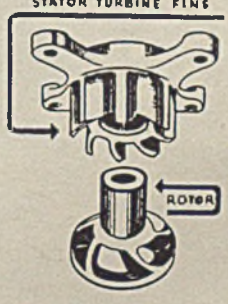
The entire output of Mysore Chemicals and Fertilizers, Ltd., has been placed at the disposal of the Government for war purposes. A Government factory provides the bichromate required for khaki dyeing and for tanning, while synthetic ammonia and ammonium sulfate are supplied by another factory.

The manufacture of chemicals is the second largest industry in the State of Baroda. Although one of the large heavy-chemical plants has not yet started production, because of delays in obtaining machinery, the output of

(*Continued on page* 194)

S-T-R-E-T-C-H
Man Hours

WITH
HOMO-MIXER'S
ADVANCED PRINCIPLE



INDUSTRY must win the race against time! But more than a great time-saver is the Eppenbach HOMO-MIXER. It's also engineered for finer diffusion.

Its principle is wholly different. There is no vortex, no air to affect the mixture. Only a fraction of the mass is worked at one time, creating more uniform dispersion. The material is rapidly forced up from the air-free bottom by the stationary turbine fins. With tremendous pressure and turbulence, the flow surges upward, outward and down. The entire batch completes this cycle in just a minute or two. No clamping to tank, no setting at angle, no vibration.

HOMO-MIXERS are doing a big job in process plants today — batteries up to a hundred! Write us!

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Processing Equipment for Over 30 Years
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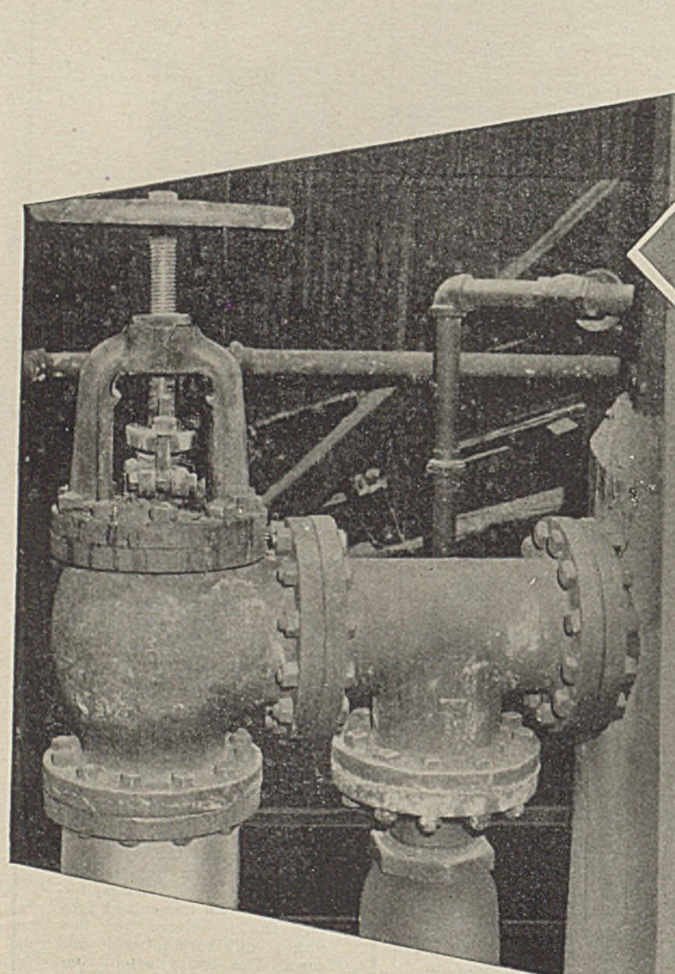
LONG ISLAND CITY, N. Y.

This is the 2ND in a series of messages



2a THE PROBLEM

Insulation of an 8" T and valve.

2b THE SOLUTION

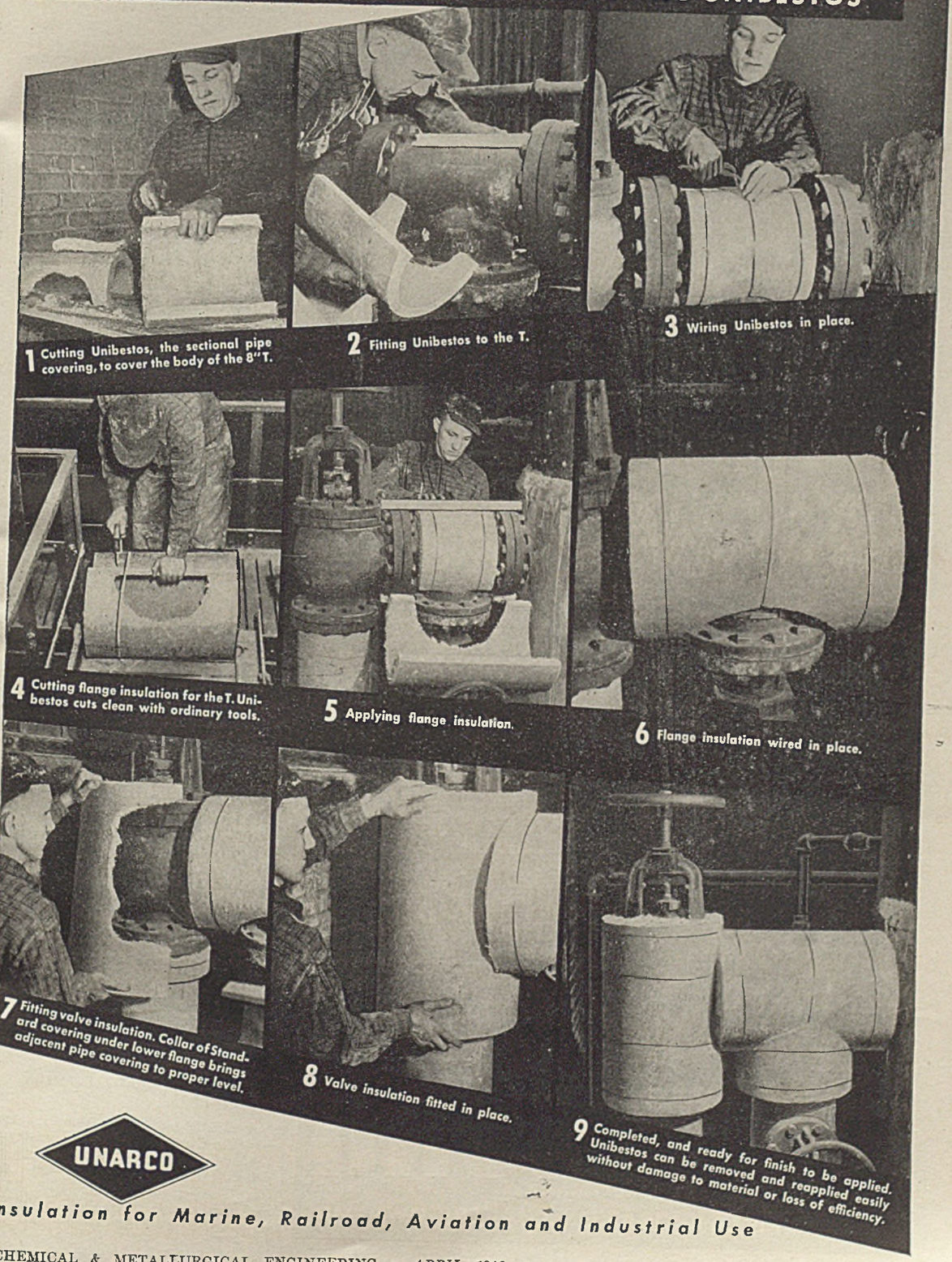
Application of Unibestos, the sectional pipe covering. Unibestos is available in Standard material for temperatures up to 750°; Super, with a temperature limit of 1200°; Combination, with a temperature limit of 1200°. These temperature limits permit the use of one material at maximum efficiency for a wide range of purposes. Unibestos is available in half sections up to 30" pipe diameter and from 32" to 60" in quadrants from ¾" to 5" in thickness. Standard and Super Unibestos are available in single layer construction with provision for expansion in piping, where required.

TWO ARMY-NAVY "E" AWARDS FOR EXCELLENCE IN WAR PRODUCTION
ONE TO THE CICERO, ILLINOIS PLANT; ONE TO THE PATERSON, N. J. PLANT

UNION ASBESTOS & RUBBER CO.

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

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



1 Cutting Unibestos, the sectional pipe covering, to cover the body of the 8" T.

2 Fitting Unibestos to the T.

3 Wiring Unibestos in place.

4 Cutting flange insulation for the T. Unibestos cuts clean with ordinary tools.

5 Applying flange insulation.

6 Flange insulation wired in place.

7 Fitting valve insulation. Collar of Standard covering under lower flange brings adjacent pipe covering to proper level.

8 Valve insulation fitted in place.

9 Completed, and ready for finish to be applied. Unibestos can be removed and reapplied easily without damage to material or loss of efficiency.

UNARCO

Insulation for Marine, Railroad, Aviation and Industrial Use

VITAL "Air Wardens" of INDUSTRY

PANGBORN Dust Collectors are silent sentinels standing guard over large and small industrial plants.

Wherever dust is produced they quickly, efficiently and economically collect it at its source—protecting your products, your equipment and your working conditions.

Don't fool yourself about DUST. It is a BIG problem in EVERY PLANT. Yet it can be CONTROLLED. For interesting data and bulletins "COME TO PANGBORN"—and get valuable facts about these vital "Air Wardens" of Industry. No obligation, of course.

PANGBORN

WORLD'S LARGEST MANUFACTURER OF DUST COLLECTING AND BLAST CLEANING EQUIPMENT

PANGBORN CORPORATION • HAGERSTOWN, MD.

pharmaceutical chemicals has been considerably increased.

Chemicals are also being produced in Bhavnagar.

LARGE SHIPMENTS OF NITRATE OF SODA FROM CHILE

Consumption of Chilean nitrate is on the upgrade, according to reports to the Department of Commerce.

During the fiscal year ended June 30, 1942, about 700,000 metric tons of nitrate were shipped to the United States, and it is expected that shipments will be more than twice that figure in the year 1942-43. If that estimate is realized, the current nitrate year will show the highest figure since 1920, when the United States took 1,480,519 tons.

Exports of nitrate to the United States reached their greatest total during World War I, in 1918, when 2,066,483 tons were shipped; in 1932 shipments declined to 56,482 tons.

Total exports of nitrate from Chile amounted to 1,397,550 tons in 1941, compared with 3,193,751 in 1929, a peak year.

Post-war prospects for the Chilean nitrate industry show promise, it is stated. Lands in Europe, overcropped and damaged by war, will need large amounts of fertilizer, it is believed.

ITALY INCREASES OUTPUT OF INSECTICIDES

The Rumianca Chemical Co. at Turin, Italy, in an effort to replace copper sulfate, has started production of insecticides on a large scale, according to the European press. Two new products, namely Cupramina and Ramital, have proved satisfactory substitutes, it is stated.

A compound, known as Granovit Rumianca, has also been developed. It has a base of mercury instead of copper and can be used for disinfecting seed grain.

SWEDISH PLANT PRODUCES OIL FROM SHALE

The shale-oil plant at Kinne-Kleva (Kinnekulle) in the Province of Vastergotland, Sweden, owned and controlled by the Swedish Naval Authorities, has been in operation more than a year and a half, and now produces about 30,000 metric tons of fuel oil a year, chiefly for the Swedish Navy.

Recently, a new test plant at Kinne-Kleva has started the production of light-benzine, utilizing a gas of high quality which, together with shale oil, is obtained from the shale distillation process. A new plant has also been built at Kinne-Kleva for the experimental manufacture of gas oil.

CAUSTIC SODA CARTEL FORMED IN GERMANY

A caustic soda association has been set up in Germany under the Ministry of Economics, according to the European press. All soda producers must become members of the association. The new organization will handle marketing problems, it is stated.

DIGESTS OF FOREIGN LITERATURE

ACTION OF COLLECTING AGENTS IN FLOTATION

COLLECTING action of ionic agents of the xanthate type is believed to involve chemical interaction of the collecting agent anion with the dissolved cation of the mineral. This forms insoluble precipitates of heavy metal xanthogenates in the pulp, and these adhere to the floatable sulphide particles. In order to prove this assumption, experiments were conducted on the flotation of sulphides obtained separately and then purposefully introduced into pulp containing precipitates of the corresponding heavy metal xanthogenates. It was found that flotation results were the same whether a precipitate of metal xanthogenate was introduced into the pulp or a xanthate as in normal flotation procedure.

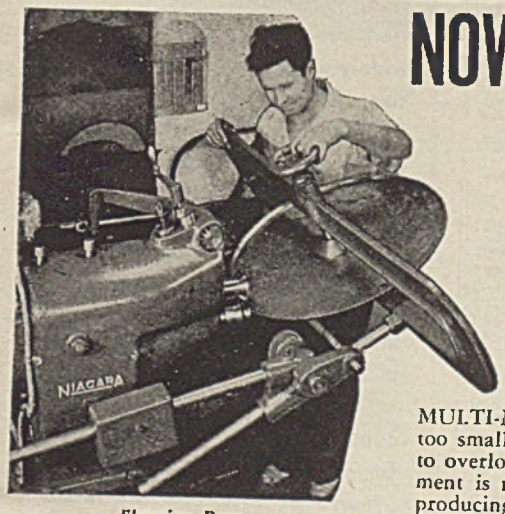
Experiments were also conducted on the wettability and flotation of the polar, non-metallic minerals calcite, barite and fluorite, in order to determine the action of the soap-type collecting agent. It was found that the collecting action of soaps is more complicated than that of the xanthate and is controlled by at least two factors: formation of insoluble soap precipitates with cations of the floatable minerals, and the additional action of the free fatty acid formed on hydrolysis of the soap. Tables in the text give methods of flotation, medium collecting agent in g. per ton, terpineol in g. per ton and the resulting extraction in percent for these three non-metallic minerals as well as for certain sulphides.

Collecting agents used in the flotation of soluble salts such as sodium and potassium chlorides, are either insoluble is saturated aqueous salt solutions or form insoluble precipitates with cations of the activators, the salts of heavy metals. In the flotation of soluble salts with fatty acids in the absence of activators, sodium and potassium soaps separate out due to the high concentration of electrolytes in the pulp. Therefore, in flotation with ionic collecting agents of the xanthate or soap type, the collecting agent in the pulp is always in an insoluble form no matter whether it is a sulphide, a polar non-metallic mineral or a soluble salt that is being floated.

Digest from "The Mechanism of the Action of Collecting Agents in Flotation," by M. E. Lipetz, *Zhurnal Phisicheskoi Khimii* 16, No. 1-2, 59-71, 1942. (Published in Russia.)

CALCINATION OF MAGNESITE

MAGNESITE is calcined to produce either caustic magnesite for preparation of plastic cement containing 3-4 percent CO_2, or dead-burned magnesite for preparation of refractory materials containing approximately 0.5 percent CO_2. Methods of calcination vary according to the manufacturer, but the furnaces can be



Flanging Pans


Welding Pipe Line Strainers

NOW FABRICATING

A Wide Variety of Process Apparatus Parts

MULTI-METAL is a medium sized plant—not too small to lack proper equipment—or too big to overlook your exacting requirements. Equipment is modern and of the highest quality for producing a variety of work in wire and filter cloth, also light sheet metal work requiring:

Cutting	Punching	Bending
Roll Forming	Welding	Soldering
Wire Stitching	Brazing	Assembling

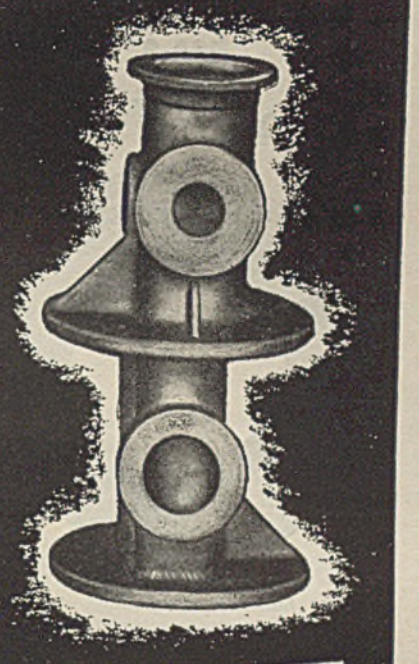
Send us your specifications. You will get an intelligent answer promptly.


All Stainless, pressure filter leaves

MULTI-METAL WIRE CLOTH COMPANY
INCORPORATED
1360 GARRISON AVE., BRONX BORO, N.Y.

WIRE CLOTH
FILTER CLOTH
ALL MESHES
ALL METALS

Stainless Steel Castings



RESISTANT TO CORROSION, ACID, HEAT, ABRASION

Stainless steel alloy castings are recommended when corrosion is a factor to contend with. Atlas metallurgists have developed a most accurate method of determining the analyses best suited to individual requirements. Many Atlas foundrymen have been specializing in alloy steel castings for over twenty years. Their experience together with every known modern facility has been assembled for making the highest grade of corrosive, heat and abrasive resistant castings. Consult with us when your product is in the layout stage—our engineers can minimize your design problems.

Write for bulletin

ATLAS

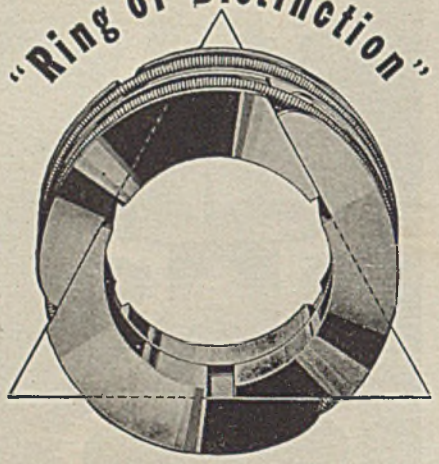
STAINLESS STEEL CASTINGS

Division Atlas Foundry Co.

540 LYONS AVENUE IRVINGTON, N. J.

FOR THE DEFENSE OF DEMOCRACY
THE BEST IS NONE TOO GOOD

FRANCE PACKING
has a
"Ring of Distinction"



Imitated but never duplicated, the France ring is manufactured in three sections. The contacting faces form the lines of an equilateral triangle. As the ring is expanded or contracted, the sections must move in or out radially equal distances from the center of the rod to which the ring is fitted.

This fundamental mechanical principal accounts for the efficiency, trouble-free performance and extra-long life of France Metal Packing.

After years of service, when the rings have become worn to such an extent that the sections nearly butt together, further years of additional service can be obtained by cutting off the narorw points of the three sections where they form a part of the inner circumference of the ring.

The spring then requires adjustment so that the sections are held to the rod with a slight tension.

For installation in engines, pumps and compressors—under all conditions of service, France Full-floating Metal Packing means true economy in the long run.

Permit France Engineers to analyze your packing requirements. Write for Catalog M-4.

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Original
FRANCE
METAL PACKING

divided into three principal types: (1) bottle-shaped furnaces, (2) vertical furnaces similar to lime kilns, and (3) rotary furnaces similar to those used for Portland cement.

Caustic magnesite is obtained by calcination at a temperature of 700-1,000 deg. C. It contains 72-90 percent MgO, 2-6 percent CaO and 3-15 percent SiO_2, and is usually pulverized so that 75 percent goes through a 200-mesh screen and 97 percent through a 100-mesh screen. Dead-burned magnesite is obtained by calcination at 1,450-1,500 deg. C. if it has a high iron content, and at 1,600-1,700 deg. C. if the iron and other impurities are low. The completely burned product is dense and dark-colored. Pure magnesite is sometimes calcined in electric furnaces at more than 1,700 deg. C. and is converted into a hard mass known as electrically fused magnesia or artificial periclase.

Digest from "Magnesite," by Manuel Munoz Lumbier, *Boletin de Minas y Petroleo* 13, No. 10, 3-10, 1942. (Published in Mexico.)

MEXICAN MINERAL PRODUCTION

ACCORDING to the contract of July 15, 1941, the United States guaranteed to buy during a period of 18 months, all of Mexico's excess exportable antimony, arsenic, bismuth, cadmium, zinc, cobalt, copper, fluorspar, tin, graphite, manganese, mercury, mica, molybdenum, lead, tungsten and vanadium, either as the mineral, concentrates or in the metallic state. On the whole, Mexican exporters will continue to deal directly with their clients in the United States. As a result of this stimulation to production, mineral output in Mexico was increased during the year, as shown by government figures. Total Mexican mineral production for 1941, with values, is shown in the accompanying table.

Mexican Mineral Production, 1941

Products	Kilograms	Value in Mexican Pesos
Gold	24,882	136,005,474
Silver	2,437,392	133,070,865
Copper	48,715,534	50,359,014
Lead	155,258,933	102,138,443
Zinc	154,996,110	128,711,248
Antimony	11,131,893	16,923,271
Graphite	16,928,427	1,500,719
Mercury	797,623	20,078,285
Arsenic	12,843,954	4,988,840
Cadmium	906,577	9,057,127
Tin	215,866	1,136,040
Molybdenum	869,578	4,246,959
Vanadium	598	1,764
Manganese	979,413	308,552
Bismuth	97,971	1,311,153
Tungsten oxide	91,095	1,191,884
Iron	71,612,521	2,989,592
Chromium	12,042	3,613
Coal	855,696,787	17,234,550
		637,257,393

Digest from "Mining Activities in Mexico during November and December of 1941," *Boletin de Minas y Petroleo* 13, No. 4, 3-5, 1942. (Published in Mexico.)

BRAZILIAN SALT INDUSTRY

ANNUAL capacity of the Brazilian salt industry is 750,000 m. tons, all from solar evaporation of sea water. Production costs range from Cr. $15 to 60 per m. ton. (Cr. $1 is roughly equivalent to 5c. U. S.) The lowest figures are in the northern dry equatorial states, the highest near Rio. Bagged Northern salt deliveries in Rio are at about Cr. $220 per m. ton, 41 percent being ship-

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Complete
Reference
CATALOG on

Stearns
MAGNETIC
PULLEYS

For protection, concentration, reclamation and purification, magnetic pulleys are most widely used due to their flexible size range, ready adaptability to conveying systems, automatic and economical operation and other features.

The Stearns air-cooled (for more power) Magnetic Pulley is the result of many years' intimate association with problems in all industries—of pioneering advancement in design and construction. There is a reason for the popular acceptance of Stearns pulleys. Get the facts. Write for Bulletin 302.

Separators
Drums
Rolls

Clutches
Brakes
Special
Magnets

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629 S. 28th St., Milwaukee, Wis.

STEARNS-MAGNETIC
MILWAUKEE

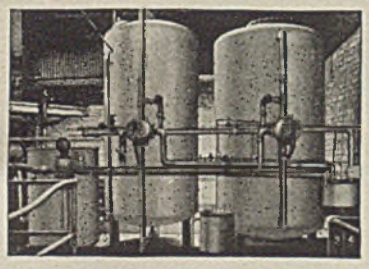
BOILER FEED-WATER TREATMENT

ENGINEERED BY ILLCO lowers operation costs!

Economical to install, easy to operate, *external* treatment plants have been engineered by ILLCO for a wide variety of boiler feed-water problems. Equipment removes the detrimental constituents of the raw water at a cost which is less than that of older, inferior methods. Any desired alkalinity can be established and maintained.

CONSTANT WATER QUALITY

ILLCO External Treating Equipment produces water of a constant quality without continual supervision.



MACHINE TOOL PLANT ILLCO Duplex Feed-water Treatment Unit, blending sodium zeolite water with hydrogen zeolite water to produce a boiler make-up with zero hardness and with very low total solids and alkalinity.

MILK PROCESS PLANT Single-tank ILLCO Combination-Regeneration Boiler Feed Unit, regenerated simultaneously with salt and acid; produces same results as Duplex Equipment above. Cypress tanks avoid use of critical materials.

ZEOLITE SOFTENERS, FILTERS, AERATORS, etc. are also manufactured by ILLCO — Water Treatment Engineers. Send for complete descriptive literature.

ILLINOIS WATER TREATMENT CO.
844 Cedar St., Rockford, Illinois

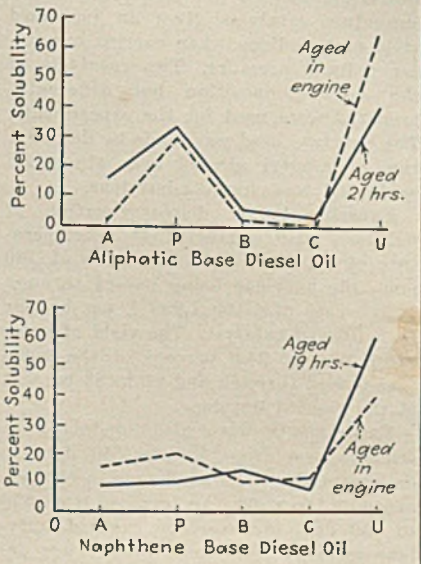
TESTED IN THE LABORATORY * ILLCO-WAY * PROVED IN THE FIELD

ping cost, 19 percent duties, 9 percent loading charges and 8 percent commercial expenses.

Digest from "The Salt Industry and Brazilian Economy," by Mario Pinto, *Revista de Quimica Industrial*, 11, 306-8, 1942. (Published in Brazil.)

DIESEL LUBRICANTS

NAPHTHENE base and aliphatic base diesel lubricants have been compared before and after artificial aging, and after aging in the engine. Artificial aging comprised heating the sample in air to accelerate oxidative deterioration. Insoluble residues are produced, as is



shown by the chart of solubilities in alcohol (*A*), petroleum ether (*P*), benzene (*B*), and chloroform (*C*); the last point (*U*) represents residue, insoluble in these 4 solvents. Diesel fuels form similar insoluble fractions under oxidizing conditions. The high content of insoluble residue in engine-aged aliphatic base oil is attributed to its higher sensitivity to oxidation.

Digest from "Study of Diesel Lubricants and Fuels," by H. Stäger and H. Künzler, *Schweizer Archiv für Angewandte Wissenschaft und Technik* 8, 231–52, 1942. (Published in Switzerland.)

RAYON

ALKALINE solubility of viscose fiber depends upon the method by which the fiber is spun, but is not in direct relationship to the fiber's polymerization degree, denier, ripening of the viscose or the orientation of the crystallites in the fiber. A brief aging period of the alkaline cellulose is favorable for obtaining a high polymerization degree; from this, however, it must not be concluded that all fibers will have the same strength and elasticity. The best fiber properties result when the aging period of the alkaline cellulose lasts for 45 hr. at 20 deg. C. If this period is prolonged, the strength of the resulting fiber decreases. The swelling properties in water are influenced by the ripening of the viscose, the fineness (denier) of the fiber, and orientation of the crystallites in the fiber. The orientation, in turn, depends upon the stretching under spin-

DE-IONIZED WATER

replaces DISTILLED WATER

at a fraction of the cost!

This modern, economical method is daily meeting the exacting standards of industrial and technical concerns requiring purified water. The process is one of *ion exchange*, using Amberlite synthetic resins to produce a final effluent comparing very favorably with single-distilled water. The water is *not* evaporated, so *no heat* is required.

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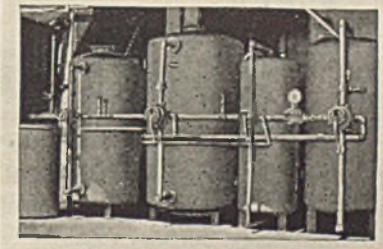

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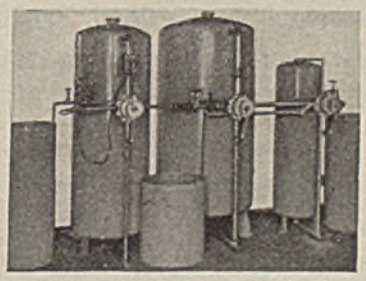

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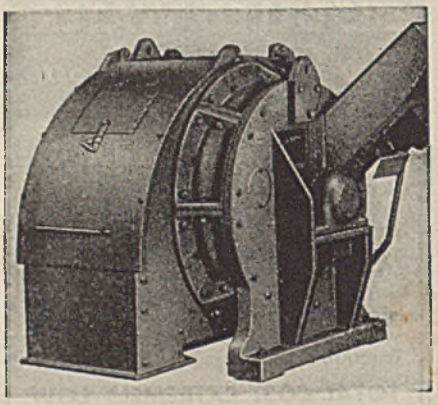

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ning. The fiber cross section may be of different shapes depending upon the ripening procedure and the amount of stretch applied during spinning. By an after treatment of the spun fiber with weak liquor, low polymeric compounds are dissolved and the quality of the material can be improved.

Digest from "The Influence of the Method of Preparing Viscose upon the Properties of Spun Viscose Fibers," by H. Schwarz and H. A. Wannow, *Kolloid-Z.*, 99, No. 2, 190-216, 1942. (Published in Germany.) [From *Bulletin of the Institute of Paper Chemistry*, 13, No. 4, 1942.]

BUTADIENE FROM BUTYLENE

DEHYDROGENATION of butylene with chromium catalysts gives an increased yield of butadiene when carried out under reduced pressure. Two catalysts of the same composition but differently prepared were used for the experiments. The butylene used was made by dehydration of n-butyl alcohol over aluminum oxide and was chiefly a-butylene.

Experiments on dehydrogenation of butylene were conducted at a temperature of 600 deg. and a pressure of 180 mm., the butylene being passed through at the rate of 1,100–1,900 l. per hr. for each liter of catalyst. The yield of butadiene was 22–24.8 percent of the butylene passed through and up to 84 percent of the reacted butylene.

Experiments were also conducted at temperatures from 550 to 650 deg. to determine the effect of change in temperature on the yield. An increase from 550 to 650 deg. increases the reacted butylene from 24 to 38 percent. Carbon deposited on the catalyst is also increased with rise in temperature, but it does not serve as a catalyst for further formation of carbon.

Changes were made in the time of contact of the butylene and catalyst, but this factor does not have a great effect on the percentage of butylene converted to butadiene.

Maximum yield of butadiene was obtained at 592 deg., the butylene being passed through at the rate of 2,000 l. per hr. for each liter of catalyst. This was 29 percent of the butylene passed through and 82 percent of the reacted butylene.

Digest from "Catalytic Dehydrogenation of Butylene into Butadiene at Reduced Pressure," by A. A. Balandin, N. D. Zelinski, O. K. Bogdanov and A. P. Shcheglov, *Zhurnal Prikladnoi Khimii* 15, No. 3, 128-38, 1942. (Published in Russia.)

MANUFACTURE OF PHTHALIC ANHYDRIDE

PHTHALIC ANHYDRIDE is produced by the catalysis of the vapor phase reaction between naphthalene and atmospheric air. Molten naphthalene is stored in a measuring tank mounted on a platform scale, tared for the weight of the tank so that the scale gives a direct reading of the weight of naphthalene. The measuring tank is filled once a day and from it the naphthalene is fed as required into a vaporizer. A stream of preheated air is blown through the vaporizer where a saturated mixture of air and naphthalene is produced. The temperature, pressure and flow of this

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primary air stream must be accurately known and regulated as this is the process which introduces the naphthalene into the system. The mixture leaving the vaporizer is within the explosive range and is too rich in naphthalene to be passed through the converter. By the addition of a secondary supply of air, the mixture is diluted and the leaner mixture—now outside the explosive range—is then passed downward through a multiple tube single pass converter containing vanadium pentoxide catalyst. The gases pass through a multipass heat exchanger operating as a waste heat boiler where they are cooled down to within a few degrees of the dew-point of the mixture before passing into large cooling chambers where the crude product condenses as a molten mass of long needle-like crystals.

The crude material is removed manually from the condensers once a day. It is transferred to a Dowtherm jacketed tank in which enough molten phthalic anhydride is accumulated to charge a vacuum still. This still is also Dowtherm jacketed. The use of Dowtherm heating permits the attainment of temperatures around 300 deg. C. at pressures of not more than 50 lb. This low pressure allows a much lighter design of the jacket and vessels than would be possible if higher pressures were required to secure the necessary temperatures. The charge is first refluxed at atmospheric pressure for several hours to decompose any phthalic acid present and to effect the polymerization of impurities which are left behind as a residue of the distillation. The charge is then distilled under an absolute pressure of 2 to 3 in. Hg. The vapors pass upward from the still through a packed column and thence into a condenser cooled by water boiling under pressure. The height of the condenser is such that the liquid phthalic anhydride flows into a barometric leg and thence to a water-cooled flaker. From the flaker the pure product is packed directly into paper bags or wooden barrels.

All equipment coming in contact with the vapor or the pure phthalic anhydride liquid is of stainless steel construction.

Digest from "The Manufacture of Phthalic Anhydride in Canada," *Canadian Chemistry and Process Industries*, XXVII, No. 1, 7-8, 1943. (Published in Canada.)

FIBER IDENTIFICATION

DIFFERENTIATION of bleached sulphate and bleached sulphite fiber is a complicated task. The author uses the difference in affinity which basic and substantive dyes have for different fibers, depending upon their cooking degree, lignin content, pH, etc. After many experiments the author selected a solution of the basic dye Rhodamine B extra and the substantive dye Brilliant dianil green G. Each dye is dissolved separately in doubly distilled water to make a 0.05 percent solution. Under constant stirring one part of the Rhodamine is added to three parts of the green solution. When highly bleached soda or sulphite pulps are moistened with the dyestuff mixture, both samples appear red-

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dish violet in daylight. Under ultraviolet light, however, the soda pulp appears a blue and the bleached sulphite a rose color.

Digest from "The Differentiation of Bleached Cellulose Fibers by Means of Fluorescent Dyes in Ultra Violet Light," Agaht, *Wochbl. Papierfabr*, 73, No. 11, 170-1, 1942. (Published in Germany.) [From *Bulletin of the Institute of Paper Chemistry*, 13, 4, 1942.]

ALCOHOL AS MOTOR FUEL

ALTHOUGH alcohol has a lower heat value than gasoline, its compression ratio is satisfactory and it makes a good motor fuel. In fact, it is necessary to add alcohol to gasolines now imported by Brazil since these have too low an octane number for modern high compression motors. Alcohol also has a number of advantages over gasoline, such as absence of smoke and disagreeable odor in the resulting combustion gases, lower volatility and therefore less danger of accident and less loss by evaporation, especially in a tropical climate such as in Brazil. Alcohol requires only about 30 percent of the air necessary for the complete combustion of gasoline, which reduces the heat loss in the exhaust. As a result of the lesser dilution with air, a more homogeneous mixture is formed before the explosion. This favors complete combustion.

The lower volatility of alcohol makes it more difficult to start a motor in cold climates but this disadvantage can be overcome by the addition of more volatile fuels. Mixtures of alcohol and gasoline behave like alcohol vapors. In Brazil from 10 to 20 percent alcohol is used in such gasoline mixtures.

Digest from "The Anti-Knock Properties of Alcohol and its Application as a Fuel," by Fernando Affonso Baster Pilar and Armando Silva de Araujo, National Institute of Technology, Rio de Janeiro, 1942.

UTILIZATION OF PLASTICS

COMMON faults in the utilization of plastics in Ordnance materials are inadequate redesign and the wrong choice of materials for particular applications. Failure to distinguish between various types of plastics is quite evident. No one would ever say "metals fail" because everyone realizes that "metal" is a general term and embraces a number of materials. Very few people ever consider plastics as a general term, but most people group the entire field as one type of material. A review of industrial drawings will show that certain parts are to be fabricated from bronze, aluminum, zinc and molded plastics. In many agencies where molded plastic parts are procured, little or no thought is given as to whether a component should be molded from a thermosetting compound or a thermoplastic. Little consideration is given to the fact that over 80 types of plastic materials are available for fabrication. This condition exists probably because of the newness of the industry, and the rapid development of its ever growing number of compounds. The classification of compounds for particular uses is therefore indicated.

Although plastics have been of assistance in conservation and in the develop-

ing of new and improved materials, they are by no means a cure-all for the industrial difficulties brought about by allocations and priorities. They do have a definite place in the armament program and can be of the greatest benefit, if they are applied with consideration of the combat efficiency of the molded part and the material properties necessary to meet ordnance requirements.

Digest from "Plastics at War," *Canadian Chemistry and Process Industries*, XXVII, No. 2, 61-6, 1943. (Published in Canada.)

DETERMINATION OF VISCOSITY OF BORAX AND BORON OXIDE

SAMPLES of these simple vitreous compounds were shaped into small rods which were suspended by clamps in an electric oven. A weight p was attached to the lower end of these rods and gradually decreased with increase in temperature. The rate of elongation of the rods was determined at constant temperature by means of a cathetometer and the calculation was made by the formula:

$$\eta = \frac{981LPZ}{q\Delta L}$$

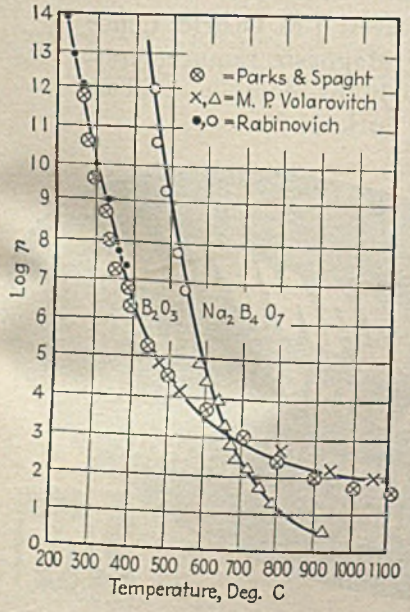
in which L = the length of the rod in cm., P = weight in gm., q = cross-sectional area of the rod in sq. cm., Z = time in seconds, ΔL = elongation of the rod in the time Z, and η = the viscosity at given intervals.

Cross-sectional area of the borax rods was 0.33 sq.cm. and 0.37 sq.cm.; the length was 2.52 and 2.66 cm. respectively. The cross-sectional area of the boron oxide rods was 0.05 and 0.08 sq. cm., and the lengths 4.48 and 4.76 cm. respectively.

Results of these measurements of viscosity at different stages of softening are given as curves in the accompanying diagram.

Digest from "Viscosity of Borax and Boron Oxide during the Softening Process," by B. V. Rabinovich, *Zhurnal Fizicheskoi Khimii* 16, No. 1-2, 23-6, 1942. (Published in Russia.)

Viscosity of borax and boron oxide as a function of temperature



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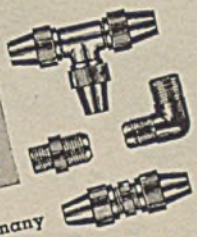

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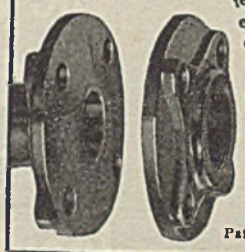

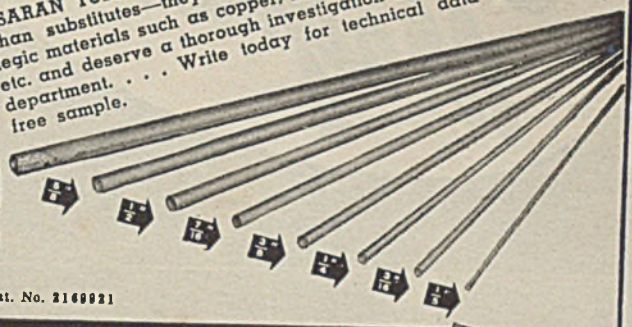

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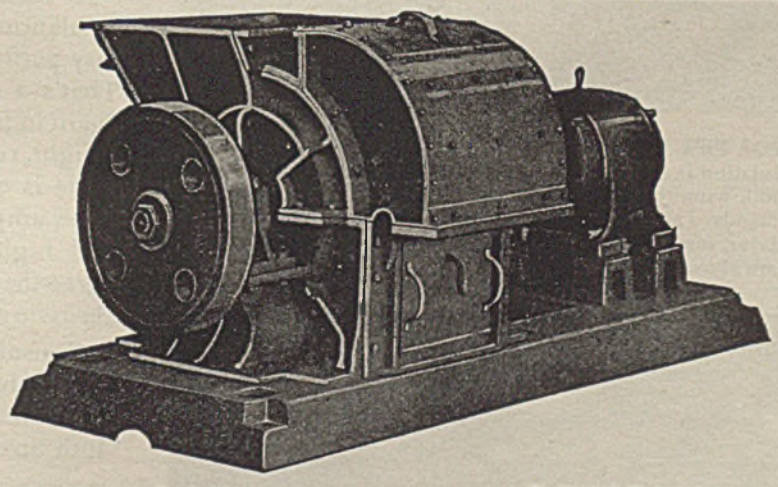

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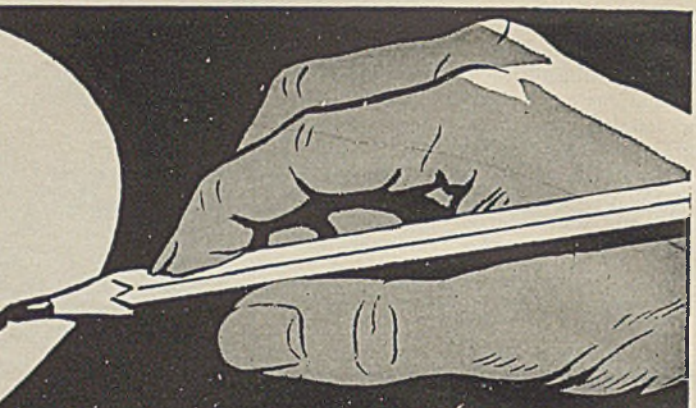

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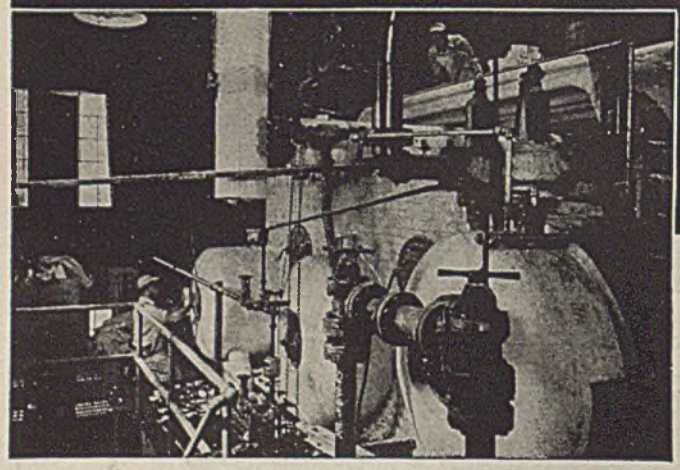

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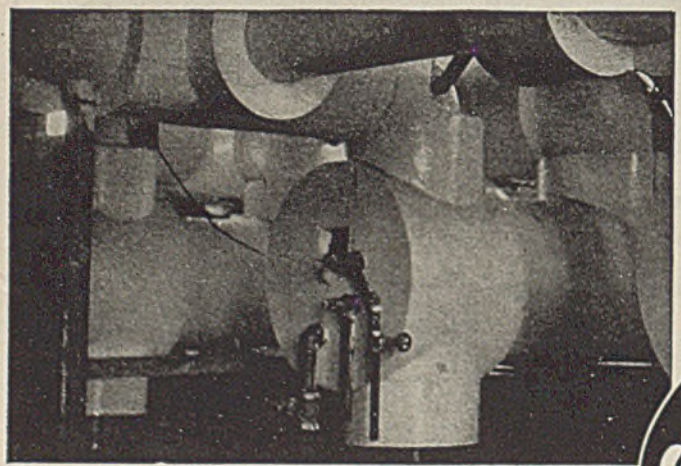

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NATIONAL RESOURCES DEVELOPMENT REPORT FOR 1943, Part 1. Postwar Plan and Program, issued by National Resources Planning Board. Available United States Government Printing Office, Washington, D. C. 81 pages. Price 25 cents.

SECURITY, WORK AND RELIEF POLICIES, 1942. Report of the Committee on Long-Range Work and Relief Policies to the National Resources Planning Board. Available United States Government Printing Office, Washington, D. C. 640 pages. Price $2.25.

PART 1, the 80-page pamphlet on the government's postwar plan and program is "must" reading for all chemical engineers and executives. It outlines in considerable detail the findings and recommendations of a group of economists that has been studying plans for transition from war to peace, for developing and expanding the economy to provide full employment, and the relation of these plans to social security and governmental participation. The section entitled "Promotion of Free Enterprise" deals directly with assistance in developing new processes and improved products through industrial research, patent reforms, concentration of industrial production, regulation of large-scale business units, assistance to small business units and, finally, the setting up of mixed corporations with joint private and governmental participation. In the latter category are included the following industries: "aluminum and magnesium, other basic metals, synthetic rubber, some chemicals, shipbuilding and aircraft."

The 640-page volume on "Security, Work and Relief Policies" is of much less concern immediately to chemical engineers. It develops in exhausting detail, however, the evolution of various public-aid programs, how they have operated in the past and how they can be made to function more efficiently in the future.

HEAT. Second edition. By *James M. Cork*. Published by John Wiley & Sons. New York, N. Y. 294 pages. Price $3.50.

Reviewed by *William J. Shore*

PROF. CORK has compiled and prepared a most interesting as well as provocative book on the subject of "heat." It deals specifically with the physical phenomena induced in matter through the application or withdrawal of heat. It appears to have been written especially for advanced students or instructors in the science of Physics.

In the preface he states, "Especially noteworthy advances have been made in certain particular phases of the extensive subject of heat. Perhaps the most striking progress has been reported in the field of extremely low temperatures, where the physical properties of materials have been investigated close to the absolute zero. The phenomenal development of nuclear physics in recent years has been greatly aided by the knowledge obtained in thermal experiments. This field in turn now offers a challenge to those who would make use of the vast stores of nuclear energy known to be available."

Prof. Cork cites over four hundred technical articles by three hundred scientists. To have read this number of treatises, is in itself, a real task. The first of these is the "Novum Organum" by Sir Francis Bacon, published in 1610, and the last is the paper by Mr. R. T. Birge, published in the Review of Modern Physics, as recently as 1941. Thus it is readily apparent that Prof. Cork's book is not only complete, but is also up to date.

To the scientist and all others interested in the subject of heat, the book makes fascinating reading. The description of methods and apparatus designed to ferret out the different laws ascribed to various phases of heat phenomena is as entertaining as the best of modern detective fiction. The remarkable ingenuity and resourcefulness of the great workers in the field of physical research is at all times worthy of praise and unstinted admiration.

At the close of each chapter, Prof. Cork submits a number of problems, (difficult ones, too) whose solution is based on the information supplied on the subject under discussion. Unfortunately, whether purposely or not, he omits the answers to these problems. In the reviewer's opinion, it would be of great assistance to most of us to know whether or not solutions arrived at were correct.

METALLOGRAPHY. By *Cecil H. Desch*. Fifth Edition. Published by Longmans, Green and Co., New York, N. Y. 408 pages. Price $8.

Reviewed by *Emy Henning Nachod*

DR. DESCH'S well known text which was published first in 1910 appears now in its fifth edition. New material which pertains to the gap between the fourth edition of 1937 and the present edition is introduced in form of an appendix at the end of the text.

The reviewer was especially pleased by the clearly written chapters IX and X (by G. D. Preston) on X-rays. It is very rare to find in such a text a readable introduction into vector and tensor calculus.

Excellent photographic illustrations add to the value of the text which can be well recommended to the practical metallurgist.

THE PLAN THAT FAILED

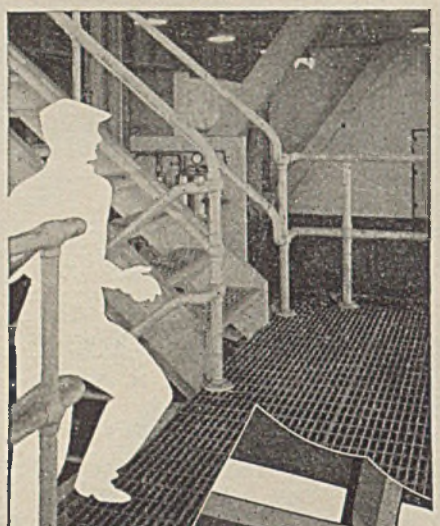
GERMANY'S MASTER PLAN. The Story of Industrial Offensive. By *Joseph Borkin* and *Charles A. Welsh*, with an introduction by *Thurman Arnold*. Published by Duell, Sloan and Pearce, New York, N. Y. 339 pages. Price $2.75.

Reviewed by *S. D. Kirkpatrick*

ABOUT a year ago there appeared on the newsstands in New York a lurid production of sensational journalism that bore the title. "Sequel to the Apocalypse. The Uncensored Story: How Your Dimes and Quarters Helped Pay for Hitler's War." The pamphlet had been written by John Boylan who has gained some fame as an author of thrilling detective stories. It had a foreword by Rex Stout. It was so palpably a mixture of fact and fiction that no one on this side of the water gave it serious consideration. Many of us only learned of its existence through the engaging editorial pages of our British contemporary, "Blue-Bits" (*Chemistry and Industry*). The deeply laid plot and most of the submysteries of this bloodthirsty tale revolved around the idea that the I. G. Farbenindustrie had taken over Germany's foreign office. Its every action was to plot our destruction and to conquer the world. In this evil scheme, the I.G. was aided and abetted by certain American corporations and their executives who Mr. Boylan held up for public pillage. In short, it was typical muckraking according to the now familiar New Deal pattern.

We expected the present book to be a similarly distorted attack on American industry, especially after we read in Judge Arnold's flattering introduction his often repeated charge that we owe our present scarcity of certain drugs and basic chemicals, magnesium and aluminum, etc. to the traitorous compacts of American companies with the German cartels. In fairness to the authors, this reviewer must admit that this book is better than its introduction. It is fairer, more objective, and with fewer recriminations. It is written in dispassionate style, with an evident desire to document its statements with several hundred references to court findings, public hearings and the reports of the famous Nye Munitions, the Bone Patents, and other investigating committees. Yet its very subtle implications are perhaps more dangerous than the direct accusations which came from Mr. Arnold.

The uninformed reader can scarcely escape the impression that the leaders of American industry were dupes who should be pitied because they were willing victims of malevolent forces tha were beyond their comprehension. "Th softest impeachment that can be mad



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of those American, British and French industrialists who consorted with German interest is that they knew not what they did. This is an alarming commentary on the profund political astigmatism of the proud management responsible for our industrial welfare." Authors show no understanding of the perfectly legitimate economic and business motives that led American business men into most of these international contracts. They have no explanation of the failure of our own New Deal government to recognize these dangers and to fight Germany with her own weapons.

Again and again we find such sentences as this one: "Canny traders of the American type were to prove almost naive when matched against the acuity and perspicacity of the exponents of I. G.'s economic philosophy. . . . Even today, they force us to do without materials, processes and industries which in the normal course of competition would have been fully established at the outbreak of the war." What industries do the authors cite? Synthetic rubber and magnesium are two that we would be inclined to question, knowing something of the difficulties in producing and selling these products in the free-competition of pre-war America.

"Beryllium, The Magic Metal," comes in for a whole chapter of rather fantastic economics and technology although undoubtedly good politics from the viewpoint of the authors. Other chapter headings are equally alluring—"Dyestuffs, the Kaleidoscope of War," "Plastics, The Test-Tube Metal," "Drugs and Geopolitics," "Industrial Munichs "Mosquitoes, Malaria and Monoply "Rubber—A Lesson in Logistics," "Magnesium, Metal of Mars," "DuPont "Krupp, the Hammer of Mars," "Tungsten Carbide, the Material Diamond Chemical engineers will read these chapters with interest and sometimes with sufficient irritation to reach for a pencil to insert question marks, exclamation points and sarcastic scribblings in the margins. At least that was this reviewer's experience.

Where the authors skate on thinner ice, however, is in their constant repetition of the old New Deal accusation that "The high-price, low-output point of view which, from fear of competition, sacrificed industrial for financial strength has been the greatest curse of the domestic economy." Were they to study the price and output curves in this country of some of the chemical products they talk most about—dyestuffs, plastics, cellophane, magnesium — they would realize how fallacious is such an argument. This same industrial management that they hold up to pity for its ineptness and naivete is today proving that increased production at ever lower costs is already spelling the doom of "Germany's Master Plan" to commit the "perfect crime." (And parentheticall we almost added "in spite of the Anti-trust Division of the Department of Justice.")

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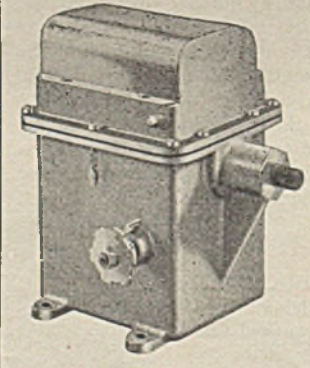

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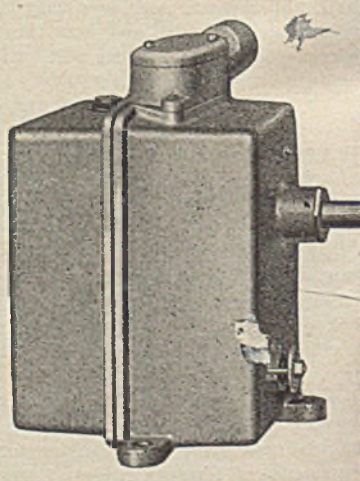

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GOVERNMENT PUBLICATIONS

The following recently issued documents are available at prices indicated from Superintendent of Documents, Government Printing Office, Washington, D. C. In ordering publications noted in this list always give complete title and the issuing office. Remittances should be made by postal money order, express order, coupons, or check. Do not send postage stamps. All publications are in paper cover unless otherwise specified. When no price is indicated, pamphlet is free and should be ordered from Bureau responsible for its issue.

Earnings in the Manufacture of Industrial Machinery, 1942, by H. R. Hosea and others. Bureau of Labor Statistics, Bulletin No. 720. Price 10 cents.

Building Construction, 1941. Prepared by Division of Construction and Public Employment. Bureau of Labor Statistics, Bulletin No. 713. Price 20 cents.

Army-Navy General Specification for Packaging and Packing for Overseas Shipment. Prepared by Army, Navy, and others. Available as U. S. Army Specification No. 100-14A, or as U. S. Navy Specification 39P16a.

Substitutes for Scarce Materials. Department of Agriculture, No. AWI-15. Includes dictionary of insecticide materials and substitutes.

Statistics on Receipts and Distribution of Sugar in the United States, 1934-39. Department of Agriculture, Statistical Bulletin No. 77.

Vitamin Values of Foods in Terms of Common Measures, by Elizabeth M. Hewston and Rosemary L. Marsh. Bureau of Home Economics, No. M. P. 505M. Price 10 cents.

Sources of Information on State Legislation. Issued as No. 19 of the monthly series State Legislation 1941-1942. Summaries of Laws Currently Received in the Library of Congress. Mimeographed.

Trade Agreement Between the United States and Peru. Tariff Commission unnumbered document. Digests of trade data with respect to products on which concessions were granted by the United States. Mimeographed.

Social Security Yearbook for the calendar year 1941. Social Security Board. Annual Supplement to the Social Security Bulletin. Unnumbered. Price 70 cents.

Proposals for a Free World. No. 2 of series "Toward New Horizons". Office of War Information.

Patents at Work. A Statement of Policy by the Alien Property Custodian of the United States. Unnumbered document regarding alien enemy and alien non-enemy patents held by the government.

National Roster of Scientific and Specialized Personnel. Report of the National Roster of Scientific and Specialized Personnel to the National Resources Planning Board. Unnumbered document. Price 10 cents.

National Resources Development Report for 1943. Part 1. Post-War Plan and Program. National Resources Planning Board. Price 25 cents.

Security, Work, and Relief Policies. Report of the Committee on Long-Range Work and Relief Policies to the National Resources Planning Board. Price $2.25.

Electrical Characteristics of Dry Cells and Batteries. National Bureau of Standards, Letter Circular LC 677.

Asbestos Products Specifications. Emergency revision of standard specifications available in mimeographed form for war period use on: Asbestos Gaskets; Metallic-Cloth, No. E-HH-G-76. Asbestos Packing; Metallic-Cloth, Sheet, No. E-HH-P-31. Asbestos Packing; Rod (High-Pressure), No. E-HH-P-36. Asbestos Packing; Sheet, Compressed, No. E-HH-P-46. Asbestos Packing; Valves-Stem, No. E-HH-P-51.

Linoleum Specifications. Emergency specifications in mimeographed form

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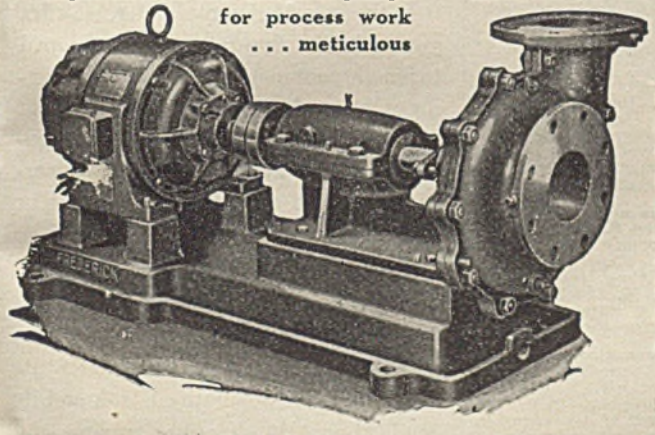

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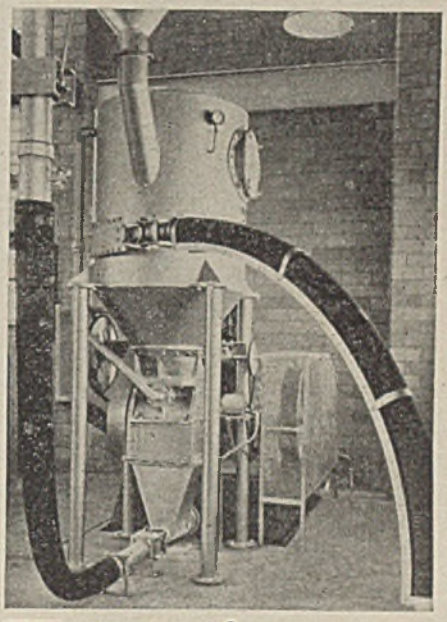

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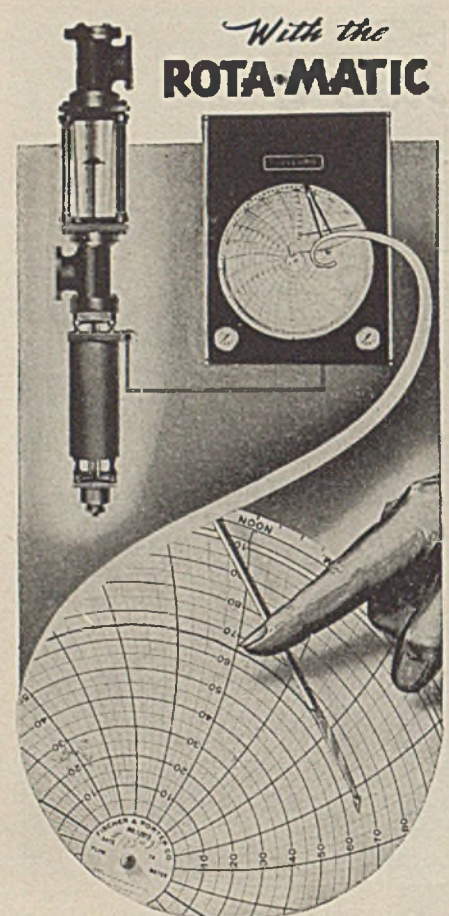

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This instrument has 100% throttling range and automatic reset for perfect attunement to varying process conditions. The flow control point is adjustable *over the entire range of the rotameter.* It also provides remote recording of flow to supervise and check process results.

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Organic Plastics; General Specifications. (Methods of Tests). Federal Standard Stock Catalog, No. L-P-406. Price 10 cents.

Cushioned Blasting. 11. Preliminary Studies of Gallery Testing, by A. R. T. Dunues. Bureau of Mines, Report of Investigations, R. I. 3674. Mimeographed.

Use of Wetting Agents in Reducing Dust Produced by Wet Drilling in Basalt, by John A. Johnson, Bureau of Mines, Report of Investigations, R. I. 3678. Mimeographed.

Trends in the Use of Energy in the Western States With Particular Reference to Coal, by V. F. Parry. Bureau of Mines, Report of Investigations, R. I. 3680. Mimeographed.

Methods and Costs of Concentrating Hübnerite Ores at the Ima Tungsten Mine, Lemhi County, Idaho, by C. M. Dice, Bureau of Mines, Information Circular, I. C. 7230. Mimeographed.

The Rare Alkalis in New England, by F. L. Hess, and others. Bureau of Mines, Information Circular, I. C. 7232. Mimeographed.

The Rate of Temperature Change in Wood Panels Heated Between Hot Plates, by J. D. MacLean. Forest Products Laboratory, No. R1299. Mimeographed.

Rate of Setting of Cold-Setting, Urea-Resin Glue Joints, by H. W. Eickner. Forest Products Laboratory, No. R1422. Mimeographed.

Method of Computing the Rate of Temperature Change in Wood and Plywood Panels When the Two Opposite Surfaces are Maintained at Different Temperatures, by J. D. MacLean. Forest Products Laboratory, No. R1406. Mimeographed.

RECENT BOOKS and PAMPHLETS

Tables of Data on Chemical Compositions, Physical and Mechanical Properties of Wrought Corrosion-Resisting and Heat-Resisting Chromium and Chromium-Nickel Steels. Prepared by *Russell Franks* and *Francis L. LaQue.* Published by American Society for Testing Materials, Philadelphia, Pa. 43 pages. Price $1.25. Gives data in condensed form and covers material in wide commercial use. There are 21 tables and 26 charts and curves covering important data. This publication is the third in a series on stainless steels issued through the work of the Society.

A. S. T. M. Standards on Electrical-Heating and Resistance Alloys. Published by American Society for Testing Materials, Philadelphia, Pa. 282 pages. Price $1.50. Includes 22 specifications and tests. There are also included four technical papers which cover thermostat materials, electrical surge on contact materials and contact testing machines.

A. S. T. M. Standards on Paints, Varnish, Lacquer and Related Products. Published by American Society for Testing Materials, Philadelphia, Pa. 408 pages. Price $2.25. Gives in their latest form more than 120 A. S. T. M. specifications, tests and definitions. A number of the standards are included for the first time.

Mechanics of Renegotiation. By *Carman B. Blough.* Published by American Institute of Accountants, New York, N. Y. 14 pages. A reprint from the March issue of *The Journal of Accountancy.* Presents aims, purposes and methods of renegotiation of war contracts.

Index to A. S. T. M. Standards. Published by American Society for Testing Materials, Philadelphia, Pa. 185 pages. This index is an adjunct to the book of A. S. T. M. Standards and comprises a ready reference for locating any standards in the bound publications of the Society in which it appears.

Workers and Bosses Are Human. By *T. R. Carskadon.* Pamphlet No. 76 published by Public Affairs Committee, New York, N. Y. 32 pages. Price 10 cents. Sub-title "Collective Bargaining at Work," this pamphlet covers a wide range of problems connected with collective bar-

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Annual Report of Compressed Gas Manufacturers' Association. Published by the Association, New York, N. Y. Annual publication of the proceedings of the 1942 meeting gives the only record of the technical committee reports and of the addresses and technical articles presented at two sessions. Persons and libraries desiring to have a complete file of literature affecting compressed and bottled gas should have this volume.

The Blue Book of Southern Progress. Published by Manufacturers Record Publishing Co. Baltimore, Md. 82 pages. Price $1. Published annually, this little booklet gives statistics on manufacturing, mining, construction, power and other industries for 16 Southern States and the District of Columbia.

An Application of the Theory of Measurements to Certain Engineering Problems. By *L. E. Woodman.* Volume 15, No. 1, Bulletin of School of Mines and Metallurgy, University of Missouri, Rolla, Mo. 41 pages. Study of the theory of measurements will suggest best ways for taking data, recording observations and interpreting results.

Save Fuel for Victory. Circular Series No. 47, Engineering Experiment Station. University of Illinois, Urbana, Ill. 35 pages. Price 25 cents. Non-technical articles about insulation, heating-plant efficiency and related fuel-saving subjects.

Codes. The National Fire Protection Association, Boston, Mass., has recently published two codes: "National Fire Code for the Prevention of Dust Explosions (1943)" 160 pages, price $1; and "National Fire Code for Extinguishing and Alarm Equipment," 672 pages, price $3.

Monetary Reconstruction. By *H. Mitchell.* Presidential address delivered at the annual meeting of the Canadian Political Science Association, May 25, 1942. Reprinted from *Canadian Journal of Economics and Political Science,* Vol. 8, No. 3, Aug. 1942. A post-war plan for universal bimetallic standard.

Training Employees as Job Instructors. Published by Policyholders Service Bureau, Metropolitan Life Insurance Co., New York, N. Y. Handbook of training principles and practices based on interviews and correspondence with Federal and State Agencies, consultations with private companies and actual use of the training method by the author in the plants of several companies.

Controlling Factory Production. Published by Policyholders Service Bureau, Metropolitan Life Insurance Company, New York, N. Y. 34 pages. Report stresses scheduling of materials and machines and is concerned with the time element of manufacturing and in related functions. Separate descriptions are given for small, medium and large-sized shops.

Factors Affecting Increased Welding Production. By *E. W. C. Smith.* Published by Lincoln Electric Company, Cleveland, Ohio. 42 pages. A series of articles reprinted from *Steel* which contains up-to-date information concerning specific phases of arc welding.

Technology and Economics of Total War. By *Lyman Chalkley.* Published by American Council of Public Affairs, Washington, D. C. 24 pages. Price 25 cents. The author is Head Economic Analyst in the Industrial Engineering Division of the Board of Economic Warfare.

Where Can We Get War Workers? By *Sanford Griffith.* Pamphlet No. 75, published by Public Affairs Committee, New York, N. Y. 32 pages. Price 10 cents. Results of a manpower survey in Baltimore. Facts given are "a warning to the public of what the country faces unless a more determined effort is made to coordinate and speed manpower placement."

Tests of Riveted and Welded Joints in Low-Alloy Structural Steels. By *W. M. Wilson, W. H. Bruckner* and *T. H. McCrackin, Jr.* Bulletin Series No. 337, published by University of Illinois, Urbana, Ill. 73 pages. Price 80 cents. Object of the investigation was to determine the properties of three low-alloy structural steels furnished in accordance with A.S.T.M. Tentative specifications A242-41T and to determine the behavior of structural joints fabricated of this steel.

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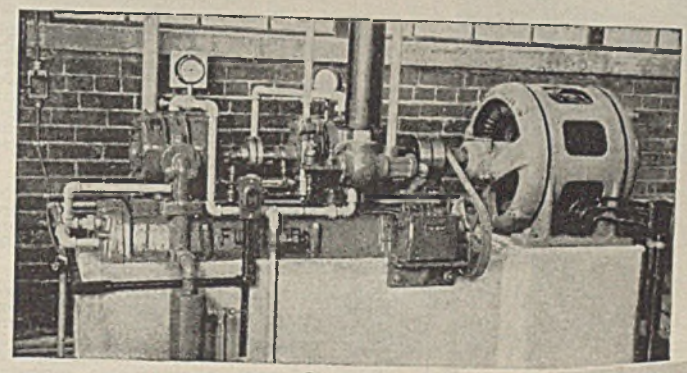

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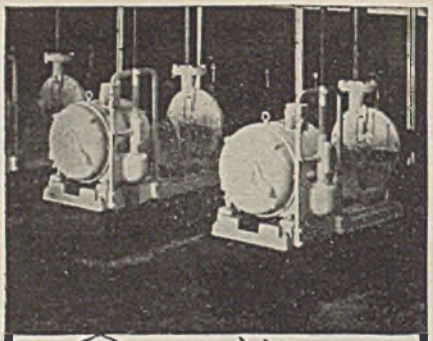

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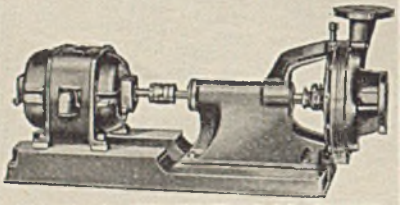

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MANUFACTURERS' LATEST PUBLICATIONS

Publications listed here are available from the manufacturers themselves, without cost unless a price is specifically mentioned. To limit the circulation of their literature to responsible engineers, production men and industrial executives, manufacturers usually specify that requests be made on business letterhead.

Gas Analysis. Burrell Technical Supply Co., 1936-42 Fifth Ave., Pittsburgh, Pa.—Bulletin 4212—6-page form describing this concern's new catalytic assembly for use in gas analysis to supersede combustion in standard apparatus. Discusses and illustrates the new apparatus, its operating principles, solutions required, accessories and prices.

Graphite. Acheson Colloids Corp., Port Huron, Mich.—Bulletin 422—4-page form dealing with this concern's "dag" colloidal graphite as a parting compound. Discusses briefly various applications.

Heaters. Draco Corp., 300 Penn Ave., Pittsburgh, Pa.—8-page form giving complete specification data on this concern's line of coal-fired series industrial heaters of 750,000 to 4,000,000 B.t.u. capacities. Illustrated with photographic reproductions and cross-sectional drawings. Contains extensive data in table and chart form.

Increasing Power Capacity. General Electric Co., Schenectady, N. Y.—Form GES 3039—24-page booklet illustrating and describing briefly how industrial plants can increase power capacity quickly and save large quantities of critical metals and materials. Outlines and illustrates in simple form methods and gives figures on materials that can be saved.

Industrial Coatings. Union Bay State Co., 50 Harvard St., Cambridge, Mass.—Two-page folder listing this concern's special coatings and cement tested for actual production requirements and meeting contract specifications for war industry. Lists the adhesives according to their war-industry uses.

Ion Exchangers. The Permutit Co., West 42nd St., New York, N. Y.—4-p form discussing the use of ion exchang for industrial processes such as the ma facture of beverages, chemicals, elect plating, insecticides, glues, gelatins, Discusses briefly principles of the changers, demineralizing, and appli tions. Illustrated.

Magnet Wire. General Electric Schenectady, N. Y.—Form GEA 391 28-page booklet dealing with this c cern's "Formex" magnet wire. Inclu properties such as dielectric streng toughness, moisture-resistance, etc., a advantages in use, types available, ap cation in industry, and extensive d tables. Well illustrated with photograp reproductions, diagrams, and charts.

Mechanical Rubber Goods. Pioneer R ber Mills, 353 Sacramento St., San Fr cisco, Calif.—22-page booklet entit "How to Lengthen the Life of Mechani Rubber Goods." Intended to serve field notes. Contains simplified directi and drawings.

Motor Control. General Electric Schenectady, N. Y.—Form GES 1724 12-page bulletin on synchronous mo control explaining the primary and ad tional functions performed by various synchronous motor controls. Also l and describes cabinet-type enclosu available for protection of these contr Illustrated.

Packings. Wayne Davies & Co., W. Huron St., Chicago, Ill.—Form 2 4 pages giving an operating analysis specifying this concern's double "U" pa ings for hydraulic or pneumatic serv

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Oil Burners. National Airoil Burner Co. Inc., 1284 East Sedgley Ave., Philadelphia, Pa.—Bulletin 65—12-page booklet dealing with this concern's line of low air pressure oil burners and Airovent centrifugal blowers. Each type is illustrated and described briefly. Contains information on burner sizes and capacities, dimensions and weights, specification, and heat content of fuel oil.

Paint Spray Recovery. Mayer Mfg. Corp., Aqua-Restor Division, 50 Division Place, Brooklyn, N. Y.—4-page folder introducing this concern's new line of paint spray booths and dust collection systems. Illustrates and describes briefly each of the units. The units are operated on the water-wash principle.

Plastics. State Council for Defense, Industrial Development Committee, Columbia, S. C.—Bulletin 9—50-page booklet entitled "Plastics from the Farms and Forests of South Carolina." Discusses various types of plastics that can be produced from raw materials of this state, uses of the various plastics, materials from cotton linters, wood plastics, textiles from casein, and data on utilities and forest resources. Extensively illustrated.

Power Transmission. Cling-Surface Co., 1048 Niagara St., Buffalo, N. Y.—32-page booklet intended as a handbook of modern mechanical power transmission for industry. Contains a brief discussion of principles and simple diagrammatic drawings, together with photographic reproductions, illustrating data on the Cling-Surface method of belt treatment.

Power Transmission. Link-Belt Co., 307 No. Michigan Ave., Chicago, Ill.—Catalog 850—180-page condensed, general catalog put out by this concern covering representative types and sizes of power transmission and materials handling equipment. Includes data on dimensions, weights, list prices and other pertinent facts on chains, sprockets, silent and roller chain drives, pulleys and other equipment. Particularly designed for those who order repair parts or wish to buy parts for new installations. Illustrated.

Power Trucks. Elwell-Parker Electric Co., Cleveland, Ohio.—8-page folder designed to teach women in industry to handle this concern's power trucks. Contains simplified instructions, accompanied by photographic reproductions and schematic drawings.

Processing. Kold-Hold Mfg. Co., Lansing, Mich.—Catalog 43I—36-page catalog entitled "Kold-Hold Thermal, Sub-Zero and Stratosphere Processing and Testing Machines." Each unit is illustrated and described. Contains information on specifications, applications in industry, and dimensions. Also a two-page sheet illustrating, describing and giving specifications on this concern's crystal test unit.

Proportioning Equipment. Cochrane Corp., 17th and Allegheny Ave., Philadelphia, Pa.—Bulletin 4009—6-page form dealing with this concern's double displacement proportioning equipment for acids, corrosive liquids and other clear solutions. Discusses principles of operation and contains diagrammatic flowsheets.

Pumps. Shartle Bros. Machine Co., Middletown, Ohio.—Bulletin 78S—4-page folder illustrating and describing briefly the line of Miami Class DV centrifugal pumps for paper mill service put out by this concern. Includes data on specifications.

Refractory Cement. The Ironton Firebrick Co., Ironton, Ohio—4-page form illustrating and discussing briefly the principles and application of this concern's "Berlite" special purpose, refractory bonding mortar for foundries.

Rubber Goods. The B. F. Goodrich Co., Akron, Ohio.—Section 7020—8-page section dealing with this concern's industrial molded rubber goods. Contains information in question and answer form. Well illustrated by photographic reproductions.

Safety. The Boyer-Campbell Co., 6540 Antoine St., Detroit, Mich.—4-page form illustrating and describing briefly this concern's line of safety equipment for women in industry. Includes safety shoes, goggles, headgear and coats.

Safety Equipment. The Boyer-Campbell

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Commercial t-Butyl Hydroperoxide is standardized at a concentration of 50-60% (10±% available oxygen) — and appears to be ideally adapted for use as a catalytic agent in one or two phase polymerizations . . . as an oxidation agent for laboratory purposes . . . as a drying accelerator in oils, paints, varnishes, etc. . . . as a combustion accelerator for heavy fuel oils used in diesel engines . . . as a bleaching agent for cotton, wool and other fabrics . . . and for numerous other uses.

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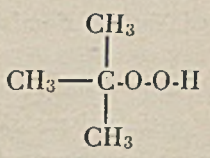

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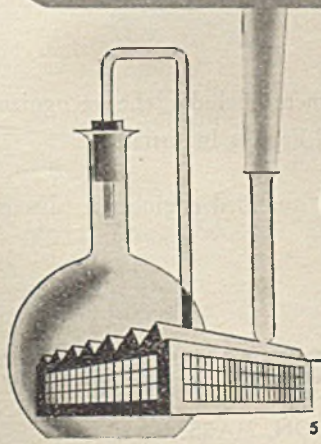
- Can be handled and shipped in large quantities without danger of explosion from shock.
- Is soluble in many common organic solvents such as alcohol, ether, ketones in general, esters, aromatics and petroleums.
- Is slightly soluble in water.
- Is fairly stable in the presence of various alkalis and acids.

*U.S. PATS. 2176407 and 2223807



In writing for further information, please outline any disclosable facts pertaining to your intended use of t-Butyl Hydroperoxide.

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EVAPORATION DISTILLATION EXTRACTION heat transfer, solvent extraction, solvent recovery, and organic synthesis. *Pilot plant equipment receives the same careful attention in its design and fabrication as do larger units.*

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Co., 6540 Antoine St., Detroit, Mich.—Catalog 50—134-page catalog giving this concern's complete line of equipment for industrial accident prevention. Includes hundreds of products such as face and head protection items, women's protective apparel, gloves, "Super Sight" for industrial and first-aid use. Each item is illustrated, described briefly, with costs listed and dimensions for specifications given. Contains an extensive 10-page index. Very complete.

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Saws. The Doall Service Co., Des Plaines, Ill.—265-page bound textbook entitled "Doall Contour Saws." Gives information on technique used in contour machining, laboratory control and manufacture of precision saw bands, and free facilities offered by this concern in training for Doall operations. Some 85 pages show how contour machining replaces conventional machining to save time and materials on production as well as on special jobs, while another 26 pages illustrate and discuss methods used to find the best type of saw, saw velocity and steam pressure. Over 80 percent of the text is shown through pictures with numerous charts and diagrams. Includes a 44-page section giving specific information on machine tools and machine shop practice for the student. Well organized.

Shift Work Plan. George S. May Co., 2600 N. Shore Ave., Chicago, Ill.—Cardboard "Shift-O-Graph" designed to present shift arrangement for a perpetual work shift schedule. Description of the plans and instructions for operating the instrument are defined on the back of the chart. Sturdily built and easy to operate. Handy for supervisors and foreman.

Stackers. The Jeffrey Mfg. Co., Columbus, Ohio.—12-page booklet dealing with the line of portable stackers and conveyors for storage and warehouse service put out by this concern. Includes data on dimensions and specifications. Illustrated by photographic reproductions and diagrammatic drawings.

Steam Engine Lubrication. Standard Oil Co. of Indiana, Sales and Technical Service Department, Chicago, Ill.—Bulletin SE13—50-page engineering bulletin for instruction of industrial salesmen on steam engines and their lubrication. Contains extensive information on classification and operation of stationary engines, lubrication of steam engine internal parts, lubrication of external parts, description of recommended lubricants, and engineering and operating data. Extensively illustrated by photographic reproductions, diagrammatic drawings and charts. Contains valuable engineering data.

Synthetic Resins. The Dow Chemical Co., Midland, Mich.—22-page catalog listing the properties and fabrication techniques for this concern's "Styraloy 22", a new synthetic thermoplastic resin of the hydrocarbon type possessing good low temperature flexibility, electrical properties, and stability to corona discharge at elevated temperatures. Includes data on physical forms, fabrication, mechanical and electrical properties, specifications and heat resistance. Extensively illustrated by drawings, charts and graphs. Contains extensive engineering data.

Synthetic Rubber Softeners. Wishnick-Tumpeer, Inc., 295 Madison Ave., New York, N. Y.—Report summarizing results of tests on the effect of some of the most commonly used softeners on physical properties of Buna-S. Softeners include asphalt, coal tar, and natural tar. Data were obtained on plasticizing action, hardness, tensile strength before and after aging, etc. Results summarized in tabular and graphic form.

Temperature Control. Wheelco Instrument Co., Harris & Peoria Sts., Chicago, Ill.—Five new bulletins describing and illustrating this concern's line of temperature recording and controlling instruments of various types.

Testing. Worthington Pump & Machinery Corp., Harrison, N. J.—Bulletin W210B28—4-page form illustrating and describing briefly this concern's dissolved oxygen test kit using the Winkler method for accurate determination of dissolved oxygen content of aerated boiler water.

Transformers. Allis-Chalmers, Milwaukee, Wis.—Bulletin B 6186—18-page catalog dealing with power and distribution transformers and other electrical distribution equipment put out by this concern. Discusses modern welded construction and standardization of design to save materials and provide advantages in installation and the new electro-cooler for increasing transformer capacity.

Transformers. General Electric Co., Schenectady, N. Y.—20-page form dealing with this concern's dry-type transformers for power and lighting circuits of 600 volts and below. Includes information on where to use such dry-type transformers, construction details, wall hangers, special application wiring diagrams, outlines and dimensions. Extensively illustrated by photographic reproduction, diagrammatic drawings and tables of engineering data.

Turbines. General Electric Co., Schenectady, N. Y.—Bulletin GEA-11450—20-page booklet dealing with this concern's line of Type D mechanical-drive turbines. Discusses use of processed steam for generation of power, specifications of the turbines, and modifications for special requirements. Extensively illustrated by photographic reproductions, diagrammatic charts and installation views.

Valves. Jenkins Bros., 80 White St., New York, N. Y.—30-page catalog entitled "Where to Use Valves, Drains and By-passes." Includes fundamentals of valve design and application and extensive data on bronze, monel, iron, steel, stainless steel and other metals. Extensively illustrated.

Valves. The Watson-Stillman Co., Distributor Products Division, Roselle, N. J. —Bulletin A4—36-page catalog on this concern's globe and check valves. Describes bronze, forged steel and cast steel valves and includes several new types. Includes data on pressure ratings, dimensions and prices, together with specifications and engineering data.

Vibration. The B. F. Goodrich Co., Akron, Ohio.—Section 7900—12-page revised edition of this concern's catalog on Vibro-Insulators, with a 4-page engineering work sheet for recording data on selection and installation. Illustrated by photographic reproduction and diagrammatic drawings.

Water Treatment. Cochrane Corp., 17th and Allegheny Ave., Philadelphia, Pa.—Publication 3005—36-page booklet dealing with the tray-type deaerators, atomizing deaerators, deaerating hot water generators and cold water deaerators put out by this concern. Includes flow diagrams, installation photographs, data on corrosion control and pH control, and accessory equipment. Extensively illustrated.

Water Treatment. D. W. Haering & Co., Inc., 205 West Wacker Drive, Chicago, Ill.—46-page booklet containing reprints of articles on scale, corrosion and water treatment problems. Includes articles on various glucosates, refrigerating brines and Nelson chemical pumps. Well illustrated by photographic reproductions, charts and diagrammatic drawings.

Water Treating. Graver Tank & Manufacturing Co., Inc., Chicago, Ind.—Bulletin 314—22-page form describing Graver hot process water softeners. Gives advantages of the softeners, methods of operation, information on filters, typical equipment and accessories. Extensively illustrated by photographic reproductions, charts, graphs, cross-sectional drawings and tables of engineering data.

Weatherproofing. Coated Products Corp., Verona, Pa.—Six-page form introducing this concern's "Plastipitch" method of weatherproofing many types of prefabricated metals and shapes to replace galvanizing and rolled method of bituminous application. The material is resistant to water, sunlight, smoke, alkali, acid or other corrosive atmospheric conditions.

Welding. Air Reduction Co., 60 East 42nd St., New York, N. Y.—15-page booklet of reprints dealing with the welding of piping. Discusses ferrous and non-ferrous piping, designs of joints, arc welding, testing, and other factors. Illustrated.

Worm Gears. The DeLaval Steam Turbine Co., Trenton, N. J.—Leaflet E-1219—4-page folder which deals with this concern's 3- in. and 3½-in. center distance bottom-drive and top-drive worm gears. Includes data on dimensions, specifications and horsepower ratings.

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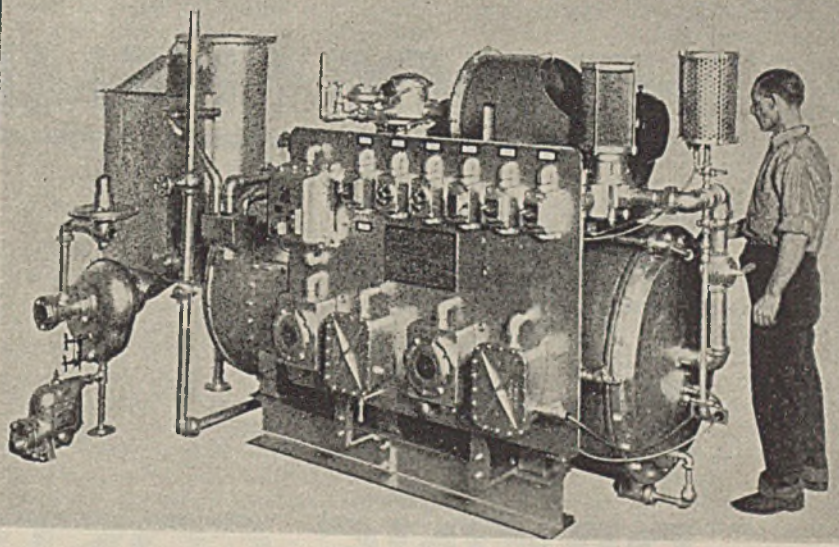

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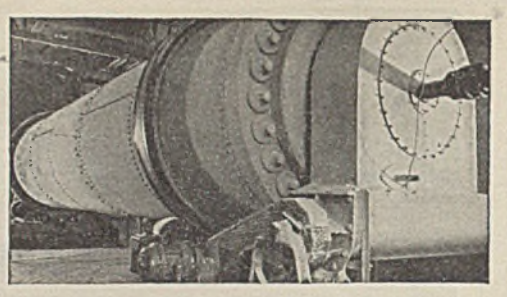

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ECONOMICS AND MARKETS

CONSUMPTION OF CHEMICALS INCREASES ALTHOUGH CIVILIAN INDUSTRIES HAVE REDUCED REQUIREMENTS

BASED ON the indexes of the Federal Reserve Board, production of chemicals in the first quarter of this year was about 25 percent higher than in the corresponding quarter of last year. Consumption of chemicals undoubtedly increased at a somewhat comparable rate. The *Chem. & Met.* index for consumption indicates there was a small decline in the use of chemicals in the ordinary channels in these periods. It is evident, therefore, that chemical outputs have been expanded, that war industries are taking a higher percentage of production, and that ordinary civilian lines are a little handicapped by the allocation of raw materials.

The *Chem. & Met.* indexes for chemical consumption are 173.20 for January and 167.12 for February. Data are incomplete for March but preliminary figures indicate the March figure will be about the same as that reported for January. Last year the index numbers were 177.12 for January, 162.84 for February, and 176.38 for March. Despite the restrictions placed on raw material deliveries and the controls over some industry operations the index registers a drop of less than one percent for the first quarter of this year. Moreover, manufacturing rates appear to be stabilized and to point to a fairly even course for the first half of the year.

Chem & Met. Index for Industrial Consumption of Chemicals

	Jan. revised	Feb.
Fertilizers	40.56	41.53
Pulp and paper	20.80	19.46
Petroleum refining	14.82	13.43
Glass	18.12	16.58
Paint and varnish	12.29	12.46
Iron and steel	13.63	12.40
Rayon	14.68	14.17
Textiles	11.48	11.07
Coal products	9.50	8.82
Leather	4.75	4.60
Industrial explosives	4.87	5.15
Rubber	3.00	3.00
Plastics	4.70	4.45
	173.20	167.12

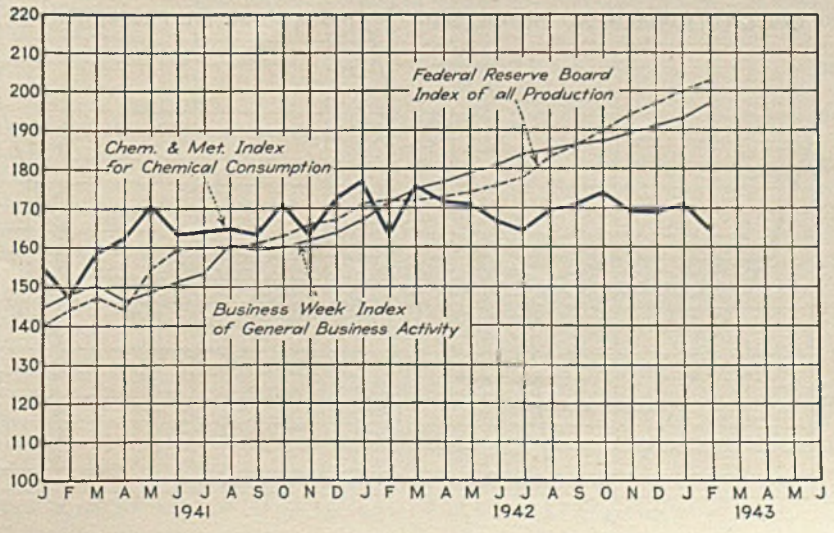
Iron and steel plants because their outputs are mostly for war purposes have steadily forged ahead and will better last year's record. Weekly percentage rates for operations are made public but it is well to remember that they are not directly comparable with those reported last year as they apply to a higher capacity total, the annual tonnage figures having been revised at the beginning of the year.

Production of superphosphate, which offers the largest single outlet for sulphuric acid, also has been on an ascending scale because of the larger needs for fertilizer. The food program has loomed very large in the war program and as raw materials appear to be readily available, monthly outputs of superphosphate should continue to be above normal. The glass industry presents a rather complicated picture with some lines much depressed and others at record levels. From the standpoint of consumption of chemicals the net result is favorable. Last year, the container branch required about 900,000 tons of soda ash which was more than the entire industry consumed in any previous year except 1941. As glass is still looked to as the answer for many of our packaging problems, production of containers will probably set another record this year.

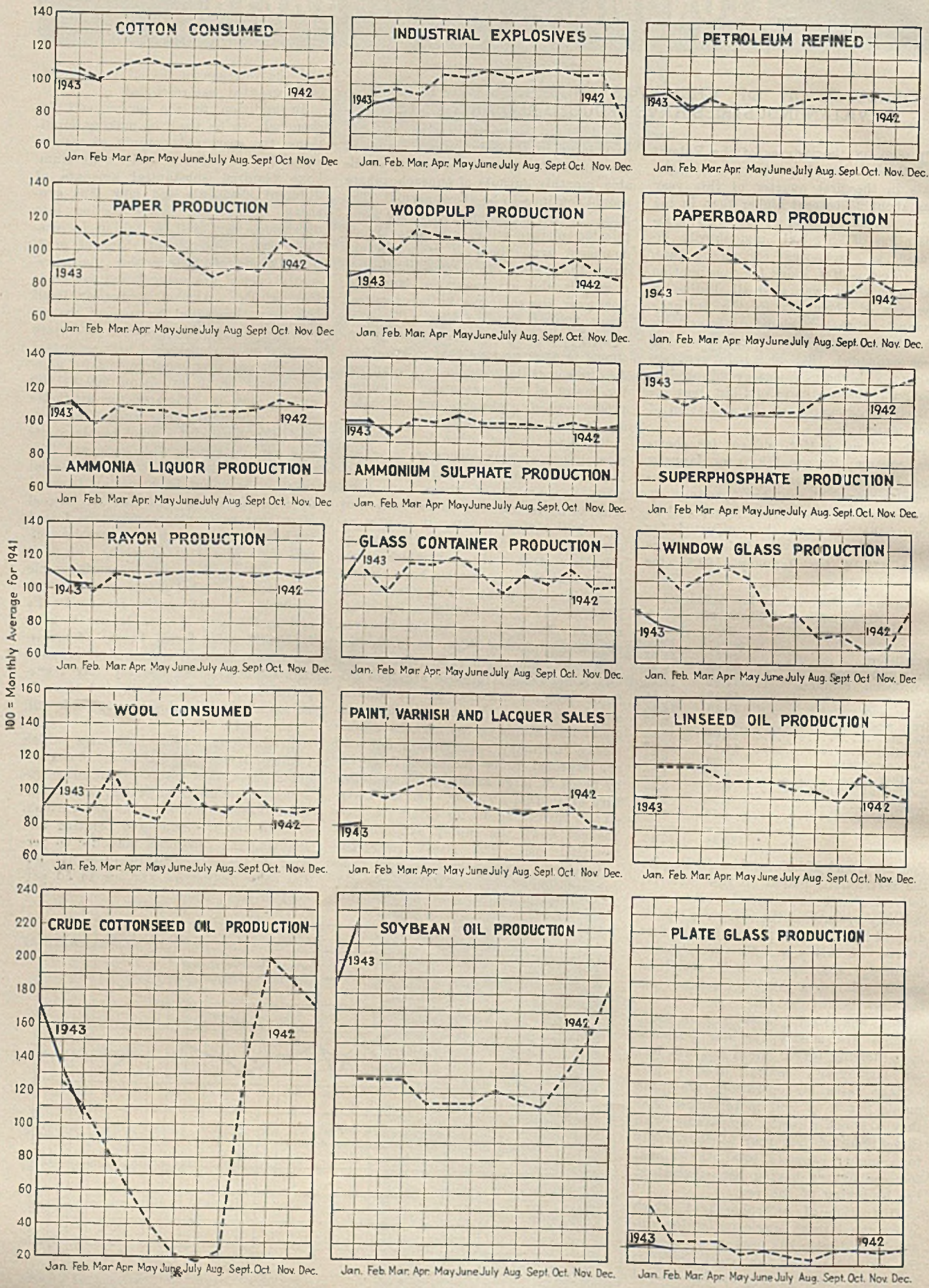
Reference to the other industries of most importance as consumers of chemicals brings out less favorable comparisons since most of them have been affected by restrictions on production or on supplies of materials. It is now reported that curtailment of civilian supplies has reached its peak which might mean that these industries have reached a stabilization point. In most cases this is borne out by the statistics for recent months. There is some doubt, however, regarding pulp and paper as further reductions in outputs may be ordered later on. Soap makers likewise are in a difficult position because of the limited supplies of oils and fats and the consequent limitations on the use of available stocks. Ordinary requirements for soap are expected to be increased this year by needs of large amounts for manufacture of synthetic rubber. Yet the necessity of furnishing oil for edible purposes has cut down the supply available for technical use. The latest restrictive order forces soap makers to hold their consumption of oils and fats to 84 percent of the amounts used in 1940-1941 and the increase in use of foots previously granted was rescinded.

In addition to the active call for chemicals to be used in making munitions, the increased outputs of metals, especially aluminum and magnesium, have required substantial amounts of different chemicals and now that synthetic rubber plants are coming into operation, they will be taking increasingly large amounts of chemical products. Some of these rubber plants recently opened are using butadiene made from alcohol. Alcohol production itself has been threatened because of the reported inability of producers to obtain supplies of grain. It had been estimated that current year requirements for alcohol would be in excess of 500,000,000 gallons but as estimates for synthetic rubber production have since been lowered, the figure for alcohol requirements also can be considerably reduced. The fact remains, however, that raw material supplies have not been coming forward up to expectations and this has caused fears that some plants might be forced to close. While government agencies control some of the grain stocks, the position in the open market is not favorable for sales to alcohol plants as it is more profitable to sell grain for foodstuffs and in the case of corn to use it as a feedstuff on the farm. Stocks of molasses are said to have increased at primary points outside the country but transportation problems remain and there is no assurance that this import trade will be resumed.

Production in the industries which require drying oils is slated for some curtailment as a result of the order restricting the use of such oils. The industries affected include, paint and varnish, oilcloth and linoleum, and printing ink. Printing ink producers may use 90 percent of the oils used in 1940-1941 but the other industries are cut to 50 percent of such usage.



Production and Consumption Trends



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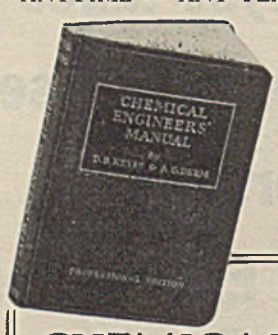

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OFFICIAL PRICE CONTROLS ARE EXTENDED TO INCLUDE NEW LIST OF CHEMICALS

THE MOST important market developments in the past month were found in official actions having a bearing on prices for chemicals. Effective March 24, a maximum price of 72.8c. a gallon was established for grade A imported cresylic acid. A ceiling of 70c. had been in effect for grade B which has been coming from Great Britain and as some of the higher grade was reported now available, the higher price was made official in order to stimulate imports of this scarce chemical. An adjustment also was made in the regulations governing sales of sulphuric acid whereby producers might revise prices on contracts entered into prior to March 1942. Several old contracts were made at prices lower than the prevailing market with provisions for later adjustment. Higher labor and raw material costs have made upward price adjustments necessary with the maximums not to exceed those to be established in a regulation to be issued soon by OPA.

For some time, eastern producers of copper sulphate had been working under a voluntary agreement to hold prices to a maximum of $5.15 per 100 lb. Western producers were not a party to this agreement and were selling as high as $5.50 per 100 lb. OPA investigation found no real differences in cost of production in the two sections and further stated that all prices were too high in relation to production costs. Hence, a nationwide price ceiling has been established calculated on a base price of $5.00 per 100 lb. for 99 percent crystals.

To correct price inequalities, specific maximums have been set up to govern sales of superphosphate. The prices are on a basis of point of production and range from 50c. for some southern points to 84c. for California loadings, the prices being per unit of available phosphoric acid. For triple superphosphate, the new prices are 88.5c. per unit delivered to buyers, for all the far western states. In other states, prices are fob point of production and vary from 62c. per unit for Florida to 70c. per unit for Montana or Tennessee.

Of interest to tanners was the issuance of a separate regulation establishing a base price of $2.25 per 100 lb. for liquid chestnut extract of 25 percent tannin content. Other grades maintain the usual differentials from the base price.

A single regulation added twelve fine chemicals to the price-controlled list. These included saccharin, caffeine, anhydrous caffeine, citrated caffeine, theobromine, vanillin, ethyl vanillin, coumarin, salicylic and acetylsalicylic acids, ascorbic acid, and citric acid. The maximum price for citric acid USP, granular, fine granular, and crystal in carlots is 20c. a lb. Maximums for salicylic acid are 28c. a lb. for USP and 26c. a lb. for technical, carlots.

In the insecticide field, price controls have been established for calcium arsenate covering sales from small amounts to carlots. The maximums range from 7c to17c a lb. for sales to distributors and from 7c to 20c a lb. on sales to retail dealers. Paris green also has been placed under ceilings with the range from 20c to 34c a lb. to distributors and from 25c to 44c a lb. to retailers. In each case the price range depends on quantity, size and type of container.

Producers of caustic soda asked that an extension in time be granted before putting into operation the cross-haul zoning plan to control distribution of this chemical. The plan was originally scheduled to operate on April 1 but May 1 has been now officially set as the effective date. Incidentally, some sections of the country, notably the south, have reported that supplies of caustic were small which is in contrast to the over-all situation as production has been topping consuming requirements with a consequent piling up of stocks. Some southern producers have been favored in finding an outlet at alumina plants where it has been found advantageous to use caustic instead of soda ash in treating bauxite.

Effective March 24, authority over the principal oils and fats was transferred from the War Production Board to the Department of Commerce. In a way this emphasizes the importance of these products in the edible trades and the cutting down of supplies available for ordinary commercial use. Within a few days of this transfer, the Department of Agriculture issued an order which was designed to make further reductions in the use of oils and fats in the manufacture of products for civilian consumption. Taking 1940-1941 as the base period consuming industries are now placed on the following quotas of oils and fats: margarine, 180 percent; other edible products, including shortening, 88 percent; soap, 84 percent of primary oils and fats and 100 percent of domestic vegetable oil foots; paints, varnishes, lacquers, water paints, and other protective coatings, 50 percent; linoleum, oilcloth, and felt base floor coverings, 50 percent; other oilcloth and coated fabrics, 50 percent; and printing inks, 90 percent.

CHEM. & MET. Weighed Index of CHEMICAL PRICES

Base=100 for 1937

This month	108.83
Last month	108.85
April, 1942	109.54
April, 1941	100.14

Principal price developments consisted in establishment of ceilings for superphosphate and chestnut extract. Higher prices also were permitted in sales of imported cresylic acid. Practically all chemicals not under ceilings, are maintaining an unchanged price position.

The cutting down of the amount of drying oils which may be used in the manufacture of paints, varnishes, lacquers, linoleum, and oilcloth to one-half that used in the base period can not help but have the effect of reducing outputs of finished products in those fields. The fact that practically all drying oils come under this restriction eliminates the possibility of substituting one for another and forces greater efforts in the direction of developing new materials for such production.

Both production and marketing of glycerine are now tied up under regulations. The first concern is felt for the supply for military purposes and the most recent control is found in Food Distribution Order No. 33 which reduces the permitted glycerine content of soaps to four-fifths of one percent. Under the order, previously in effect, soap makers were permitted to leave as much as 1 percent of glycerine in most soap and manufacturers of liquid, potash, cold-made, and half-boiled soaps were permitted to leave as much as 2.75 percent of glycerol in the finished product. The new order also requires the soap maker to recover not less than 92 percent of the glycerol content of the spent lye. In the fat-splitting process, not less than 94 percent of the glycerine must be recovered. Refiners of crude glycerine are required to recover not less than 96 percent of the glycerol content.

Market reports in general are unchanged in this respect that they point to a small supply for most of the important chemicals. Consumers of calcium carbide, acetylene, and oxygen were requested last month to adopt all possible means of conservation in the use of these materials as they not only were quite scarce but no hope was held for an improvement in the supply situation in the near future. In the case of oxygen it was stated that the supply will be below all requirements throughout the year as it will take that long to complete prospective production facilities.

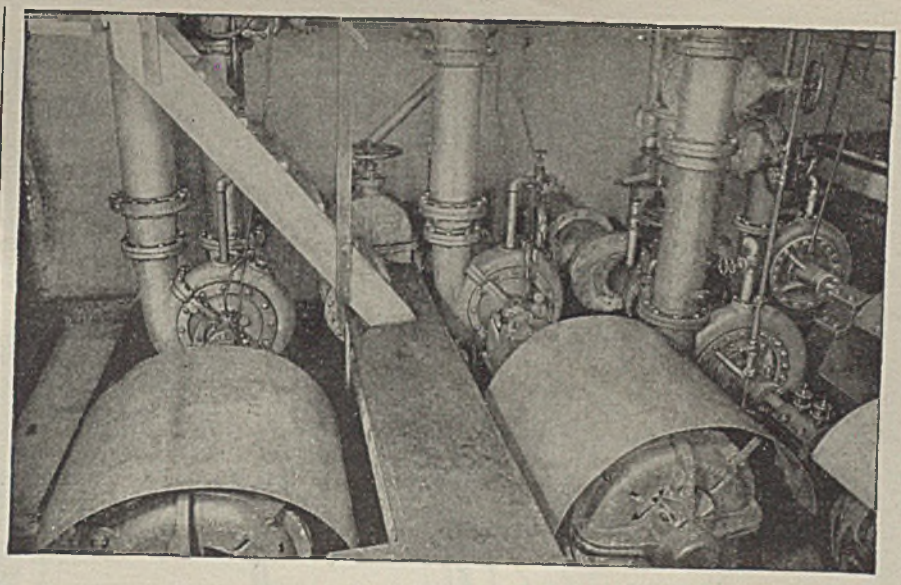
Supplies of shellac for some time have been so restricted that allocations have been reserved mainly for most essential purposes. Recently it was announced that attempts would be made to start larger shipments from primary markets and that an official representative would go to India to help in the solution of this problem.

CHEM. & MET.
Weighed Index of Prices for
OILS & FATS

Base=100 for 1937

This month	146.03
Last month	145.37
April, 1942	143.89
April, 1941	93.76

Transfer of control over most fats and oils from WPB to the Department of Agriculture has not affected prices but limitations on use outside the edible trades has cut down supplies for industrial consumption and strengthened the price position.



PUMPS . . .

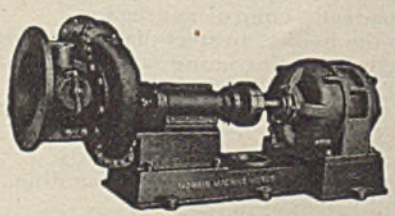
that are not merely "adapted to"

but DESIGNED FOR . . .

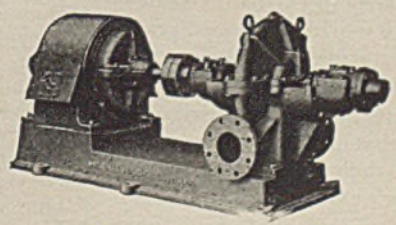
YOUR requirements

MORRIS has twelve different types of centrifugal pumps for handling abrasive materials such as slurry, sand, gravel, etc. . . . five different types for handling pulpy materials such as sewage, paper stock, etc. . . . and a standard type for every clear water service.

Therefore, whatever your pumping requirements may be, you can be sure of an *exactly suitable* Morris design. . . . not merely an "adapted" design. Your benefits are higher efficiency . . . longer service . . . lower maintenance expense. Write for bulletin on the Morris design for your needs.



ST-P Non-clogging Pump — Guaranteed Non-binding for Pulpy Mixtures



Double Suction Horizontally Split Pump for Clear Liquids

MORRIS MACHINE WORKS

MORRIS

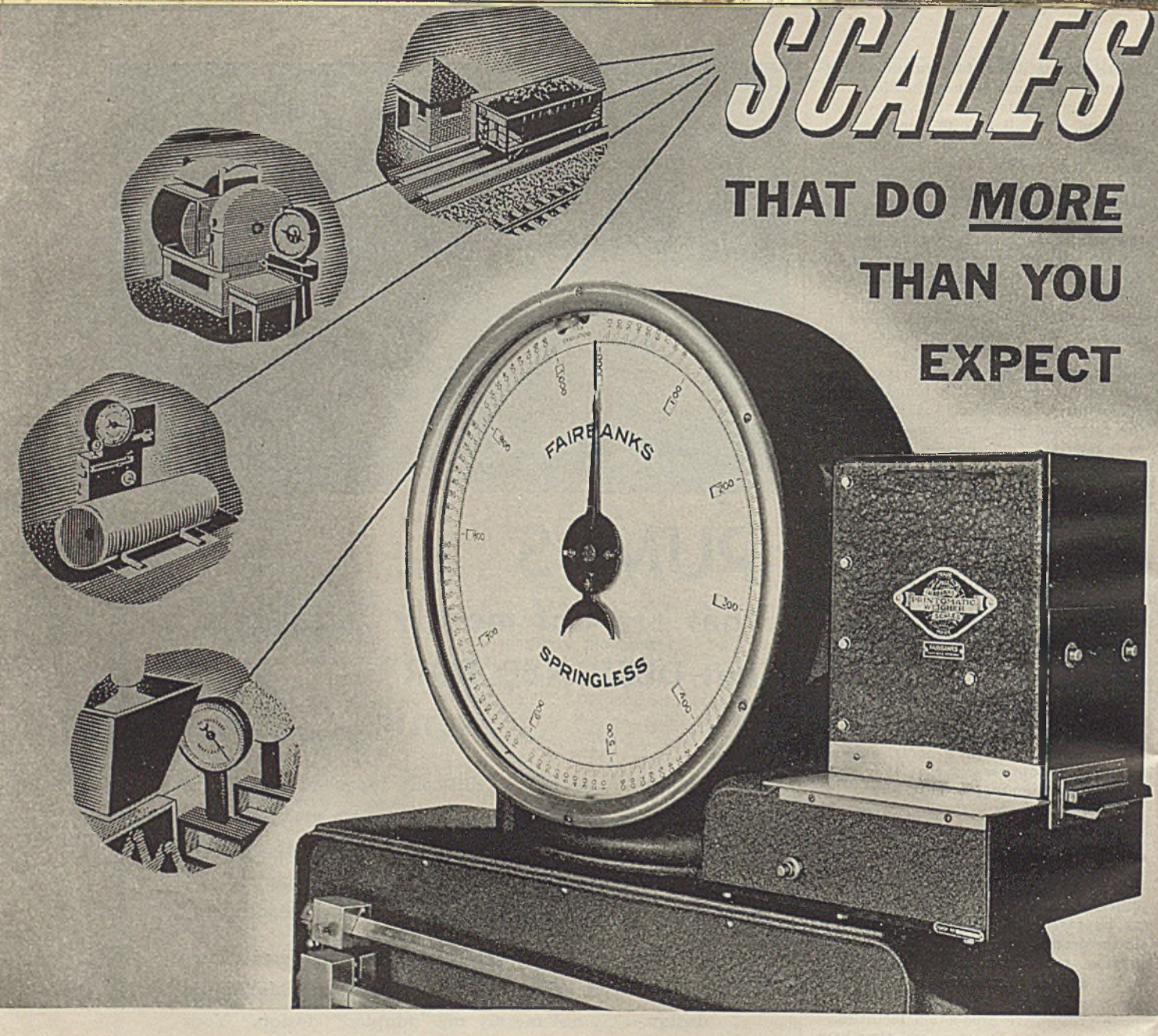
ESTABLISHED 1864

BALDWINSVILLE NEW YORK

CENTRIFUGAL PUMPS

SCALES

THAT DO *MORE* THAN YOU EXPECT



OF course, Fairbanks Scales are big, husky, and accurate. You have a right to expect these things in *any* good scale — and particularly of Fairbanks Scales with the world's broadest scale manufacturing experience behind them.

The feature about Fairbanks Scales that may surprise you the most, is their ability to do things you *don't* expect of scales.

Here are a few of many jobs done by Fairbanks Scales:

- They count small parts — more accurately than manual counting
- They weigh carloads of coal in motion and make a printed record of each weight
- They automatically control paint ingredients
- They automatically control aggregates
- They "keep the books" in steel plants, making printed records of incoming and outgoing shipments
- They keep accurate records on chlorination in water treatment
- They record the *flow* of liquid chemicals
- They guard secret formulas in compounding
- They control batching in bakeries
- They prevent disputes by eliminating the human element in weighing.

AND all of these things, only the beginning of the story, they do automatically and mechanically thereby eliminating human errors.

How Fairbanks Scales can be fitted into your production flow to speed up operations and eliminate errors may prove to be the most interesting discovery you ever made. Investigate now. Write Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Illinois.

FAIRBANKS-MORSE

DIESEL ENGINES
PUMPS
MOTORS
GENERATORS
SCALES
WATER SYSTEMS
FARM EQUIPMENT
STOKERS
AIR CONDITIONERS
RAILROAD EQUIPMENT

FAIRBANKS SCALES

Scales

CURRENT PRICES

INDUSTRIAL CHEMICALS

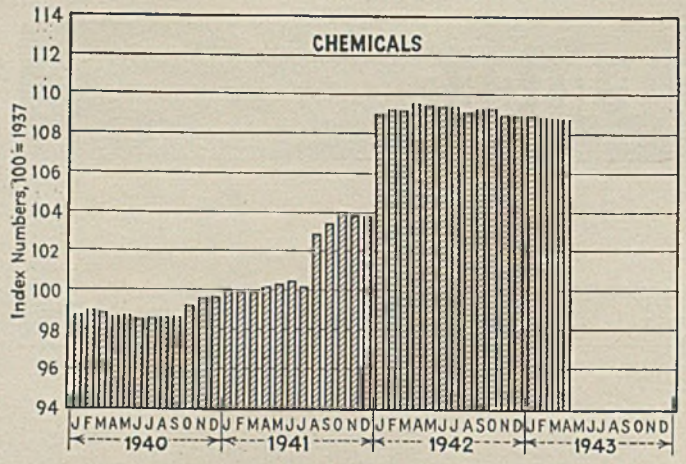
	Current Price	Last Month	Last Year
Acetone, drums, lb.	$0.085–$0.109	$0.085–$0.109	$0.168–$0.173
Acid, acetic, 28%, bbl., cwt.	3.38 – 3.63	3.38 – 3.63	3.38 – 3.63
Glacial 99.5%, drums	9.15 – 9.40	9.15 – 9.40	9.15 – 9.40
U. S. P. X 1, 99.5%, dr.	10.95 –11.20	10.95 –11.20	10.95 –11.20
Boric, bbl., ton	109.00–113.00	109.00–113.00	109.00–113.00
Citric, kegs, lb.	.20 – .23	.20 – .23	.20 – .23
Formic, cbys, lb.	.10½– .11	.10½– .11	.10½– .11
Gallic, tech., bbl., lb.	1.10 – 1.15	1.10 – 1.15	1.10 – 1.15
Hydrofluoric 30% drums, lb.	.08 – .08½	.08 – .08½	.08 – .08½
Lactic, 44% tech., light, bbl., lb.	.073– .075	.073– .075	.073– .075
Muriatic 18°, tanks, cwt.	1.05 –	1.05 –	1.05 –
Nitric, 36°, carboys, lb.	.05 – .05½	.05 – .05½	.05 – .05½
Oleum, tanks, wks., ton	18.50 –20.00	18.50 –20.00	18.50 –20.00
Oxalic, crystals, bbl., lb.	.11½– .13	.11½– .13	.11½– .13
Phosphoric, tech., c'bys., lb.	.07½– .08½	.07½– .08½	.07½– .08½
Sulphuric, 60°, tanks, ton	13.00 –	13.00 –	13.00 –
Sulphuric, 66°, tanks, ton	16.50 –	16.50 –	16.50 –
Tannic, tech., bbl., lb.	.71 – .73	.71 – .73	.71 – .73
Tartaric, powd., bbl., lb.	.70 –	.70 –	.70 –
Tungstic, bbl., lb.	nom	nom	nom
Alcohol, amyl			
From Pentane, tanks, lb.	.131–	.131–	.131–
Alcohol, Butyl, tanks, lb.	.10¾–	.10¾–	.158–
Alcohol, Ethyl, 190 p'f., bbl., gal.	11.94 –	11.94 –	8.19 – 8.25
Denatured, 190 proof			
No. 1 special, dr., gal. wks.	.62 –	.62 –	.60 –
Alum, ammonia, lump, bbl., lb.	.03½– .04	.03½– .04	.03½– .04
Potash, lump, bbl., lb.	.04¼– .04½	.04¼– .04¼	.04 – .04¼
Aluminum sulphate, com. bags, cwt.	1.15 – 1.40	1.15 – 1.40	1.15 – 1.40
Iron free, bg., cwt	1.85 – 2.10	1.85 – 2.10	1.85 – 2.10
Aqua ammonia, 26°, drums, lb.	.02¼– .03	.02¼– .03	.02¼– .03
tanks, lb.	.02 – .02¾	.02 – .02¾	.02 – .02¾
Ammonia, anhydrous, cyl., lb.	.16 –	.16 –	.16 –
tanks, lb.	.04½–	.04½–	.04½–
Ammonium carbonate, powd. tech., casks, lb.	.09½– .12	.09½– .12	.09½– .12
Sulphate, wks., ton	29.20 –	29.20 –	29.00 –
Amylacetate tech., from pentane, tanks, lb.	.145–	.145–	.145–
Antimony Oxide, bbl., lb.	.15 –	.15 –	.15 –
Arsenic, white, powd., bbl., lb.	.04 – .04½	.04 – .04½	.04 – .04½
Red, powd., kegs, lb.	nom	nom	nom
Barium carbonate, bbl., ton	60.00 –65.00	60.00 –65.00	60.00 –65.00
Chloride, bbl., ton	79.00 –81.00	79.00 –81.00	79.00 –81.00
Nitrate, casks, lb.	.11 – .12	.11 – .12	.10½– .11
Blanc fix, dry, bbl., lb.	.03½– .04	.03½– .04	.03½– .04
Bleaching powder, f.o.b., wks., drums, cwt.	2.25 – 2.35	2.25 – 2.35	2.25 – 2.35
Borax, gran., bags, ton	44.00 –	44.00 –	44.00 –
Bromine, cs., lb.	.30 – .32	.30 – .32	.30 – .32
Calcium acetate, bags	3.00 –	3.00 –	3.00 –
Arsenate, dr., lb.	.07 – .08	.07 – .08	.07 – .08
Carbide drums, lb.	.04½– .05	.04½– .05	.04½– .05
Chloride, fused, dr., del., ton.	18.00 –24.00	18.00 –24.00	19.00 –24.50
flake, bags., del., ton.	18.50 –25.00	18.50 –25.00	20.50 –25.00
Phosphate, bbl., lb.	.07½– .08	.07½– .08	.07½– .08
Carbon bisulphide, drums, lb.	.05½–	.05½–	.05½–
Tetrachloride drums, gal.	.73 – .80	.73 – .80	.73 – .80
Chlorine, liquid, tanks, wks., 100 lb	2.00 –	2.00 –	2.00 –
Cylinders	.05¼– .06	.05½– .06	.05½– .06
Cobalt oxide, cans, lb.	1.84 – 1.87	1.84 – 1.87	1.84 – 1.87
Copperas, bgs., f.o.b., wks., ton	18.00 –19.00	18.00 –19.00	18.00 –19.00
Copper carbonate, bbl., lb.	.18 – .20	.18 – .20	.18 – .20
Sulphate, bbl., cwt.	5.00 – 5.50	5.15 – 5.40	5.15 – 5.40
Cream of tartar, bbl., lb.	.57 –	.57 –	.57 –
Diethylene glycol, dr., lb.	.14 – .15½	.14 – .15½	.14 – .15½
Epsom salt, dom., tech., bbl., cwt.	1.90 – 2.00	1.90 – 2.00	1.90 – 2.00
Ethyl acetate, drums, lb.	.12 –	.12 –	.12 –
Formaldehyde, 40%, bbl., lb.	.05½– .06	.05½– .06¼	.05½– .06
Furfural, tanks, lb.	.09 –	.09 –	.09 –
Fusel oil, drums, lb.	.18 – .19	.18 – .19	.18 – .19
Glaubers salt, bags, cwt.	1.05 – 1.10	1.05 – 1.10	1.05 – 1.10
Glycerine, c.p., drums, extra, lb.	.18¾–	.18¼–	.18¾–
Lead:			
White, basic carbonate, dry casks, lb.	.08½–	.08½–	.08½–
White, basic sulphate, sck., lb.	.07½–	.07½–	.07½–
Red, dry, sck., lb.	.09½–	.09½–	.09½–
Lead acetate, white crys., bbl., lb.	.12½– .13	.12½– .13	.12½– .13
Lead arsenate, powd., bag, lb.	.11 – .12	.11 – .12	.11 – .12
Lime, chem., bulk, ton	8.50 –	8.50 –	8.50 –
Litharge, powd., sck., lb.	.08½–	.08½–	.08½–
Lithopone, bags, lb.	.04½– .04¾	.04½– .04¾	.04½– .04¾
Magnesium carb., tech., bags, lb.	.06½– .06¾	.06½– .06¾	.06½– .06¾
Methanol, 95%, tanks, gal.	.58 –	.58 –	.60 –
97%, tanks, gal.	.58 –	.58 –	.60 –
Synthetic, tanks, gal.	.28 –	.28 –	.28 –
Nickel salt, double, bbl., lb.	.13½– .13¾	.13½– .13¾	.13½– .13½
Orange mineral, csk., lb.	.12½–	.12½–	.12½–
Phosphorus, red, cases, lb.	.40 – .42	.40 – .42	.40 – .42
Yellow, cases, lb.	.18 – .25	.18 – .25	.18 – .25
Potassium bichromate, casks, lb.	.09¾– .10	.09¾– .10	.09¾– .10
Carbonate, 80–85%, calc. csk., lb.	.06½– .07	.06½– .07	.06½– .07
Chlorate, powd., lb.	.10 – .12	.10 – .12	.10 – .12
Hydroxide (c'stic potash) dr., lb.	.07 – .07½	.07 – .07½	.07 – .07½
Muriate, 60% bags, unit	.53½–	.53½–	.53½–
Nitrate, bbl., lb.	.05½– .06	.05½– .06	.05½– .06
Permanganate, drums, lb.	.19½– .20	.19½– .20	.19½– .20
Prussiate, yellow, casks, lb.	.17 – .18	.17 – .18	.17 – .18
Sal ammoniac, white, casks, lb.	.0515– .06	.0515– .06	.0515– .06
Salsoda, bbl., cwt.	1.00 – 1.05	1.00 – 1.05	1.00 – 1.05
Salt cake, bulk, ton	17.00 –	17.00 –	17.00 –
Soda ash, light, 58%, bags, contract, cwt.	1.05 –	1.05 –	1.05 –
Dense, bags, cwt.	1.10 –	1.10 –	1.10 –
Soda, caustic, 76%, solid, drums, cwt.	2.30 – 3.00	2.30 – 3.00	2.30 – 3.00
Acetate, del., bbl., lb.	.05 – .06	.05 – .06	.05 – .06
Bicarbonate, bbl., cwt.	1.70 – 2.00	1.70 – 2.00	1.70 – 2.00
Bichromate, casks, lb.	.07½– .08	.07⅞– .08	.07⅞– .08
Bisulphate, bulk, ton	16.00 –17.00	16.00 –17.00	16.00 –17.00
Bisulphite, bbl., lb.	.03 – .04	.03 – .04	.03 – .04
Chlorate, kegs, lb.	.06½– .06¾	.06½– .06¾	.06½– .06¾
Cyanide, cases, dom., lb.	.14 – .15	.14 – .15	.14 – .15
Fluoride, bbl., lb.	.08 – .09	.08 – .09	.08 – .09
Hyposulphite, bbl., cwt.	2.40 – 2.50	2.40 – 2.50	2.40 – 2.50
Metasilicate, bbl., cwt.	2.50 – 2.65	2.50 – 2.65	2.50 – 2.65
Nitrate, bulk, cwt.	1.35 –	1.35 –	1.35 –
Nitrite, casks, lb.	.06½– .07	.06½– .07	.06½– .07
Phosphate, tribasic, bags, lb.	2.70 –	2.70 –	2.70 –
Prussiate, yel. drums, lb.	.10½– .11	.10½– .11	.10½– .11
Silicate (40° dr.), wks., cwt.	.80 – .85	.80 – .85	.80 – .85
Sulphide, fused, 60–62%, dr. lb.	.03 – .03½	.03 – .03½	.03 – .03½
Sulphite, crys., bbl., lb.	.02¼– .02½	.02¼– .02½	.02¼– .02½
Sulphur, crude at mine, long ton.	16.00 –	16.00 –	16.00 –
Chloride, dr., lb.	.03 – .04	.03 – .04	.03 – .04
Dioxide, cyl., lb.	.07 – .08	.07 – .08	.07 – .08
Flour, bag, cwt.	1.90 – 2.40	1.90 – 2.40	1.90 – 2.40
Tin Oxide, bbl., lb.	.55 –	.55 –	.55 –
Crystals, bbl., lb.	.39½–	.39½–	.39½–
Zinc, chloride, gran., bbl., lb.	.05½– .06	.05½– .06	.05 – .06
Carbonate, bbl., lb.	.14 – .15	.14 – .15	.14 – .15
Cyanide, dr., lb.	.33 – .35	.33 – .35	.33 – .35
Dust, bbl., lb.	.1035–	.1035–	.09½–
Zinc oxide, lead free, bag, lb.	.07½–	.07½–	.07½–
5% leaded, bags, lb.	.07½–	.07½–	.07½–
Sulphate, bbl., cwt.	3.85 – 4.00	3.85 – 4.00	3.40 – 3.50

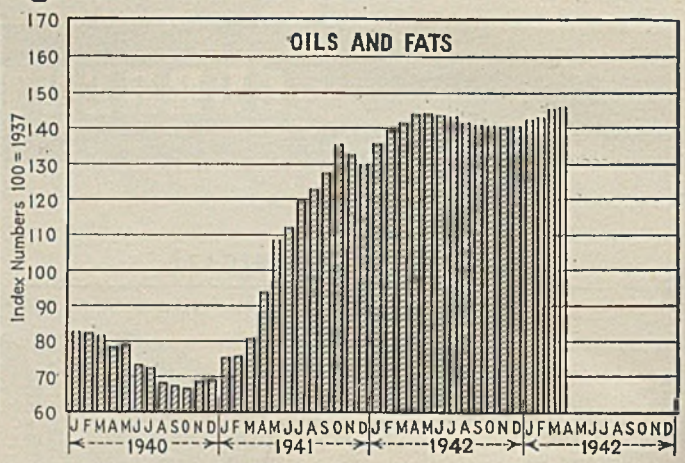
OILS AND FATS

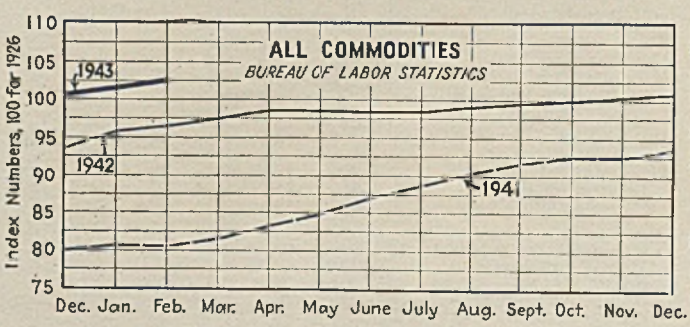
	Current Price	Last Month	Last Year
Castor oil, No. 3 bbl., lb.	$0.13½–$0.14½	$0.13½–$0.14½	$0.13½–$0.14½
Chinawood oil, bbl., lb.	.38 –	.38 –	.38 –
Coconut oil, Ceylon, tank, N. Y., lb.	nom	nom	nom
Corn oil crude, tanks (f.o.b. mill), lb.	.12½–	.12½–	.12½–
Cottonseed oil, crude (f.o.b. mill), tanks, lb.	.12½–	.12½–	.12½–
Linseed oil, raw car lots, bbl., lb.	.158–	.14 –	.141–
Palm, casks, lb.	.09 –	.09 –	.09 –
Peanut oil, crude, tanks (mill), lb.	.13 –	.13 –	.13 –
Rapeseed oil, refined, bbl., lb.	nom	nom	nom
Soya bean, tank, lb.	.12½–	.11½–	.11½–
Sulphur (olive foots), bbl., lb.	nom	nom	.19½–
Cod, Newfoundland, bbl., gal.	nom	nom	nom
Menhaden, light pressed, bbl., lb.	.117–	.117–	.114–
Crude, tanks (f.o.b. factory) lb.	.088–	.088–	.088–
Grease, yellow, loose, lb.	.08½–	.08½–	.09295–
Oleo stearine, lb.	.09½–	.09½–	.09½–
Oleo oil, No. 1	.11½–	.11½–	.11½–
Red oil, distilled, dp.p. bbl., lb.	.11½–	.11–¼–	.12 –
Tallow extra, loose, lb.	.08¾–	.08¼–	.097125–

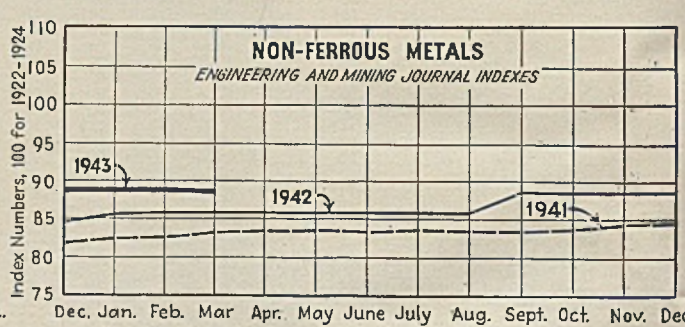
The accompanying prices refer to round lots in the New York market. Where it is the trade custom to sell f.o.b. works, quotations are given on that basis and are so designated. Prices are corrected to April 13

Chem. & Met.'s Weighted Price Indexes









Coal-Tar Products

	Current Price	Last Month	Last Year
Alpha-naptbol, crude bbl., lb.	$0.52– $0.55	$0.52– $0.55	$0.52 –$0.55
Alpha-naphthylamine, bbl., lb.	.32 – .34	.32 – .34	.32 – .34
Aniline oil, drums, extra, lb.	.15 – .16	.15 – .16	.15 – .16
Aniline, salts, bbl., lb.	.22 – .24	.22 – .24	.22 – .24
Benzaldehyde, U.S.P., dr., lb.	.85 – .95	.85 – .95	.85 – .95
Benzidine base, bbl., lb.	.70 – .75	.70 – .75	.70 – .75
Benzoic acid, U.S.P., kgs., lb.	.54 – .56	.54 – .56	.54 – .56
Benzyl chloride, tech., dr., lb.	.23 – .25	.23 – .25	.23 – .25
Benzol, 90%, tanks, works, gal.	.15 –	.15 –	.14 –
Beta-naphthol, tech., drums, lb.	.23 – .24	.23 – .24	.23 – .24
Cresol, U.S.P., dr., lb.	.11 –	.11 – .11	.10½– .11
Cresylic acid, dr., wks., gal.	.81 – .83	.81 – .83	.81 – .83
Diethylaniline, dr., lb.	.40 – .45	.40 – .45	.40 – .45
Dinitrophenol, bbl., lb.	.23 – .25	.23 – .25	.23 – .25
Dinitrotoluol, bbl., lb.	.18 – .19	.18 – .19	.18 – .19
Dip oil, 15%, dr., gal.	.23 – .25	.23 – .25	.23 – .25
Diphenylamine, dr. f.o.b. wks., lb.	.60 –	.60 –	.70 –
H-acid, bbl., lb.	.45 – .50	.45 – .50	.45 – .50
Naphthalene, flake, bbl., lb.	.07 – .07½	.07 – .07½	.07 – .07½
Nitrobenzene, dr., lb.	.08 – .09	.08 – .09	.08 – .09
Para-nitraniline, bbl., lb.	.47 – .49	.47 – .49	.47 – .49
Phenol, U.S.P., drums, lb.	.10½– .11	.10½– .11	.13 –
Picric acid, bbl., lb.	.35 – .40	.35 – .40	.35 – .40
Pyridine, dr., gal.	1.70 – 1.80	1.70 – 1.80	1.70 – 1.80
Resorcinol, tech., kegs., lb.	.75 – .80	.75 – .80	.75 – .80
Salicylic acid, tech., bbl., lb.	.33 – .40	.33 – .40	.33 – .40
Solvent naphtha, w.w., tanks, gal.	.27 –	.27 –	.27 –
Tolidine, bbl., lb.	.86 – .88	.86 – .88	.86 – .88
Toluol, drums, works, gal.	.33 –	.33 –	.32 –
Xylol, com., tanks, gal.	.26 –	.26 –	.26 –

Miscellaneous

	Current Price	Last Month	Last Year
Barytes, grd., white, bbl., ton.	$22.00–$25.00	$22.00–$25.00	$22.00–$25.00
Casein, tech., bbl., lb.	.21 – .23½	.19 – .20	.19½– .25
China clay, dom., f.o.b. mine, ton.	8.00 –20.00	8.00 –20.00	8.00 –20.00
Dry colors			
Carbon gas, black (wks.), lb.	.0335– .30	.0335– .30	.0335– .30
Prussian blue, bbl., lb.	.36 – .37	.36 – .37	.36 – .37
Ultramarine blue, bbl., lb.	.11 – .26	.11 – .26	.11 – .26
Chrome green, bbl., lb.	.21½– .30	.21½– .30	.21½– .30
Carmine, red, tins, lb.	4.60 – 4.75	4.60 – 4.75	4.60 – 4.75
Para toner, lb.	.75 – .80	.75 – .80	.75 – .80
Vermilion, English, bbl., lb.	3.05 – 3.10	3.05 – 3.10	3.05 – 3.10
Chrome yellow, C.P., bbl., lb.	.14½– .15½	.14½– .15½	.14½– .15½
Feldspar, No. 1 (f.o.b.N.C.), ton.	6.50 – 7.50	6.50 – 7.50	6.50 – 7.50
Graphite, Ceylon, lump, bbl., lb.	.08 – .10	.08 – .10	.08 – .10
Gum copal Congo, bags, lb.	.09 – .30	.09 – .30	.09 – .30
Manila, bags, lb.	.09 – .15	.09 – .14	.09 – .15
Demar, Batavia, cases, lb.	.10 – .22	.10 – .20	.10 – .22
Kauri, cases, lb.	.18 – .60	.17 – .60	.18 – .60
Kieselguhr (f.o.b. mines), ton.	7.00 –40.00	7.00 –40.00	7.00 –40.00
Magnesite, calc, ton.	64.00 –	64.00 –	64.00 –
Pumice stone, lump, bbl., lb.	.05 – .07	.05 – .08	.05 – .07
Imported, casks, lb.	nom	nom	nom
Rosin, H., 100 lb.	4.05 –	4.15 –	3.44 –
Turpentine, gal.	.69½–	.69 –	.70½–
Shellac, orange, fine, bags, lb.	.39 –	.39 –	.43 –
Bleached, bonedry, bags, lb.	.39 –	.39 –	.40 –
T. N. bags, lb.	.31 –	.31 –	.32 –
Soapstone (f.o.b. Vt.), bags, ton.	10.00 –12.00	10.00 –12.00	10.00 –12.00
Talc, 200 mesh (f.o.b. Vt.), ton.	8.00 – 8.50	8.00 – 8.50	8.00 – 8.50
200 mesh (f.o.b. Ga.), ton.	6.00 – 8.00	6.00 – 8.00	6.00 – 8.00

Industrial Notes

THE EIMCO CORP., Salt Lake City, has established a filtration laboratory in connection with its office at 111 West Washington St., Chicago. Paul Richter is in charge of the filtration equipment department.

WHEELCO INSTRUMENTS CO., Chicago, has appointed Hugh Acock Texas district manager with headquarters in Houston. C. H. Garrison represents the company in Kansas City and Russell George has been added to the Chicago office.

HERCULES POWDER CO., Wilmington, has opened sales offices in the Statler Bldg., Boston. Homer C. Simmons heads the cellulose products department, Howard C. Bates is in charge of sales of synthetics and W. M. Williams heads the industrial chemical division.

COPPERWELD STEEL CO., Glassport, Pa., has elected William J. McIlvane vice-president in charge of sales and assistant to the president.

NEW WRINKLE, INC., Dayton, has moved its research and development laboratories to new quarters adjoining the general offices at 314 West First St.

THE H. M. HARPER CO., Chicago, has opened a factory branch at 210 West 7th St., Los Angeles, with Clarence A. Gauger in charge.

WICKWIRE SPENCER STEEL CO., New York, announces that Fred Johnson has retired and has been succeeded by W. A. Steele as general superintendent at the company's plant in Buffalo.

WHITING CORP., Harvey, Ill., has moved headquarters of its Canadian subsidiary, Whiting Corp., Ltd., to 45 Richmond St. West, Toronto, where its newly elected vice-president and general manager, H. M. Rowlette will be in charge of Canadian business.

THE B. F. GOODRICH CO., Akron, has opened an office in Atlanta for its national sales and service division. Maury M. Calvert is manager of the new office.

THE OHIO CRANKSHAFT CO., Cleveland, has named Bernard F. Nemerguth service manager of the TOCCO electrical induction heating and hardening equipment division.

SHELL OIL CO., New York, has made J. G. Jordan manager of retail sales for the West Coast territory with headquarters in San Francisco. He is succeeded in Cleveland by R. D. Kizer.

KOLD-HOLD MFG. CO., Lansing, Mich., is now represented in Missouri, Iowa, Kansas, Nebraska, and part of Minnesota by A. L. Golay.

MANNING, MAXWELL & MOORE, INC., Bridgeport, has opened a new plant at Tulsa, Okla., to manufacture oil relief valves. G. P. Kirchhofer is plant manager and John Scott superintendent.

WESTINGHOUSE ELECTRIC AND MFG. CO., East Pittsburgh, has appointed Thomas C. Finnell manager of the industrial department in the eastern district. He succeeds C. W. Miller who has been made manager of the application department at Baltimore.

MIXING EQUIPMENT CO., INC., Rochester, has moved its New York office to 136 Liberty St. C. F. Donovan is manager and Glenn J. Moorhead new eastern divisional sales manager also will make this office his headquarters.

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NEW CONSTRUCTION

	Current Projects		Cumulative 1943	
	Proposed Work	Contracts	Proposed Work	Contracts
New England	.....	.....	$80,000	$160,000
Middle Atlantic	$4,000,000	$230,000	13,890,000	1,670,000
South	80,000	.....	1,968,000	3,600,000
Middle West	120,000	40,000	8,530,000	8,495,000
West of Mississippi	4,370,000	1,750,000	9,290,000	7,475,000
Far West	1,570,000	.....	1,850,000	6,336,000
Canada	360,000	.....	3,545,000	817,000
	$10,500,000	$2,020,000	$39,153,000	$28,553,000

PROPOSED WORK

California—Union Oil Co., 617 West 7th St., Los Angeles, plans to construct a gasoline absorption plant in the Santa Maria Valley. Estimated cost $500,000.

Calif., Berkeley—Linde Air Products Co., 1150 South 8th St., plans the construction of an addition to its factory.

Ind., Muncie—Goodyear Tire & Rubber Co., St. Marys Div., St. Marys, O., plans to remodel its plant here. Estimated cost including equipment $40,000 or more.

Iowa—Defense Plant Corp., Washington, D. C., plans the construction of an alcohol plant to be operated by the Iowa Farm Processing Corp., Dubuque, Ia. Estimated cost $2,000,000.

Louisiana—Texas Gulf Sulphur Co., Freeport, plans to develop a sulphur production well in Lafourche Parish, Lake Charles area.

Missouri—Defense Plant Corp., Washington, D. C., is having plans prepared by Sanderson & Porter, Engrs., Rialto Bldg., Kansas City, Mo., for the construction of an alcohol plant. Estimated cost $2,000,000.

Nevada—Molybdenum Products Co., E. George Howe, Supt., 244 West First St., Reno, plans the construction of a quicksilver plant in Humbolt Co.

New Jersey—E. I. du Pont de Nemours & Co., Inc., DuPont Bldg., Wilmington, Del., plans to construct a group of manufacturing buildings. Project will be financed by Federal Government. Estimated cost $4,000,000.

North Carolina—National Carbon Co., P. O. Box 749, Charlotte, has received a low bid from the Southeastern Construction Co., West Second St., Charlotte, for reconstructing its plant. C. M. Graves, Madison and West Sts., Cleveland, O., Archt. Project will be financed by Defense Plant Corporation.

Oklahoma—Phillips Petroleum Co., Bartlesville, plans the construction of a new catalytic plant. Project will be financed by Defense Plant Corp., Washington, D. C.

Okla., Tulsa.—Mid Continent Petroleum Corp., Mid Continent Bldg., plans to reconstruct portion of refinery recently destroyed. Estimated cost $40,000.

Texas or Mexico—A. V. Davis c/o Aluminum Corp. of America and Associates, 230 Park Ave., New York, N. Y., plan the construction of a plant and facilities for a large castor bean processing plant in either Texas or Mexico.

Tex., Troup—General Refractories Co., Philadelphia, Pa. and Troup, plans to construct and equip a brick manufacturing plant, main building 100x680 ft., main kiln 500 ft. long and several smaller kilns. Estimated cost $250,000.

Utah—Kalunite, Inc., 81 Navajo St., Salt Lake City, plans to enlarge its aluminum reduction plant. Project will be financed by Defense Plant Corp., Washington D. C. Estimated cost $990,000.

Wis., Manitowoc—Heresite & Chemical Co., Manitowoc, is having plans prepared by F. W. Raeuber, Archt., 926 South 8th St., for the construction of a 1 story, 60x140 ft. addition to its factory.

Wis., Rice Lake—E. Brunett, Rice Lake, plans to construct a dry kiln, veneer plant and warehouse.

B. C., Vancouver—Surrey Dome Oil & Gas Co., Ltd., 402 West Pender St., plans to develop its claims here. Estimated cost $70,000.

B. C., Woodfibre—B. C. Pulp & Paper Co., Ltd., 602 West Hastings St., Vancouver, will soon receive bids for the construction of a plant. Estimated cost $60,000.

N. B., Coldbrook—Brantford Roofing (Maritimes) Ltd., Coldbrook, plans to reconstruct its plant.

Ont., Toronto—Plibrico Jointless Firebrick, Ltd., 863 Lakeshore Rd., plans to construct 60x130 ft. addition to its plant on Horner Ave., New Toronto.

Sask., Shaunavon—Saskatchewan Industrial Development Board, H. W. Monahan, Mgr., Regina, plans the construction of an industrial alcohol plant. Estimated cost $150,000.

CONTRACTS AWARDED

Maryland—Carrollton Springs Pure Rye Distillery, Inc., 400 South Central Ave., Baltimore, has awarded the contract for altering and repairing its plant to Armiger Construction Co., 2127 Maryland Ave., Baltimore. Project will be financed by Defense Plant Corp., Washington, D. C. Estimated cost including equipment $150,000.

N. J., Deal—Bell Telephone Laboratories, 463 West St., New York, N. Y., have awarded the contract for the construction of a 1 story, 44x120 ft. addition to their laboratory to James Sutherland, Inc., 224 Main St., Asbury Park.

N. J., Hillside (br. Elizabeth)—A & B Tire Co., 34 Spring St., Newark, has awarded the contract for the construction of a 1 story addition to its tire processing building to Joseph Krumholz Construction Co., 15 Reynolds Pl., Newark.

O., Cleveland—Allied Plating Corp., John Hallack, Pres., 277 East 156th St., has awarded the contract for the construction of a 1 story, 60x120 ft. factory to George Colcher, 369 East 200th St. Estimated cost $40,000.

Texas—Monsanto Chemical Co., Texas City, will construct additional buildings and facilities for chemical manufacturing plant addition. Work will be done by force account and subcontracts. Project will be financed by Defense Plant Corp., Washington, D. C. Estimated cost $1,750,000.