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CHEMICAL & METALLURGICAL ENGINEERING

ESTABLISHED 1902

S. D. KIRKPATRICK, *Editor*

JANUARY, 1943

OUR YEAR II OF WORLD WAR II

We have come a long way since Pearl Harbor. Munitions production, as announced at the end of 1942, was up to 382 percent of that of a year ago, war construction was up to 256 percent, and total war output to 314. We had authorized, through November 30, 1942, a war program to cost $237.9 billions of which $61.8 billions had already been spent. We had authorized and largely completed construction of $16,944 millions of industrial facilities of which $13,551 millions are government financed and $3,593 millions are privately financed. We have mobilized, equipped and partially trained the largest army and navy in our history.

But we have come a lot farther than the figures show. We have learned what it means to fight a highly technical war on a global scale. We have learned that manpower, particularly technically trained brainpower, is more important than money —or even materials—when a nation mobilizes its real resources. More and more companies have come to realize that the job to be done in Washington or in the munitions plants calls for the best men they have in their organizations—not those who can be spared most easily.

We have made some other mistakes from which we should have learned important lessons. The Baruch report put its finger on something broader than the trouble with the rubber program when it cited the disastrous effect of political control over essentially technical decisions. Conflicting views among the heads of various war agencies with duplicating or overlapping authority completely overshadowed the recommendations of the technical men who were best qualified to pass on the problems involved. Appointment of an aggressive executive to head up a single agency, with what we thought were entirely adequate powers, seemed like a move in the right direction. Yet Director Jeffers' most recent report, summarized elsewhere in this issue, is none too encouraging. There are still some people who think we need aviation gasoline more than we need synthetic rubber. This, too, is a technical problem capable of accurate evaluation if only the essential facts are made available.

But because matters affecting technology, scientific research and engineering development are inherently complicated and often difficult for the layman to comprehend, we are particularly vulnerable to attack by the politicians and social reformers. People fear that which they do not understand. Perhaps that is the reason certain great legal minds in the present Administration see nothing but conspiracy and deception in every patent agreement, particularly if it involves a foreign country. They would have you believe that American scientists and engineers are dupes that must be protected from all business contacts with the smarter, more resourceful technologists from abroad. The implication is that our science and technology are inferior and that something must be done to help them grow and develop.

So we have such things as the Kilgore bill. Here the very legal minds of some of our most astute legislators get together and decide that technology will win the war if only it is properly coordinated and given a subsidy of a quarter of a billion dollars. They hold hearings in which they are told that because Russia and Germany have both regimented their technologists into great war machines, we should do likewise. Other witnesses point to defects (real and imagined) in our technical setup and propose to correct them by superimposing an over-riding control by politicians and non-technical administrators. The whole performance, we are sorry to say, strikes us as about as ridiculous as would be the case if a committee of scientists and engineers were to get together and decide that something should be done to coordinate and regi-

ment the lawyers and politicians who are so impeding our technical progress with unnecessary and conflicting laws, regulations, rulings and red tape.

But the war program demands that we do not waste too much time with these obstacles that politics have placed in our paths. There is a tremendous job to be done in this second year of the war. By this time next year, 9,700,000 of our citizens must be in the armed forces, 20,000,000 in war industry, 19,600,000 in essential civilian industry, 7,900,000 in year-round agriculture, and 6,000,000 in seasonal and miscellaneous occupations. This is going to mean more transferring of men and jobs, more training, more employment of women and older people than ever before. To many chemical engineers it is going to mean doing the equivalent of the work of two men. One must help in the primary job of turning out the goods in the quantity and quality the war demands. The other must do more of the thinking and planning that will keep a technical organization functioning efficiently on into the reconstruction period ahead.

During the coming year we are going to hear a great deal more about post-war planning. Some of it is certain to be starry-eyed idealism that was characteristic of the boondoggling days of the early brain-trusters. Other plans, geared to the same high objectives of maximum employment and an enhanced standard of living, will be more practical in their approach to our common problem. The chemical engineer can contribute most to such programs through the development of new products and the improvement of existing processes. From now on every minute that can be spared from the primary job of war production can be profitably employed in planning for the day when chemical warfare gives way to chemical welfare.

Ours is the job to help in every way we can to make 1943 the decisive year in World War II. We are not optimistic enough to think it can all be over a year from now, but we know we are going to pile up a tremendous production of war goods during the next 12 months. We know that the United Nations have started an offensive that cannot stop short of a European victory in 1944 if not in 1943. After that we can give our undivided attention to the job of avenging Pearl Harbor—and that won't take too long either.

RESEARCH COORDINATION GROWS

STIMULATED, perhaps, by the threats of drastic regimentation proposed in the Kilgore bill, a three-part program of coordinated research and development is being prepared to serve the government during the war period. The first of the three parts, in order of establishment, is the Office of Scientific Research and Development which deals with the instrumentalities of war. Next came the Office of Production Research and Development which functions within WPB on war production problems, (see *Chem & Met.* Dec. 1942, pp. 80-1). Newest of the trio is Agricultural Research Agency which will serve the Food Administrator as the central coordinating force with respect to research on foods and other agricultural products.

The heads of these three groups, Vannevar Bush of O.S.R.D., Harvey Davis of O.P.R.D., and E. C. Auchter of A.R.A., are in effect the three research czars. Colleges, public institutions, private agencies, and research departments of industry all must look to them for policy making on any scientific or engineering problem which affects governmental interests. Fortunately these men are qualified by long experience and high professional standards to set a sound course with respect to all these matters affecting war-time problems.

To a considerable extent even the private work of individuals and companies will be influenced. There is no intention to stop such work, or any desire to regiment it. But it must be recognized that the extreme pressure of need for immediate results on war-time problems may make it necessary for many individuals and companies to lay aside the things that otherwise would be foremost in their private plans. Where such sacrifice is asked or made it will be in the interest of national security, and not because there is any effort at Washington among these leaders to interfere with private incentive, patents, or products, as they relate to industrial research.

This is a very fortunate situation. It is a very different one than would result if "reform" legislation like the Kilgore bill of last season were to pass. That bill would have regimented research, put political bosses over technical men, and could have done irreparable damage to the war effort as well as to private industry.

Volume 50—Chemical & Metallurgical Engineering—Number 1

Chemical & Metallurgical Engineering is the successor to *Metallurgical & Chemical Engineering*, which in turn was a consolidation of *Electrochemical & Metallurgical Industry* and *Iron & Steel Magazine*, effected in July, 1906.

The magazine was originally founded as *Electrochemical Industry*, in September, 1902, and was published monthly under the editorial direction of Dr. E. F. Roeber. It continued under that title until January, 1905, when it was changed to *Electrochemical & Metallurgical Industry*. In July, 1906, the consolidation was made with *Iron & Steel Magazine*, which had been founded eight years previously by Dr. Albert Sauveur. In January, 1910, the title was changed to *Metallurgical & Chemical Engineering*, and semi-monthly publication was begun Sept. 1, 1915. On July 1, 1918, the present title was assumed and weekly publication was begun Oct. 1, 1919. Monthly publication was resumed in March, 1925.

Dr. E. F. Roeber was editor of the paper from the time it was founded until his death Oct. 17, 1917. After a brief interim he was succeeded by H. C. Parmelee. Ten years later, Nov. 1, 1928, Mr. Parmelee assumed other responsibilities in the McGraw-Hill Publishing Company and Sidney D. Kirkpatrick was appointed editor.

The present editorial staff of the magazine comprises, in addition to Mr. Kirkpatrick: James A. Lee, managing editor; H. M. Batters, market editor; T. R. Olive, associate editor; J. R. Callaham, N. G. Farquhar and L. B. Pope, assistant editors. R. S. McBride, E. S. Stateler and Earle Mauldin are editorial representatives in Washington, Chicago and Atlanta, respectively.

PERMIT US TO INTRODUCE—

SEASONED READERS of *Chem. & Met.* will remember numerous instances in the past when Dan Gutleben's name has headed an article: perhaps a discussion of maintenance in the sugar refinery; or a discourse on a new type of sugar centrifugal; again a description of a gadget for improving heat recovery in the refinery; or maybe a new means of eliminating corrosion in the refinery's associated molasses fermenters.

Dan is chief engineer of the Pennsylvania Sugar Co., at Philadelphia. In addition to being, if not the founder at least one of the guiding spirits of that informal organization which might be known at the Amalgamated Sugar Tramps of America, he has now the distinction of becoming *Chem. & Met.'s* first regular "colyumist." He is a philosopher of rare wit, an indefatigable correspondent, and a man given to recording his impressions on sundry subjects with succinctness, humor, and a knack for finding the nub of a subject, which will appeal to engineers, whatever the industry they serve.

For years Dan Gutleben's "Log" has circulated widely in the sugar industry, and to a lesser extent among his friends outside that field. However, when he has appeared in the *Chem. & Met.* in the past, it has been under special assignment, hedged around with restrictions set up by the Editor. Largely eliminated were the pithy particles which made such amusing yet instructive reading in the Log. Gone were his "polanders" and their mishaps, his polynational mechanics and their ingenious dodges and shortcuts, his observations on places, people and things.

Starting forthwith, our 1943 resolution is to eliminate these shortcomings of ours and give Dan his head. Having overcome considerable objection on his part, due to his natural but unjustified modesty, we now present him in his own column. The space on page 133 is his own, to use as he will. Sometimes it will contain excerpts from the Log, sometimes paragraphs from his "Letters to Mac." Some will be written especially for the column, some will be new, some old. On the surface what he says may appear to apply only to the sugar industry. If so read it again, Engineer Reader! We guarantee your money's worth, whatever the subject.

WASHINGTON HIGHLIGHTS

POST-WAR PLANNING is being greatly speeded by the feeling in Washington that the European phase of the war will be largely settled in favor of the United Nations by the end of 1943. Whether we agree or not with that schedule it has definite and important meaning for process industries. It suggests the need for more planning by business to utilize the products of these industries effectively and to eliminate burdensome surpluses by their prompt adaptation to peace-time purposes. If business does not do the planning, the New Dealers will. That should inspire new effort in industry.

GLYCERINE will no longer be allowed to impose any burdens on the edible fat and oil supplies. The shortage of glycerine is very real. But government officials now fear more the shortage of food fats. We can synthesize the glycerine but no one can synthesize the food fats. This gives new stimulus to new methods of glycerine making and it imposes new burdens on the soap maker who tries to maintain customer satisfaction with quality soap while short of most-desired raw materials.

GAS OR TIRES. this is the choice. A very sharp conflict continues to rage in Washington between those who want more aviation gas and those who seek to speed the synthetic rubber program. There are several causes of conflict between the two. Both want the same raw materials, certain petroleum refinery fractions. Both wish the same high pressure machinery and control instruments. Both burden the same management and engineering skills and compete for the time of scientists and engineers. The whole conflict demonstrates the shortages, both of chemical engineering skill and of chemical process equipment capacity.

NEW PRODUCTS which will be marketed after the war can well be promoted at this time. Washington considers such advertising and promotion effort a very desirable war-time activity so long as it does not interfere with actual war production. Naturally the making of the new products on a commercial scale is not encouraged unless they are actually needed for the war. Small scale production, as in pilot plants, may be encouraged when it permits prospective customers to have research quantities to try out new uses. Any such program is judged from the over-all effect on today *and tomorrow.*

COORDINATION of government activities to avoid duplications or complications has been substantially improved in recent weeks. Senator Kilgore is entitled to some of the credit. His bill proposing technologic mobilization in a super super board has impressed officials enough to get some constructive action. Research coordination is being very much advanced, and will be still further helped by interchange of information and opinion between the big department groups working on foods and process-industry problems. As we give Senator Kilgore this credit, we repeat our conviction that his proposed bill should not pass. It would regiment scientific matters much to the detriment of the public and it would handicap scientists and engineers very seriously by imposing political bossing.

SHORTER HAULS for industrial goods must be sought by every possible means. Strenuous effort is being made by officials to prevent cross haul of goods. Particular attention has been given to foods, even to a proposal that no food be hauled more than 500 miles from source to destination without special permission. Cooperation in deliveries to customers for chemicals must take account of these facts. With the aid of government officials there can be agreements between companies that normally would be illegal. The shortage of transportation facilities justifies many such arrangements even in the eyes of the Department of Justice.

Waste Disposal Problems In Wartime

F. W. MOHLMAN

Director of Laboratories, Sanitary District of Chicago, and Editor of Sewage Works Journal

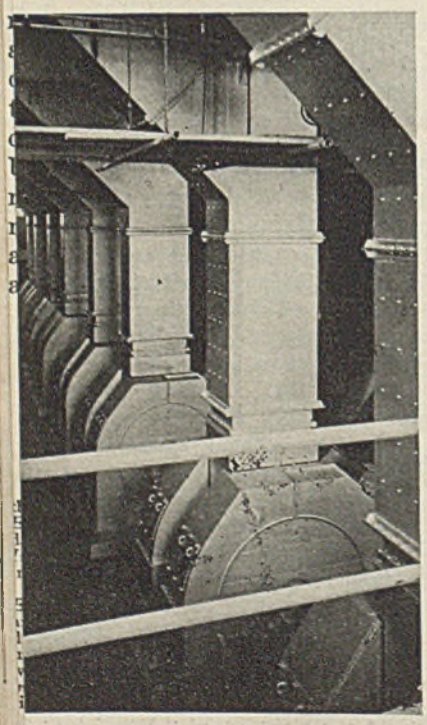
Chem. & Met. INTERPRETATION

Engineers are so involved in the urgent need for production and still more production that they are apt to overlook the fact that the entire waste disposal situation is vastly different when a nation is at war. Dr. Mohlman, who is one of the country's outstanding authorities in this field, has recently surveyed the many problems involved in the wartime disposal of both domestic sewage and industrial wastes. In the first of two articles, based on the paper he presented in Chicago during the second National Chemical Exposition, chief emphasis is on sewage and byproduct recovery. Next month he will discuss wastes from many of the chemical process industries, including munition plants. —*Editors.*

THE IMPERATIVE NEED for production, and ever more production, on the industrial war front forces the problem of industrial wastes into the background, where it will probably remain until the war is finished. Yields, economy, clean streams, esthetic standards, recreational facilities,—all may have to be sacrificed temporarily, until we have produced the products needed to win the war.

Even in normal times the mention of waste disposal evokes no warm response from the average manufacturer, and now he can find no convincing reason why the problem of waste treatment should be resurrected, now that the bars are down between government and industry, and the product rolls out of the production line, even though an excessive residue also rolls out the sewers and into our streams and lakes. In fact,

Squirrel-cage mills in sludge drying circuit break solids for flash drying in suspension



industry is supreme now, and our rivers and water resources should be regimented in the war effort, to do their share in washing away the sins of industrial inefficiency and the soaring tons of waste substances discharged daily from industrial sewers.

Under present conditions, we ought to have a Water Priorities Board that would allocate stream flow and dilution resources for the byproducts that come out of the back door of industry, in the same manner that the War Production Board allocates priorities and establishes quotas in the products that come out of the front door. The urgency of our need for critical materials such as alcohol, rubber, foodstuffs, steel, tin, and munitions far transcends the resultant pollution problems of the disposal of mash residues, soap and organic emulsions, packinghouse wastes, pickle liquor, acids, dyes and organic compounds. If production can be hastened and the use of critical materials obviated, let our stream deteriorate temporarily, certainly in their esthetic or recreational aspects. Health standards, however, must be maintained, and in a situation such as that of Lake Michigan in the Calumet District, corrective measures must be applied if industrial wastes are permitted to increase the hazard to the point of menace to health of millions of people.

Most of our rivers, however, do not constitute such a health hazard, because their waters are not used for drinking purposes, or the river flow is so tremendous as to dilute and oxidize pollution beyond the limits of the sensitive and infinitesimal detection methods of water chemistry and bacteriology.

There seems to be an astonishing lack of appreciation among industrial chemists of the metabolism of streams—the significance of biochemical oxygen demand and oxygen balance, the seasonal changes of stream bacteriology and biology, the mechanism of self-purification, and the measurement of assimilative capacity for domestic or industrial pollution. It is surprising that even our best managed industries rarely make any attempt to study the relation between their wastes and the water courses into which the wastes are discharged. The officials come into conferences with government engineers with no conception of how to meet the problem, and either politely rebuff the state sanitary engi-

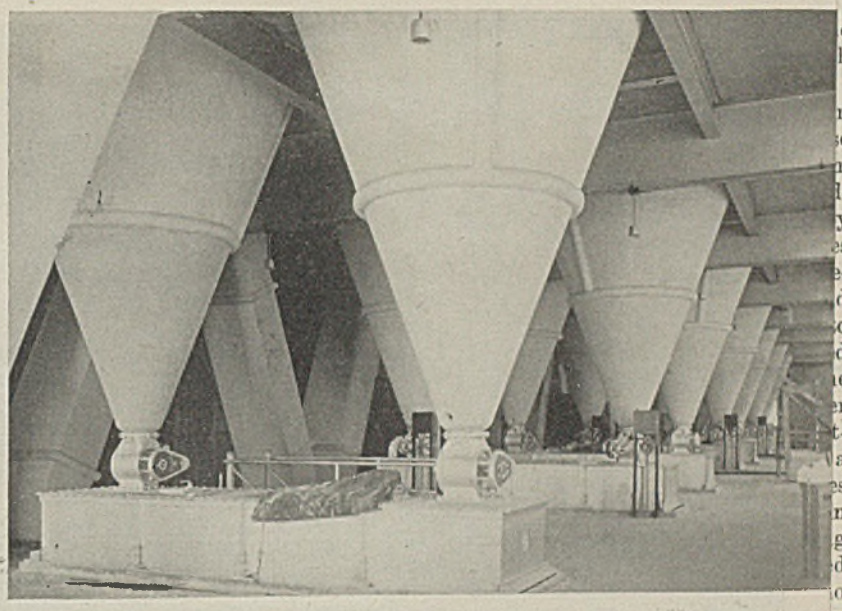
neer's staff or other public representative, or stall for time, or fall back on the inability to do anything because of (a) lack of methods for treatment of their particular wastes, or (b) lack of funds to do anything. How much more sensible it is for the industry to face the issue squarely, to spend some money and some years on the study of the problem, and to abate the problem in consecutive and logical steps, rather than in one full and expensive swoop, with back to the wall, and no progressive constructive measures available.

It is profitable for an industry, if large enough, to make its own studies of its waste problems. There have been several instances in which a thorough study of the problem, inside the plant, would have saved the company a lot of money that was spent on waste treatment.

Salvage, separation, change of process, substitution of pollution-free ingredients, re-circulation, regeneration—these inter-plant procedures should be exhausted before over-all treatment should be decided upon.

Industrial executives are usually ready to agree that these steps are wise, in principle, and sometimes they make a half-hearted effort to utilize these steps in the solution of their waste problem, but usually the problem is turned over to some young chemist just out of college, and no determined, competent, nor continuous effort is made to study the problem in the same thorough way the modern plant executive studies problems of production and development. A good, experienced man should be picked in the plant organization; he should be supplied with a staff, a laboratory and competent advice on the pollution aspects of his waste problem; and he should set about abating the problem by the least painful and least expensive steps possible, so that the company's money may be spent wisely and efficiently.

A subdivision in the plant scheme of organization devoted to waste prevention and polution abatement would be able to prevent many losses of recoverable materials down the sewers; it would be able to advise all operating divisions as to whether they were creating excessive pollution, and could help them to lessen such pollution; and it would conserve our national resources so that we would have more raw materials to produce more goods, and thus to improve our whole national economy and efficiency.



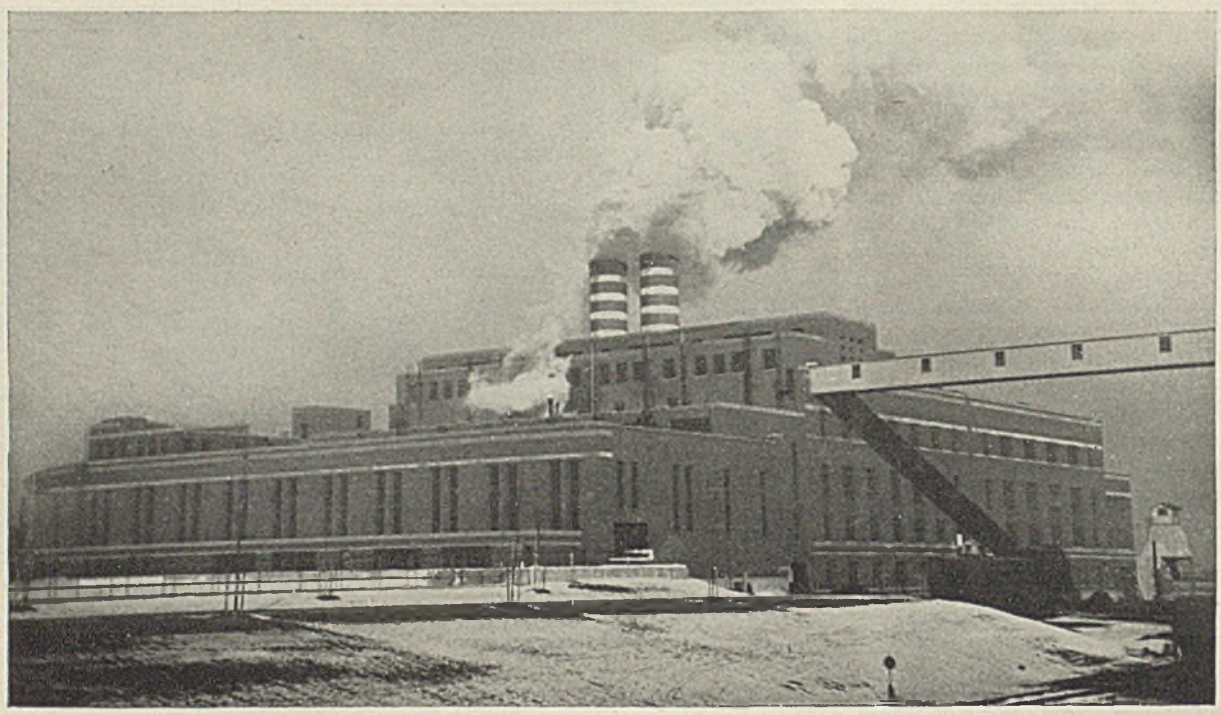
Dried sludge is removed from the drying circuit by cyclone separators

However, it is unwise to make the mistake of approaching industry in the role of an economic crusader, bent on demonstrating that fortunes are being lost down the sewers unknown to the plant management. This approach is wrong both psychologically and economically. Surveys can be made, pounds of losses computed, and values assigned superficially, without taking into account the many factors of overhead, markets, depreciation, competition and obsolescence that can and usually do change most of the salvage accounts from black to red.

It has seemed to me that the honest approach to the alleviation of industrial waste pollution is to consider the objectives to be the same as those objectives we have achieved in some phases of sewage disposal, namely reduction of the cost of an inevitable burden that certain types of industry, those that produce liquid wastes, must assume. Modern sewage treatment has developed several sources of salvage, none of which amounts to a net profit, but several of which serve to reduce the cost of treatment and disposal, and contribute to the universal desire for conservation.

SALVAGE FROM SEWAGE

Fertilizer.—The favorite diversion of the conservation enthusiast is to compute the value of the tons of nitrogen that are discharged into our streams and lakes daily in the sewage of our urban communities. This type of computation is highly fallacious because only a small portion of the nitrogen can be recovered in the form of usable solids which have enough value to warrant their transportation to farm lands. However, there are two types of sludges that should be recovered and used as fertilizer. Digested sludge is low in fertilizing value, because (a) it has been produced by biological decomposition of settled sewage solids and (b) it contains a large amount of water. If the moisture is reduced below 10 percent, by mechanical drying, objection (b) is eliminated but the question then is whether the dried digested sludge is worth enough to pay for its drying. Most sewage authorities agree that it is unwise to attempt to prepare and sell digested sludge as a commercial fertilizer, but that farmers should be urged to use the air-dried sludge within truck hauling distance of the sludge pile and that the sludge should be given to them free of charge by the sewage works management. Now, with Victory gardens urged throughout the land for next summer, there ought to be a nation-wide campaign to promote the use of digested sludge as a fertilizer for most types of vegetables and farm produce. Modern heat-digested sludge is free from pathogenic organisms if properly digested and dried, and can be used with impunity on the plants of all vegetables that are cooked, or on the plants of tomatoes, corn, beans or squash. Possibly esthetic considerations ban its use on radishes, lettuce and celery.



Activated sludge fertilizer is produced at the Southwest Treatment Works, Sanitary District of Chicago

Activated sludge is now well established as a commercial fertilizer, particularly as a source of organic nitrogen. It is practically dry, has little phosphoric acid and no potash, but the nitrogen is available and valued for green crops, cotton and tobacco. It is shipped to the southeastern states.

The production of these types of sludge by the Sanitary District of Chicago in 1941 is on page 81.

Milwaukee also sells 50,000 or more tons of activated sludge per year. Toledo, Grand Rapids, Akron, and a few other cities sell digested sludge after it has been dried in rotary heat dryers. Hundreds of smaller cities send digested sludge to city parks and to neighboring farm lands.

The U. S. Public Health Service has recently reported results of a survey of sewage treatment in the United States, in which it is stated that there are 5,403 sewage works in which sludge digestion is practiced. This is 97 percent of all the sewage treatment plants in the U. S., but not 97 percent of the population whose sewage is treated, inasmuch as Chicago, Milwaukee, Minneapolis and other large cities dry sludge mechanically, without previous digestion. The population for which digestion is used may be estimated at around 35,000,000 people. If we take a per capita production of dry sludge of 75 lb. per year, a removal of 80 percent suspended solids, and digestion of 33 percent of the settled solids, there should be available annually 1,400,000 tons of air-dried sludge containing 50 percent moisture. This would be sufficient, at five tons per acre, to fertilize 280,000 acres, or nearly 440 sq. mi., of gardens, lawns and fields.

Of course, this type of fertilization is incomplete and not to be compared with the results that can be obtained with mixed, complete commercial fertilizer, but the sludge constitutes a source of low-grade plant food that should not be wasted. In Oriental countries, with lower standards of sanitation than ours, all human excrement is used on the land, in spite of its health hazards of hookworm, amoebae, typhoid fever and cholera. Digested sludge does not contain these hazards, or at least they are present to a negligible degree.

Use of dried, digested sewage sludge should therefore be promoted as a potential source of nitrogen and plant food that is available free, except for the cost of transportation. This is an important obstacle these days, but possibly city authorities or garden planning commissions could arrange to have sludge transported short distances to storage piles where it could be obtained by the truck gardener even under gasoline rationing.

Gas and Power—A second source of salvage from sewage is contained in the gas produced in heated sludge digestion tanks. This gas contains approximately 70 percent methane and has a net heat value of 600 B.t.u. per cu. ft. The various steps in the development of efficient use of this gas are interesting. At first, the gas was wasted, and still is, from Imhoff tanks. Widespread research in the decade 1920-1930 demonstrated that by heating the digesting sludge from an annual average of 60 deg. F., as collected, to an average of 85 deg.–90 deg. F., the time required for digestion would be reduced by 60 percent, thus requiring much less tank capacity and producing a more thoroughly digested and less infective sludge.

The gas was then used to heat water, which was circulated through coils in the digestion tank to bring the contents up to the desired temperature. The excess gas was wasted. It was not found advisable nor profitable to sell the sludge gas to the city's gas plant, as the amount of sludge gas produced is only a small fraction of that required by the city, and the purification, transportation and delivery of the sludge gas is too expensive to make its sale profitable.

Then a number of alert engineers proposed and tried out the scheme of using the gas to drive a gas-engine, which furnished the power for lighting, pumping, aeration and other uses around the sewage works. The heated water from the water-jacket of the gas engine circulates

through the digestion tank coils, is cooled, and returns to the gas engine. Thus all gas can be used, and the power produced greatly reduces or eliminates the cost of purchased power at the sewage works. Walraven at Springfield, Ill., was a pioneer in this development. Piatt, in North Carolina, used one of the first gas engines in 1928. In 1941 there were 180 gas engines in 115 sewage works, developing 35,000 hp. Three of the largest, of 1,440 hp. each, are at the Jamaica, Long Island, treatment works.

An average of approximately 0.6 cu. ft. of gas per capita per day is produced in heated digestion tanks. Gas engines use approximately 20 cu. ft. of sludge gas per hp. hr. or 480 cu. ft. per day. Therefore the sewage solids of 800 people, on the average, furnish enough gas to produce 1 hp. of useful energy.

Sewage gas has also been used for operating motor vehicles. This use started in Germany in 1936 at Munich, Berlin, and Stuttgart. The CO_2 was removed, and the CH_4 compressed to 150 atmospheres in steel flasks holding 22 cu. m. of gas. A 40-hp. motor was reported to use 18 cu. m. per 100 km. (10.2 cu. ft. per mile). Gas from the digestion tanks of the Middlesex Sewage Treatment Works, near London, the largest treatment plant in the British Empire, has been collected in bags, lightly compressed, and used to run motor vehicles on London streets during the past two years. In the U. S., the use of gas for city garbage trucks was investigated at Atlanta during the past year. It was estimated that the operating costs and fixed charges would amount to $15,743 per year as compared with a saving of $19,350 worth of gasoline at 15c. per gal.

Grease—Recovery of grease from sewage and sewage sludge has always intrigued chemists and engineers. There is a long history of uneconomical attempts at recovery, and during the last war the so-called Miles Acid Process was investigated at New Haven, Conn., under the direction of the writer. In this process, SO_2 was dissolved in the sewage to form sulphurous acid, the soaps were cracked to fatty acids and recovered in the sludge. It was proposed to dry the sludge and extract the grease. Grease, however, although present in the sludge in rather large amount, up to 27 percent, was high in non-saponifiable, containing 20 to 28 percent, and in normal times the value would be only 2 to 3c. per lb.

The various grease-separating basins and processes that have been developed in sewage treatment during the past few years have not been promoted for recovery of usable grease, but rather to relieve biological treatment processes of operating difficulties. Grease in the heated digesters produce a large amount of gas, and this seems to be the preferred method of disposal of the floated grease, which is mixed with the putrescible sewer solids.

There is one important exception to the general dictum that grease cannot be recovered with profit from sewage. This is the plant at Bradford, England, which was visited by the writer in 1938. In normal times Bradford washes and processes one-fifth of all the world's wool, and the wash waters are discharged into the sewers. The sewage is treated with acid, the sludge containing the grease is removed, heated, filter pressed hot, and the grease separated by cooling. It has sold from a low of $40 per ton in peace times to a maximum of $300 per ton in 1918. During the year ending March 31, 1940, the sales exceeded $350,000. However, there is no other situation similar to that in Bradford. For normal sewages, grease recovery continues unprofitable. It must be removed before the sewers are reached. Grease traps on army camp kitchen drains are reported to recover appreciable amounts of usable grease. Catch basins on packinghouse drains have always been a profitable investment.

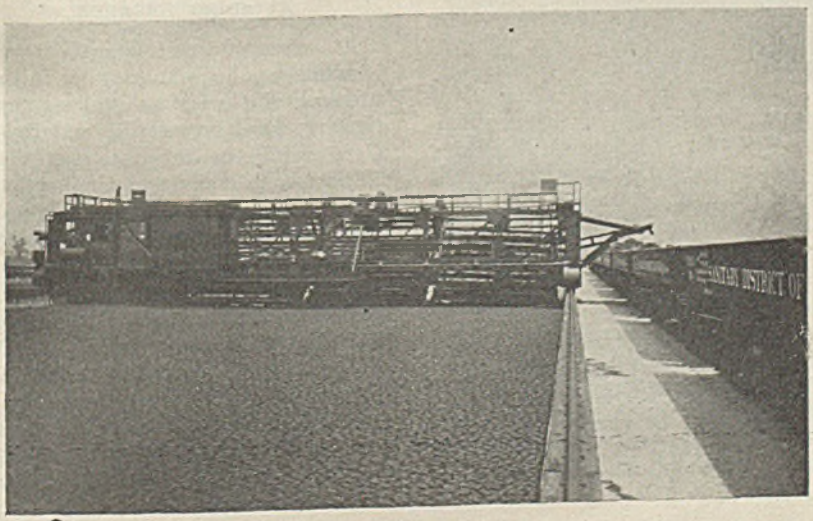
Fish Culture—The growth of fish in diluted sewage effluents has been carried on for years at Munich, and similar river fertilization promoted a large fish industry on the lower Illinois River in past years, but levees and dikes of drainage districts constructed during the '20's so restricted fish spawning in sloughs and backwaters that the industry all but disappeared. Treated and diluted sewage effluents, when suitably diluted, promote growth of plankton, algae and protozoa, which serve as fish food. It is reported from Munich that about 500 lb. of carp are produced annually per acre of ponds. However, it is unlikely that this byproduct of sewage disposal will ever prove popular in the U. S.

Hormones—Sewage and sewage sludge have been shown to contain hormones which stimulate plant growth, such as indole, skatole, indole-acetic acid and naphthalene-acetic acid. These hormones have not been extracted or identified clearly and their value is still questionable but some of the stimulating effect of sewage and sludge on plant growth is ascribed to these hormones. Sewage may also prove to be the source of other obscure extracts, of value for germicidal or anti-toxic uses. Not enough work has been done as yet to prove or disprove this possibility.

Fertilizer and Sludge Production, Sanitary District of Chicago, Year 1941

Sewage Treatment Works	Tons	NH_3 %	Avail. P_2O_5 %	Dry Basis Ash	Dry Basis Organic
Calumet (Activated)	7,412	5.10*	1.94*	43.7	56.3
Southwest (Activated)	49,185	6.41*	2.32*	33.3	66.7
West Side (Imhoff)	149,867	0.86**	0.33**	52.9	47.1

Front view of a sludge bed cleaner



Safety in Handling Aluminum Powders

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Chem. & Met. INTERPRETATION

Except for those people who work constantly with aluminum powders, sufficient respect for the explosibility of this material does not appear to exist. With the present widespread use of aluminum powders for the manufacture of military pyrotechnics, need has developed for the more widespread dissemination of information on safe practices in their handling and in manufacturing pyrotechnics. The article which follows is based on the experience gained by the Reynolds Metals Co. in many years of producing and handling metallic powders and is offered as a starting point in the development of safety programs for concerns engaged in or beginning operations in pyrotechnic work. Certain fundamental precautions are discussed by the authors as a service to the industry, but neither they nor their company assume liability of any kind in presenting this information.—*Editors.*

FLAKE ALUMINUM POWDER, somewhat similar to the material commonly used in aluminum paint under the rather misleading name of "aluminum bronze powder," is a valuable component of pyrotechnic mixtures used for flares and signals. The high surface area of a given weight of aluminum flake powder makes it easily ignitible when in the presence of oxygen or air. Burning, it evolves a tremendous amount of heat and light. Owing to its low apparent density, fine particles of the material tend to float in air with the attendant danger of violent explosion upon ignition, when a proper ratio of aluminum to oxygen is reached.

A somewhat different aluminum powder, the grained variety, consists of spheres, sausage shapes or irregular grains of aluminum, which are relatively hard to ignite. When mixed with oxygen-producing compounds, the grained powder will burn with the evolution of much heat and light. This material, however, has a high apparent density and low surface area which tends to keep it from suspension in air so that the danger of explosion or fire from aluminum "fog" is almost nil.

Both flake and grained aluminum are shipped in sealed drums with fully removable heads. These drums should be stored unopened in a separate area wherever possible, since if they are stored along with such chemicals as sulphur, nitrates and others of similar character, a fire from any cause would present a most serious problem. Whenever a drum of aluminum powder is opened for loading or inspection, it should be closed and re-sealed as soon as possible. This not only insures greater safety against fire from external causes but also limits the likelihood of tramp material getting into the powder, or of the powder absorbing water from the air. In one instance a sealed drum of flake aluminum withstood an aluminum dust explosion and subsequent fire without ignition of the drum contents.

There are few practical means of extinguishing fires involving aluminum powder or mixtures containing this powder. Anything which tends to disturb the burning mass may throw the aluminum into the air and result in a violent explosion of tremendous destructive power. It is true that dry sand, carefully placed over a pile of burning aluminum, will smother the flame, but in the excitement attending such a fire, there is danger that the sand will be thrown or shoveled on to the mass, and that the powder will be thrown into the air. There have been several cases where relatively harmless fires have been changed to serious and fatal explosions from this cause.

Consequently, the safer and more prudent rule is to instruct employees to walk out of the building in the case of an aluminum fire, shutting the door securely but as gently as possible to avoid disturbing the burning mass.

All employees should be instructed in procedures to avoid. They should understand thoroughly that water, carbon tetrachloride, fire foam, carbon dioxide and similar extinguishing agents should not be used on aluminum fires. Use of such materials will cause explosions. Night watchmen should be instructed to convey this information to any regular or volunteer group which attempts to extinguish an aluminum fire. Furthermore, the use of a fine spray of water from a stirrup pump, such as is used by civilian defense workers on incendiary bombs, should never be used on aluminum powder fires.

It is of utmost importance that local fire departments be informed of these precautions. The department should be provided with complete information and charts regarding those warehouses which contain aluminum, as well as those containing other chemicals. These charts should also be readily available to the watchmen and to the plant's own protection division at all times.

AVOIDING HAZARDS

A source of great danger in the handling of aluminum powder is the presence of foreign substances, particularly hard or metallic materials. Care should be taken to see that closing bolts, nails and similar bits of metal cannot contaminate aluminum powder or pyrotechnic mixtures.

Good plant housekeeping is one of the most effective methods in achieving plant safety and care must be taken particularly in the weighing, mixing and pressing rooms. As little material as is practical should be kept in one place at one time. Scoops for handling powders should be of non-sparking material and the handling should be slow and deli-

berate to reduce dusting to a minimum. Rooms in which powder is handled should be cleaned at frequent intervals, but never during weighing, mixing or pressing operations. All material should be kept in closed containers while cleaning is in progress. If oil is used in the pyrotechnic mixture, special care must be taken to insure that all oily rags or waste are deposited in closed safety cans away from the storage or loading areas. These rags must be disposed of daily. In cleaning, care must be taken particularly to keep all corners, window ledges beams, building steel and other resting places free from dust.

BUILDING PROTECTION

The buildings used for weighing, mixing and loading operations should, wherever possible, be so spaced and protected that fires or explosions in one unit cannot be communicated to other units. Construction should be adapted to the venting of explosions, using either a "soft" wall or roof, or a blow-out panel. All equipment should be located so that the operator has a free path to an outside door, without a mixing bench, press or mixer between him and the door.

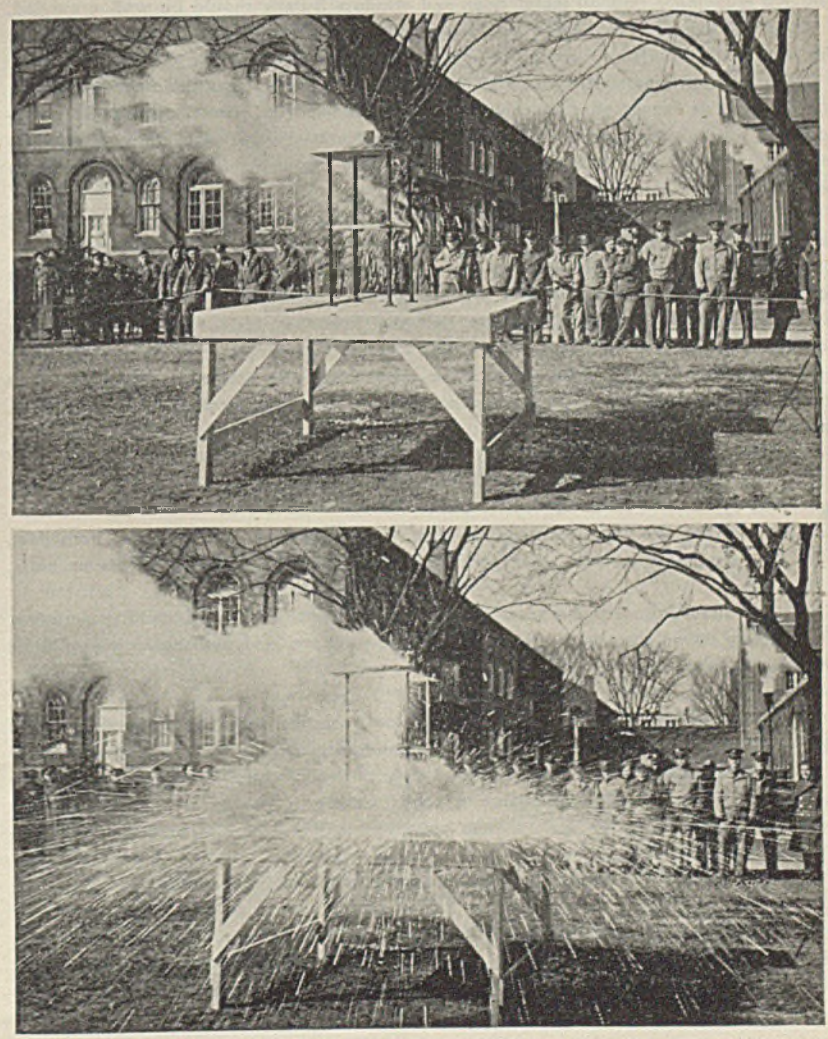
All metal in the buildings should be grounded. This not only includes the equipment itself, but also metal window and door frames and other building elements. Clips connected to flexible grounded leads should be placed on all metal drums or other movable equipment. Only explosion-proof motors should be permitted, and for these the controls should be fully inclosed and non-arcing, located outside the workroom so that no worker need be in the mixing or pressing room from the time of starting these operations until they are completed.

All lights should be of a type approved for explosive operations and conditions. Particular care must be taken when automatic or manual tools are to be used in buildings for repairs or changes. When such work is to be carried out, the rooms must first be emptied of all ignitible material and thoroughly cleaned. Fatal explosions have been caused in dust-filled rooms by an arc from the switch of an ordinary flashlight. Therefore, only flashlights, electric lighting and power equipment carrying Underwriters' approval for use in explosive areas and where explosive vapors are encountered should be used.

Wherever possible, both the shoes of workers and the floors should be of a conductive but non-sparking type. Electrical discharges produced by static or lightning are the most difficult safety hazards to control. The danger from static charges produced by friction is greatest in cold, dry weather. Even walking on concrete or composition flooring in non-conducting shoes may produce sparks capable of igniting pyrotechnic mixtures or fine aluminum particles suspended in the air. Even the friction caused by aluminum powder poured from a scoop to a container can create high static charges on the aluminum particles. Particularly in the case of flake aluminum powder, considerable time is required to dissipate this charge.

Several types of non-sparking, conductive floors have been employed successfully.* Three types may be described briefly here, including (1) Magnesite flooring installed over a wood or concrete base, with conductive metal grids placed beneath the surface of the floor and properly grounded; (2) emulsified asphalt composition flooring with a conductive aggregate which also is laid over grounded metal grids; and (3) industrial graphite tile made of a conductive mastic, the edges of the tile being melted together with a hot iron on installation to provide a continuous surface. With this last mentioned type no metal grid is necessary, the tile itself being grounded at various points.

These views, from photos by the U. S. Army Signal Corps, show a thermite bomb demonstration at the Army War College, Washington, D. C.; the upper view shows the bomb beginning to explode, while the lower shows the climax of the explosion where the bomb, having reached a temperature of about 4,000 deg. F., is melting through the slab of steel on which it rests



* Further information on these floors can be secured from Armstrong Cork Co., Building Products Div., Lancaster, Pa.; the Flintkote Co., Industrial Emulsions Div., 30 Rockefeller Plaza, New York, N. Y.; and the Kompolite Co., 111 Clay St., Brooklyn, N. Y.

The causes of static should be explained to employees, using simple illustrations such as the rubbing of silk in cold weather, or the combing of hair. Belt drives should not be used on machines in the mixing, pressing or loading rooms. Special care should be taken in screen rooms, since the friction of the particles passing over the screens and their temporary suspension and separation in air can build up high static charges. All metal in processing and storage rooms should be grounded and every possibility of a spark from machinery, from broken electric light bulbs, or from the dropping of steel tools should be guarded against. Properly grounded metal containers on spark-proof conductive flooring will permit more rapid dissipation of static charges than wooden containers. Mixers should be allowed to remain at rest for a short time before the mixture is removed, thus permitting any static charge induced in the metal particles in the mix to be conducted to ground. Simple electroscopes can be made to determine when a mixture is free of static charge.

Adequate lightning protection is an important requirement for the plant handling aluminum powders. The grounding of all metal window and door frames and approved lightning protection of all wiring will largely eliminate the possibility of high charges collecting before or during a thunderstorm and perhaps discharging to the ground with an accompanying flash or spark. Protection against actual lightning strokes is best left to authorities on this subject.[3,4] Many concerns shut down all mixing and loading operations during severe, nearby lightning storms, the employees leaving the processing rooms during that period. Radio sets are good indicators of approaching electrical storms, but if they are used, they should not be installed in the loading area owing to the hazard they introduce.

Highlights in Avoiding Aluminum Powder Explosions

1. All machinery and all metal door and window frames should be well grounded.
2. All mixing and conveying equipment should be constructed so as to minimize the escape of dust into rooms.
3. Spatulas, scoops, conveyors and the like should be of non-sparking materials.
4. Motors, as far as possible, should be kept in separate rooms, outside the workrooms. Where it is necessary to have them in the workrooms, they should be of the explosion-proof, dust-proof, splash-proof and water-proof type of squirrel-cage construction.
5. Dust should not be permitted to collect in workrooms; they should be cleaned several times a day, if necessary, although not while operations are going on.
6. Dust in the air should be kept at a minimum. Most people who do not work constantly with aluminum powder do not fully appreciate the explosibility of this material. Trostel and Frevert[1] state that the lower explosive limit for aluminum powder suspended in air varies with the method of ignition. With an electrically heated glowing wire, or with an arc, the lower explosive limit was found to be at a concentration of 7.0 mg. Al per liter of air, and at a concentration of 13.7 mg. with an induction spark.
7. Lighting of rooms should be provided by dust-proof, explosion-proof bulbs.
8. If necessary to use flashlights, they should always be of an Underwriters'-approved type, for use in explosive atmospheres.
9. All bearings and gears should be kept well lubricated and protected from dust.
10. All employees should wear approved type clothing, without pockets or cuffs, if feasible.
11. Operators engaged in mixing should wear respirators as a health precaution.
12. Safety shoes of a type which are both conductive and non-sparking should be worn by operators.
13. Conductive flooring should be employed if possible.
14. Operators should be instructed that, in case of fire, they should walk out and close the door of the room until someone in authority arrives to take charge.
15. Aluminum powders should be stored only in sealed drums and apart from other materials, especially oxidizing agents or easily oxidizable substances.
16. Only dry sand or Underwriters'-approved extinguishers should be used on aluminum powder fires.
17. Care should be taken to prevent foreign substances from getting into aluminum powder.
18. Building construction should follow the recommendations of the National Fire Protection Association.[2]
19. In general, it is advisable to follow most of the precautions usually observed in the handling of explosives.

MIXERS AND PRESSES

Machinery used in mixing and pressing operations should be equipped with outboard dust-proof bearings, which should be kept well lubricated. Excessive temperature rise in any part should call for an immediate shutdown. If a shaft or other part should freeze on a bearing surface, no attempt should be made to loosen the part by force, such as by a hammer blow on the shaft, as long as any ignitible material is in the room. Exposed ring gears or bevel gears should be protected from aluminum-powder-containing materials, liberal applications of a heavy grease minimizing this danger.

The clothing worn by plant employees should be kept clean and free from aluminum dust by frequent washing. Many concerns supply shirts and slacks to both male and female employees, the slacks being made without cuffs. There is a possibility of danger when employees wear their work clothes to their homes before changing. For example, a spark from a cigarette may easily cause fatal burns to a person whose clothing is filled with the dust of a pyrotechnic mixture. Owing to the possibility of static charges, silk and silk-like materials should not be worn at work by employees.

The ideal arrangement in locker rooms for employees is to use a double locker system with an intervening shower or washroom. With this method, a locker is provided for each employee at each side of the shower or washroom. The employee removes his work clothes and places them in the work clothes locker, then takes his shower and continues to his second locker on the other side of the shower room where he secures his street clothing. Thus his work clothes locker is always available for inspection by company officials or for the removal of soiled clothing for replacement with clean clothing. As previously mentioned, spark-proof and conductive shoes should always be worn by employees in the loading and mixing areas.

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First Progress Report From Office of the Rubber Director

Chem. & Met. INTERPRETATION

Progress Report Number One of the Rubber Director outlines the problems arising from the critical rubber situation, plans to meet these problems and the present status of organization. Some of the highlights are abstracted here for *Chem. & Met.* readers. — *Editors.*

THE PROGRAM of the Office of the Rubber Director cannot be stated better than in the Baruch Report where it said:

"We must supply not only the needs of our armed forces but most of those of the military machines of our Allies as well. We must equip our buses and trucks and other commercial vehicles and provide on a large scale specialty items for such purposes as factory belting, surgical, hospital and health supplies. And in addition to all these, we must maintain the tires on at least a substantial portion of our 27,000,000 civilian passenger automobiles."

The total requirements of natural and/or synthetic rubber (in terms of natural) are estimated at 577,000 and 672,000 long tons for 1943 and 1944 respectively.

The Baruch Report definitely established that we cannot be permitted to reduce our domestic inventory of rubber stocks below 120,000 tons at any time. It is now apparent that the inventory of crude and synthetic rubber in the fall of 1943 will, to all practical purposes, be down to the absolute dangerous inventory dead-line of 120,000 tons, and by the end of 1943 will have been built up to only 175,000 tons.

It is clear that there is every necessity for continuing through the critical fall of 1943 a policy of rigid conservation of rubber, and that we must envisage the possibility of a complete exhaustion at that time of even so-called normal inventories of finished products. In fact, a delay of a month in the part of the program which includes plants that should be finished by May 30 would mean the loss of 40,000 to 50,000 tons, at a time when there will be none to lose. Present indications are that the impact of competitive programs will cause a delay. It is too early to say how much of a delay.

The Baruch Committee recommended certain plant expansion. New plants to provide the desired increase in Neoprene and Thiokol capacity are being started. Currently, existing copolymerizing plants promise to provide the required capacity in that direction. However, shortages of raw materials will forbid running these to even rated capacity for another year; hence, no further copolymerizing plants will be started for another six months.

Final arrangements have been been made for a portion of the recommended 100,000 tons a year additional capacity of butadiene from refinery conversions. Engineering work, together with pilot studies, will permit completing arrangements for the remaining capacity as rapidly as necessary critical materials can be obtained.

Plans for building plants to make an additional 30,000 tons per year of Buna S from butadiene made from grain are being studied. It is expected that the studies will be sufficiently complete to permit building these as soon as possible after adequate piloting of the processes which the Baruch Committee recommended investigating. This step must also depend on avoiding serious conflict with the flow of materials to plants now under construction.

Shortages have been found in fabricated components (such as instruments, forgings, valves, heat exchangers, etc.), more than in materials. Studies have emphasized that unless these components for synthetic rubber manufacturing plants reach the plants as rapidly as they can be installed the resultant relay will cause such a drain on the crude rubber stocks that there may be no crude left for heavy-duty tires, self-sealing gasoline tanks, and those other military uses which demand crude rubber.

We are rapidly approaching the time when the Director must require certain manufacturers to use synthetics costing them much more per pound than the 22½c now charged for crude rubber. Unless there is to be a complete dislocation and demoralization of various parts of the rubber industry, it will be necessary either to compensate for this by subsidies or to permit an equitable adjustment of selling prices. The problem of how this can be accomplished without dislocation of the rubber program has still to be determined in conjunction with Rubber Reserve and the OPA.

The Baruch Committee emphasized the desirability of completing as soon as possible one standard copolymerization plant. It is expected that the first of these units will be finished in March. To finish one earlier would necessitate changes and interruptions which might result in almost disastrous delays to more critical portions of the program.

Facilities for the manufacture of considerable tonnage of Buna S by what is essentially standard plant design are already finished. These units are being run at less than one fifth of their capacity because of the present unavailability of butadiene. Because of this shortage, an emphasis is upon bringing into production the first increments of butadiene and styrene. It is expected that the first butadiene will come from the first of the four units at the alcohol plant at Institute, W. Va. and that this will be followed closely by the first increment of butadiene from petroleum at Baton Rouge, La. It is hoped that both of these will be producing early in the year. Unfortunately, these increments constitute only a little more than five percent of the ultimate program.

The Baruch Committee emphasized the necessity of scrutinizing all requirements for rubber. A plan has been inaugurated to obtain detailed requirements from all the claimant agencies for end products of rubber or rubber substances to meet actual schedules of production of airplanes, trucks, ships and other products requiring rubber or rubber-like materials. This survey which will be kept up-to-date monthly, together with our newly inaugurated survey of all inventories of all end products, will enable us shortly after the first of the year to control properly the consumption of natural rubber, synthetics and substitutes, and to regulate them by the possible liquidation of less-essential inventories of end products, in such a way as to conserve our diminishing stockpile of natural rubber.

Selection of Pumps for Oleum and Strong Sulphuric Acid

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Chem. & Met. INTERPRETATION

This is the first of several articles dealing with the selection and operation of acid pumps under war-time conditions, when the work of selection on the one hand, and of operation on the other, must often be done by inexperienced persons. The author's approach is practical, and although intended chiefly for the instruction of engineers confronted with new problems, will often prove enlightening to those familiar with the difficulties encountered. The present article is concerned with tank car loading and transfer pumps.—*Editors.*

NOW that many hundreds of operators, previously inexperienced in the chemical industry, are being called upon to assist in the operation of chemical plants, there is a great need for articles which will assist in the rapid instruction of these people in safe practices, and which will also assist in the specification of equipment and its layout for maximum safety and efficiency.

A recent accident involving a sulphuric acid pump illustrates some of the hazards that may arise from improper specification and operation. A former garage mechanic hired by a defense plant making acids was assigned to the crew in charge of tank car loading and the transfer of concentrated sulphuric acid and oleum. Although he had read the safety rules applying to the acid areas in the plant and had his goggles and rubber gloves handy, he was seriously injured and scarred for life when acid sprayed out of a poorly packed stuffing box. He was attempting to open a steel plug cock on the suction side of the oleum pump, while wearing his goggles. The valve was stuck and as it opened suddenly, he fell backward toward the side of the pump opposite the stuffing box. When the valve opened the sudden application of pressure of a 20 ft. head of oleum on the stuffing box caused the liquid to spray over his bare arms and face. This accident would have been avoided if the stuffing box had been packed properly, or if the valve had not stuck. Investigation showed that steel valves were selected because steel piping and tanks could be used satisfactorily. The inexperienced specification writer did not realize, however, that the protective coating of ferrous sulphate which forms on tanks and pipe would be removed on the rubbing surfaces of the valve, nor did he appreciate the effect of dilution of the acid which seeped through the stuffing box, from absorption of moisture from the air.

Investigation also showed that, since the pump was not delivering the required amount of acid, it had been difficult to shut it down long enough to pack it properly. It was found that the packing had disintegrated rapidly, the shaft sleeve was badly scored and acid had leaked out of the stuffing box and corroded the base and foundation, heaving the ground under the foundation. Thus the pump had been thrown out of line and could not be kept packed.

Although this pump was too small for the job, it could have given adequate service, the packing would have lasted satisfactorily and there would have been no leakage from the stuffing box if the pump had been operated correctly. Furthermore, the correct size of pump would have been selected if the specification writer had calculated the total dynamic head correctly and had not included the static head of the acid in the storage tank. If he had understood the situation he would have specified the correct type of acid valves. The pump manufacturer should have given adequate operating instructions for the particular service and an experienced operator should have warned the new man of the possibility of spraying acid and should have had the pump packed properly. Finally, the employer's responsibility had not adequately been discharged since he had neither provided a safety guard over the stuffing box nor called in the service engineer of pump manufacturer to help correct the causes for poor operation.

These days it is not always possible to have an experienced engineer and an experienced operator on every job. However, experienced men generally have some opportunity to check the work and assist in the instruction of the new men.

It may be instructive to follow through the steps of a project for selecting, installing and operating an acid pump for the loading of tank cars. An installation of a sulphuric acid pump of this type in an outdoor exposed location is so frequently met in chemical plants that the problem discussed here should have wide application. As an example, take the case of a sulphuric acid plant to produce 265 tons per day of 98 percent acid. The plant will also produce oleum and acid of 66 deg. Bé. concentration.

Typical of the way the job of pump specification may be handled by a man inexperienced in acid plant layout is the following case. After the construction company's engineer had sketched up the general layout of the location of the storage tanks, the spur track for the acid tank cars and the loading rack next to the track, the sketches were given to a draftsman experienced in the detailing of steel construction and piping layout work who, however, knew nothing about acid handling. He selected steel valves and made a nice arrangement for a water or oil handling system, relative to pump location, but did not realize that the valves in an acid system may have to be located with respect to the pump in such a way as to avoid serious operating difficulties from leaking acid.

Knowing the size of the plant and having been told that the pump must handle that capacity in three or four

hours per day for the loading of tank cars, to permit one day shift to do all of the loading without overtime, the draftsman calculated the required maximum capacity of the pump as $(265\times2{,}000)\div(8.33\times1.84\times3\times60)=192$ g.p.m. Since 3-in. steel pipe is usual for this type of work, the draftsman checked the friction loss in the system by referring to the usual friction tables for 200 g.p.m. of water in 3-in. ordinary wrought iron pipe. Since the total dynamic head figured out at about 100 ft. and this seemed reasonable, specifications were written for an apparently suitable acid pump. These specifications called for a pump with a capacity of 200 g.p.m. at 100 ft. total dynamic head, for direct connection to a 1,750 r.p.m. motor. Realizing that in figuring the entire capacity for but three hours of operation there is a large factor of safety to take care of possible errors and increased viscosity of the liquid during cold weather, the chief draftsman approved the specifications as written.

The pump manufacturer, receiving the invitation to bid, saw that a pump to do this job would be costly and would require a fairly large motor. Since the service required of the pump was known, he realized that the exact capacity was not as important as proper application to give long trouble-free service. Therefore, he requested drawings of the proposed installation so as to be able to determine the actual capacity with his various standard acid pumps. Furthermore, the plan and elevation drawings would permit him to supply correct operating instructions for the pump, applying to the particular system.

This last point is especially important since, as is well known, any acid pump packing will disintegrate to a greater or lesser extent in contact with 98 percent sulphuric acid and oleum.

In the case described, it was necessary to use a standard type acid pump since the storage tanks were too deep to permit the use of a self-priming pump or a vertical submerged pump. Also, an automatic-seal pump without packing was not practical since there would be times when the pump would pull a high vacuum when pumping from a nearly empty storage tank at a distance from the pump. Even if this objection could be overcome by larger piping and relocation of the pump, it would still be good practice to install a standby unit where a pump was used that required considerable time for servicing in case the special sealing features needed repair.

The pump manufacturer was anxious to insure a safe operating unit in this tank car loading installation and attacked the problem and worked up his quotation along the following lines:

A diagram of the pumping system from storage tank to tank car is shown in Fig. 1. The steps necessary in analyzing the complete system included: Calculation of friction losses for different sizes of pipe for various capacities; plotting of the friction system curves thus obtained in terms of capacity vs. head

Fig. 1—Pump and piping diagram for loading tank cars with strong sulphuric acid; by manipulation of the valves as described in the text, pressure on the stuffing box can be made negative while the pump is running, and relieved entirely when it is shut down

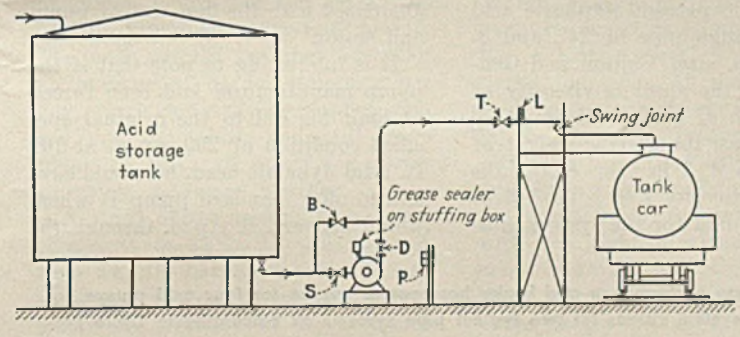
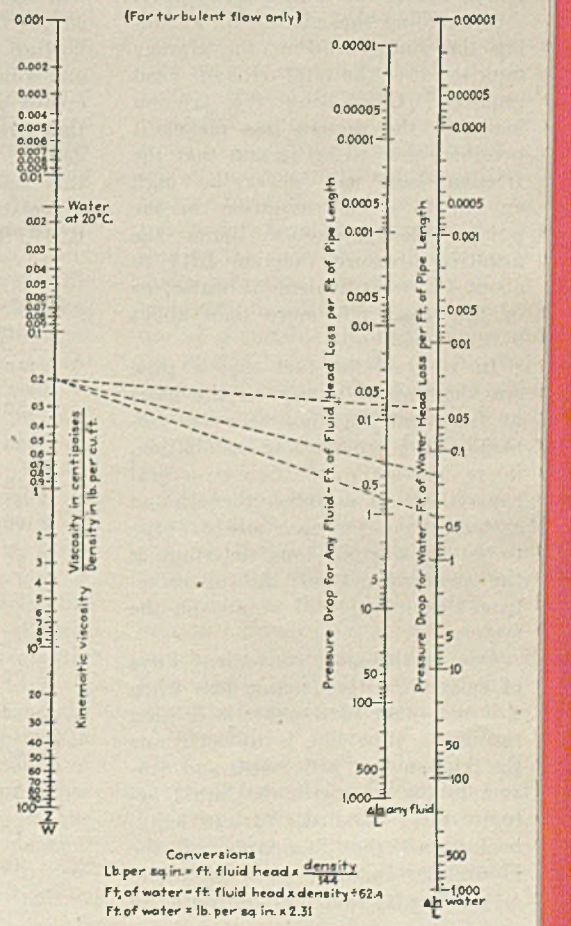


Table I—Calculation of Friction System Curves

(Data: It is required to pump 265 tons per day of 98 percent sulphuric acid. At 70 deg. F. this acid has an absolute viscosity of 25 cp. The acid density is 1.84, its weight is 115 lb. per cu. ft. and its kinematic viscosity is 25/115 = 0.217, which is the value for the lefthand scale of Fig. 2.)

	Pipe Sizes, In. I. P. S.		
	2½	3	4
Linear length pipe, ft	223	223	223
Entrance, tank to pipe, equiv. ft	3.5	4	6
Six short radius ells, equiv. ft	36	48	60
Four gate valves, equiv. ft	6	8	8
Total equivalent pipe length, ft	268.5	283	297
Friction loss, water, 15 year old iron pipe at 200 g.p.m., per ft	0.43	0.178	0.044
Friction loss, acid, from Fig. 2, ft	0.75	0.30	0.07
Total friction loss, ft. head	202	85	20.8
Velocity head, $V^2/2g$, ft	2.5	1	0.5
Static head, low level in tank, ft	14	14	14
Total dynamic head (TDH), ft	218.5	100	35.3
By similar calculations:			
TDH at 100 g.p.m., ft	.....	40	22
TDH at 225 g.p.m., ft	.....	134	40
TDH at 300 g.p.m., ft	.....	.....	60

Fig. 2—Nomograph for converting pressure loss in pumping water through a given pipe to pressure loss for another liquid under the same flow conditions. (From Chilton & Genereaux, *Chem. & Met.*, Nov. 1930)



loss; plotting of the performance curves of all pumps under consideration on the same grid with the friction system curves, in terms of capacity vs. total dynamic head; and final tabulating of the data thus obtained for each pump system for final comparison and selection of the most economical combination of pump and piping.

Ordinarily a pump manufacturer would not be in a position to work up all of these data for every pump quoted, but in this particular instance he was anxious to educate a specification writer who in the future would probably specify a large number of similar installations. For future installations, particularly where they were of a repetitive type, the pump manufacturer would be able to check him readily.

It is necessary to determine the friction losses for the entire system for the liquid actually handled, and not for water. In this particular case the viscosity of the acid could be taken as that at the average temperature since the pump to be selected would allow extra pumping time for handling the more viscous acid in colder weather. Such a system must be calculated for pumping from the most distant storage tank and also with the tank nearly empty, thus avoiding the mistake of including the static head in the storage tank to lower the total dynamic head required. Calculating the friction losses in the suction line makes it possible, also, to be certain that the friction loss will never be high enough to cause cavitation in the pump. Good practice limits the negative pressure (suction lift) to about 15 ft. equivalent of water, or in this case, not more than about 9 ft. of acid.

In view of the fact that a pipe size determined purely on the basis of judgment may not be most economical for a particular installation, it is necessary to figure several capacities and establish the friction system curve for each size of pipe to be considered, thus determining the performance of the manufacturer's standard acid pumps on the system.

One of the most convenient ways of calculating the friction loss when a liquid other than water is flowing through a pipe line is to determine the friction loss with water and convert to the loss with the liquid actually to be handled. Various handbooks and the Standards of the Hydraulic Institute contain tables giving the friction loss for water in ordinary steel pipe of various sizes and for various rates of flow. These tables also give the equivalent length of straight pipe which has the same friction loss as fittings, valves, etc., so that the entire piping system can be reduced to its equivalent length of straight pipe.

To convert the friction loss with water to that which will obtain with the liquid being handled, it is necessary to know the absolute viscosity of the liquid at the average temperature of handling. This can be obtained from handbooks such as Perry's Chemical Engineer's Handbook, or from the alignment chart presented by Chilton and Genereaux (*Ind. Eng. Chem.*, 22, p. 1384, 1930). Knowing the absolute viscosity Z of the liquid and its specific weight ρ, it is then possible to calculate the kinematic viscosity Z/ρ and hence the pressure drop for the liquid for a given length of pipe, if the pressure drop for water is known. A method of performing this calculation was worked out by Chilton and Genereaux (*Chem. & Met.*, 37, p. 689, 1930), who presented a simple nomograph (here reprinted in Fig. 2) to obtain the desired results for turbulent flow.

For purposes of illustration, we will calculate the friction system curves for 98 percent sulphuric acid flowing through pipe of 2½-, and 3- and 4-in. i.p. size. Chilton and Genereaux give the absolute viscosity of this strength of acid as 25 cp. at 70 deg. F. Since the specific weight of this acid is 115 lb. per cu.ft., the kinematic viscosity Z/ρ is 25/115 = 0.217. The data for the system illustrated in Fig. 1 for the three sizes of pipe are tabulated in Table I.

It is evident from the table that 2½-in. pipe is too small and so further consideration will be given only to the 3- and 4-in. pipe. The data of Table I are plotted as "friction system curves" in Fig. 3. On the same graph, performance curves for four different pumps designated as A, B, C, and D, are plotted for several different motor speeds in terms of gallons per minute vs. total dynamic head. The brake horsepower curves for these same pumps and motor speeds are also added.

Such a series of curves makes it possible to determine from the intersections of the curves just how many gallons per minute each pump will deliver through a particular piping system. The performance data for each pump can then be tabulated as in Table II. On the same tabulation the first costs and yearly operating costs can be shown, together with the amortized costs over a selected time. This time should be short enough so that replacement cost will be a negligible factor. Thus the matter of final selection is easy and definite. In the table the total cost of a pumping unit using 4-in. pipe is taken as $300 more than a unit with 3-in. pipe. The $300 is then amortized with the first cost of pump and motor.

It is interesting to note that if the pump manufacturer had been forced to limit his bid to the original specified condition of 200 g.p.m. at 100 ft. total dynamic head, he would have had to offer standard pump D which would deliver 221 g.p.m. through the

Fig. 3—Pump performance and brake horsepower curves for four acid pumps, vs. friction system curves for two typical pipe systems as calculated in Table I

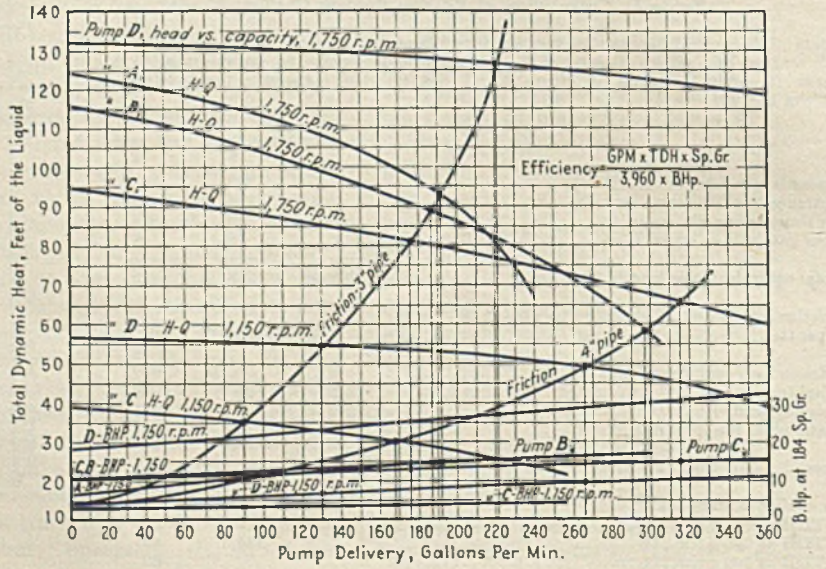


Table II—Pump Analysis Tabulation From Curves of Fig. 3

Based on pumping 265 tons per day (100,000 tons per year) of 98 percent sulphuric acid in the systems summarized in Table I. Pump C was selected, for use with 4-in. pipe. This is a satisfactory pump which, with 4-in. pipe, requires a small motor, operates at low speed, has low repair cost and the lowest power cost of any combination shown. The total operating cost is the lowest for any pump which will not have to run more than 3½ hr. per day.

Pump	Pipe Size, In.	Motor Speed, R.P.M.	Capacity, G.P.M.	Power Required with 98% Acid, B. Hp.	Pump Capacity, Tons per Hr.	Hours for 265 Tons	Cost to Pump 100,000 Tons, Dollars	Motor Rating, Hp.	Cost Pump and Motor, Dollars	Extra Cost for 4-In. Pipe vs. 3-In. Pipe, Dollars	Maint. Cost per year,* Dollars	Yearly Amortization Cost** (Inc. Maint.), Dollars	Total Cost per Year, Dollars	Remarks
A	3	1,750	192	14.9	88.5	3.0	168.50	15	534.00	0	16.00	123.00	291.50	Excellent pump
B	3	1,750	187	14.8	86.4	3.07	171.50	15	470.50	0	16.00	111.00	282.50	Breakage hazard
C	3	1,750	176	13.0	81.2	3.26	160.00	15	446.00	0	11.00	100.00	260.00	Satisfactory pump. Low repair cost.
D	3	1,750	221	27.5	102.0	2.6	269.00	30	810.00	0	22.00	184.00	453.00	Excellent pump
C	3	1,150	90	3.7	41.6	6.37	89.00	5	403.00	0	9.00	89.00	178.00	Satisfactory pump. Low repair cost.
D	3	1,150	130	7.2	60.0	4.42	120.00	10	699.00	0	20.00	160.00	280.00	Excellent pump
B	4	1,750	297	17.1	137.0	1.94	124.80	20	494.50	300.00	16.00	175.00	299.80	Breakage hazard
C	4	1,750	315	15.2	145.5	1.82	104.40	15	446.00	300.00	11.00	160.00	264.40	Satisfactory pump. Low repair cost.
C	4	1,150	168	4.2	77.6	3.42	54.20	5	403.00	300.00	9.00	149.00	203.20	Best pump for job.
D	4	1,150	266	9.8	123.0	2.15	79.50	10	699.00	300.00	20.00	220.00	299.50	Excellent pump.

* Packing and greasing. ** Amortization of pump and motor cost over 5 yrs.; in case of 4-in. pipe, includes $300 extra system cost over 3-in. pipe.

3-in. pipe, requiring a 30-hp., 1,750-r.p.m. motor costing $810 for pump and motor, compared with a cost of $403 for the unit finally selected, which included a pump and a 5-hp., 1,150-r.p.m. motor. The use of this lower cost pumping unit involved changing from 3- to 4-in. pipe, but even the increased cost of $300 for the 4-in. pipe allowed a saving of $214.80 per year in power cost, and an overall cost saving $249.80 per year, figured by amortizing the cost of pump, motor and the extra cost of 4-in. pipe over a five-year period. The unit selected required less than an average of 3½ hr. pumping per day, which can easily be handled during one day shift and still leave plenty of factor of safety for slower pumping in colder weather.

A study of the various figures and comments in Table II will make it clear why the particular selection was made. An analysis of this sort should insure the selection of the best and most efficient pumping unit for a tank car loading job. A study of the method of calculation and analysis should enable engineers called upon to select pumps, to design future jobs with assurance.

Unfortunately, proper design and specification work does not in itself insure a satisfactory pumping unit, owing to the possibility of poor operation. No acid pump will prove satisfactory if given no more care than if it were a water pump. Hence it is up to the pump manufacturer to be certain that adequate operating instructions actually get into the hands of the operator. Instructions originally accompanying a pump which is installed by a construction crew rarely find their way into the hands of the eventual operator. Since special operating instructions are necessary, particularly for a pump handling this acid, and when neither a water or grease seal will suffice, these instructions should be mailed direct to the maintenance engineer of the operating company.

Any pump stuffing box, as is quite generally understood, must have a lubricating film between the shaft or shaft sleeve and the packing. Otherwise, overheating will result, causing burned packing and a scored shaft. Water pumps prevent overheating by introducing water under pressure into a lantern ring or seal cage between the rings of packing. Most acid pumps can be similarly treated by the use of an independent water seal, thus presenting little possibility even for a green operator to burn up the packing by running the pump with too tight a gland. In many cases, however, even slight water dilution is not permissible and an automatic grease sealing device becomes practical and effective. In pumping 98 percent sulphuric acid or oleum a water seal cannot be used and there are no greases which are completely effective in long contact with these acids. Furthermore, since some acid storage tanks are as much as 30 ft. deep, there may be times when the stuffing box will be under a pressure as high as 20 lb. per sq. in. and grease sealing devices will not hold up against such pressure without excessive attention.

Under these circumstances, the only satisfactory way to operate a pump is to remove the pressure of acid from the stuffing box and create a slight negative pressure at the gland. Then by sealing the packing with a good grade of grease to provide lubrication and prevent infiltration of air, the operation becomes simple and readily controlled. A small amount of lubricant and sealing grease may be drawn into the pump without harm, as this is constantly replaced, while the packing is prevented from disintegrating due to continuous contact with the acid.

All good acid pumps are so designed that the pressure created by the impeller is not transmitted to the stuffing box. This is accomplished by the use of full open impellers, by suitable balance port holes or by "pump-out" vanes or similar effective devices on the back of the impeller. Hence, the only pressure on the stuffing box is approximately equal to the pressure of the liquid at the suction nozzle of the pump. On that account, the stuffing box can be put under negative pressure if the acid at the entrance to the pump is under negative pressure. This can be accomplished most readily by the use of a suitable throttling valve in the suction line near the pump. Owing to the variable depth in the acid storage tanks, orifices or small diameter pipe cannot be used for this purpose.

From the above it is obvious that pumps can be operated without pressure on the stuffing box and hence without acid leakage at the stuffing box while the pump is in actual operation. However, it is also important to avoid continuous drip of acid from the stuffing box during times when the pump is shut down, perhaps 75 percent or more of the time. Since a grease sealing device is impractical for holding the acid against high static pressure, it becomes necessary to prevent the pressure from reaching the stuffing box while the

(*Please turn to page* 91)

Effect of the Kinetic Energy Term In Gas Flow Calculations

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Chem. & Met. INTERPRETATION

When gas flows through a pipe its pressure decreases, resulting in an increase in the specific volume, velocity and kinetic energy. Usually the kinetic energy increase is neglected, being small in comparison with the surface friction, but when the initial pressure is low and the flow rate is high, the kinetic energy increase may be important in gas flow calculations. The author presents a simplified method of calculating the pressure drop from the equation previously used to allow for the kinetic energy increase. He also shows that this equation gives too small a kinetic energy increase and hence too high an outlet pressure. He therefore introduces a correction factor to overcome this source of inaccuracy.—*Editors.*

As GAS FLOWS through a pipe its pressure decreases, and its specific volume correspondingly increases. Since the cross section of the pipe remains constant, the velocity of the gas must increase; so also must its kinetic energy. This increase in kinetic energy as well as the surface friction must be supplied by the decrease in pressure.

Usually the surface friction is so large compared to the increase in kinetic energy that the latter may be neglected. But when the flow rate is high and the initial pressure low the increase in kinetic energy may be important.

Bernoulli's theorem is therefore frequently written for a horizontal pipe in the differential form:

$$v\,(dp/dx) + (V/g)\,(dV/dx) + 2fV^2/gD = 0 \qquad (1)$$

where v is the specific volume of the gas; p is the pressure; x is the distance measured along the pipe axis; V is the space average gas velocity (in the direction of the axis); g is the acceleration due to gravity; f is the friction factor; and D is the inside diameter of the pipe.

The term $(V/g)\,(dV/dx)$ is intended to allow for the increase in kinetic energy. The allowance is too small, but consideration of this deficiency can be deferred until Equation (1) has been integrated, as shown below.

If the flow is steady—that is, if the weight rate of flow is the same all along the pipe—

$$V/v = V_i/v_i \qquad (2)$$

where V_i is the space average gas velocity at the inlet, and v_i is the specific volume at the inlet.

If the temperature of the gas remains constant, and if Boyle's Law applies

$$pv = p_iv_i \qquad (3)$$

where p_i is the pressure at the inlet.

If Equations (2) and (3) are applicable, the viscosity of the gas will not change substantially so that the Reynolds number will be substantially the same all along the pipe. This means that the friction factor will be constant. With all these assumptions Equation (1) integrates to

$$v_i\,(p^2_i - p^2_o) + (2p_iV^2_i/g)\ln(p_o/p_i) - 4fp_iV^2_iL/gD = 0 \qquad (4)$$

where p_o is the pressure at the outlet; L is the distance from the inlet to the outlet; and ln means "natural logarithm of."

The term $(2p_iV^2_i/g)\ln(p_o/p_i)$ in Equation (4), which is intended to allow for the kinetic energy change, makes it inconvenient to solve for the outlet pressure. Often this term is small compared to the term $4fp_iV^2_iL/gD$, and it is usually neglected. But if it is desired to retain the term a straightforward method of solution is helpful.

Lobo, Friend, and Skaperdas[1] divide Equation (4) by $p^2_iv_i$ and obtain

$$1 - 4fV^2_iL/p_iv_igD = (p_o/p_i)^2 - (2V^2_i/p_iv_ig)\ln(p_o/p_i) \qquad (5)$$

Then they plot p_o/p_i against $1 - 2fV^2_iL/p_iv_igD$ for various values of V^2_i/p_iv_ig. The resulting chart can be used to determine p_o/p_i, and makes possible a direct solution for the outlet pressure.

Another method, which may be preferred for some purposes, is to replace $\ln(p_o/p_i)$ by the first two terms of the series which it equals:

$$\ln(p_o/p_i) = -(1 - p_o/p_i) - (1 - p_o/p_i)^2/2 - (1 - p_o/p_i)^3/3 - \ldots \qquad (6)$$

Making this substitution, and writing Y for V^2_i/p_iv_ig, Equation (5) becomes

$$1 - 4fYL/D = (p_o/p_i)^2 + 2Y(1 - p_o/p_i) + Y(1 - p_o/p_i)^2 \qquad (7)$$

or

$$(1 + Y)\,(p_o/p_i)^2 - 4Y\,(p_o/p_i) + 3Y + 4fYL/D - 1 = 0 \qquad (8)$$

and Equation (8) can be solved readily for p_o/p_i.

Lobo, Friend, and Skaperdas gave an example to illustrate the use of their method. In this example it was required to calculate the pressure drop in 75 ft. of pipe (inside diameter, $\frac{1}{3}$ ft.) through which gas was flowing at an inlet space average velocity of 440 ft. per sec. The inlet specific volume was given as 8.70 cu.ft. per lb. The kinematic viscosity was given as 1.14×10^{-4} sq. ft. per sec., making the Reynolds number 1,290,000; a value of 0.0038 was selected as the friction factor for this Reynolds number.

With these values they calculate that Y is 0.137 and that $1-2fYL/D$ is 0.765. Then from their chart they determine that p_o/p_i is 0.638.

Inserting 0.137 for Y and 0.765 for $1-2fYL/D$ in Equation (8), p_o/p_i is found to be 0.644; that is, the error due to the use of the approximation is about 1 percent. This slight error can be reduced by substituting ln 0.644 for ln p_o/p_i in Equation (5), and solving for p_o/p_i. However, it is questionable whether the added refinement is worth while.

It is questionable also whether it is worth while to construct a chart from which p_o/p_i can be read to three places; this cannot be done from the published chart.

The chief reason for questioning the value of putting forth the labor required to get a solution for Equation (5) having high mathematical accuracy is the uncertainty in the value of the friction factor. For clean, round, straight pipe Miller[2] has shown that

$$(1/2f)^{1/2} = 2.54 \log \mathrm{Re} - 2.17 \qquad (9)$$

where Re is the Reynolds number, and log means "logarithm to the base 10 of."

The friction factor for a Reynolds number of 1,290,000 is 0.0028, according to Equation (9), while a value of 0.0038 had been selected for the illustrative example. It is recognized that a pipe line has joints and perhaps other elements which offer resistance to flow in addition to that caused by surface friction. Making a generous allowance for these elements, a value of 0.0033 might well have been selected for the friction factor. If it should be, $1-2fYL/D$ will be 0.796, rather than 0.765. This change will increase p_o/p_i from 0.644 to 0.707, according to Equation (8). In this case a decrease of 13 percent in the value selected for the friction factor would increase p_o/p_i by 10 percent. It seems likely that in most cases the uncertainty in the value of the friction factor will make the value of p_o/p_i doubtful by more than the error due to using Equation (8) rather than Equation (5).

After showing that Equation (8) gives a solution for Equation (5) which is as accurate as the uncertainty in the friction factor warrants, the inadequacy of the allowance for kinetic energy change will be considered. The term $(V/g)(dV/dx)$ in Equation (1) should be replaced by $(jV/g)(dV/dx)$, where j is a number greater than 1. Then Equation (4) should have the term $(2jp_oV^2{}_i/g)\ln(p_o/p_i)$ instead of $(2p_iV^2{}_i/g)\ln(p_o/p_i)$. Equation (5) should therefore be replaced by

$$1 - 4fYL/D = (p_o/p_i)^2 - 2jY \ln (p_o/p_i) \qquad (10)$$

and Equation (8) should be replaced by

$$(1+jY)^{\frac{1}{2}}(p_o/p_i)^2 - 4jY\,(p_o/p_i) + 3jY + 4fYL/D - 1 = 0 \qquad (11)$$

While a chart could be constructed by plotting p_o/p_i against $1-2fYL/D$ for various values of jY, the use of Equation (11) is recommended instead.

Table I — Variation of Velocity Ratio And j With Reynolds Number

Log Re	u_c/V	j
3.50	1.393	1.279
3.75	1.313	1.193
4.00	1.276	1.147
4.25	1.247	1.109
4.50	1.223	1.086
4.75	1.205	1.070
5.00	1.191	1.060
5.25	1.180	1.054
5.50	1.170	1.048
5.75	1.161	1.042
6.00	1.153	1.036
6.25	1.146	1.032
6.50	1.140	1.030

If the velocity of the fluid in a pipe were the same at all parts of the cross section, it would not be necessary to specify that V is the *space average* velocity, and j would be 1. But the velocity is zero at the wall, and increases regularly to a maximum at the center. In viscous flow the ratio of maximum velocity to space average velocity is 2, and the value of j is also 2. In turbulent flow the ratio of maximum velocity to space average velocity varies with the Reynolds number, decreasing as the latter increases, and j also decreases as the Reynolds number increases. The relevant values are given in Table I, where u_c means maximum velocity.

Consider again the example used above in which the Reynolds number was 1,290,000. For this value of Re, j is 1.034. Y is 0.137, so that jY is 0.142. Taking 0.765 for $1-2fYL/D$, as given by Lobo, Friend, and Skaperdas, Equation (11) yields 0.640 for p_o/p_i. Taking 0.796 for $1-2fYL/D$, as suggested above for a clean, round, straight pipe line, Equation (11) yields 0.704 for p_o/p_i.

At lower Reynolds numbers the value of j is greater, and the error introduced by implicitly assuming that j is equal to 1 is also relatively greater. But at lower Reynolds numbers the importance of the entire kinetic energy term is likely to be smaller.

References

1. Lobo, Friend, and Skaperdas, *Ind. Eng. Chem.*, **34**, No. 7, p. 821, July 1942.
2. Miller, *Chem. Met. Eng.*, **44**, No. 10, p. 616, Oct. 1937.

ACID PUMPS

(*Continued from page* 89)

pump is standing idle. A constant drip of acid is difficult to dispose of in the usual drip pan or catch basin devices. Furthermore, strong sulphuric acid in contact with the air tends to creep along and over most types of surface, especially if the surface is being corroded. Pumps which allow acid to seep from the stuffing box invariably show large accumulations of sulphate on external iron and steel parts of the pump near the stuffing box and on the base. Frequently the concrete foundation and floor also show serious disintegration.

Prevention of static pressure on the stuffing box during shutdown periods lies in proper manipulation of the valves shown in Fig. 1. When this is done the pump will be emptied sufficiently on shutting-down so that the small amount of acid which will be left in the volute and in the discharge nozzle will fall below the level of the stuffing box. As long as the valves on both sides of the pump are tight, it will therefore be impossible for acid to reach and drip from the stuffing box.

Proper valve manipulation is simple and obvious, but must nevertheless be explained to a new operator. In starting the system shown in Fig. 1, the motor is started with the valves closed. Then discharge valve D is opened, followed by the opening of suction valve S until acid drip appears at the stuffing box gland. Then valve S is gradually closed until the drip ceases, thus throttling the suction and putting the stuffing box under negative pressure as noted above. When the pump is to be shut down by a single operator who must be on the loading platform, he should first stop the motor at push button station L after which he closes suction valve S. He then starts the motor again from push button station P and allows the pump to run for a minute, after which he closes discharge valve D and shuts down the motor. In this sequence of operations the head of acid in the storage tank is exerted on the pump stuffing box only for the time required for the operator to get down from the loading rack to the pump. In Fig. 1, valve B is provided to bypass the pump when loading a car by gravity under control of valve T.

When a suitable pump is operated in the described manner, a good installation can be kept in good condition for years without corrosion of the pump surroundings. About the only maintenance expense will be repacking two or three times a year and supplying a moderate amount of grease for sealing the stuffing box and lubricating the bearings.

Nylon Research Wins Its War Wings

EDITORIAL STAFF REPORT

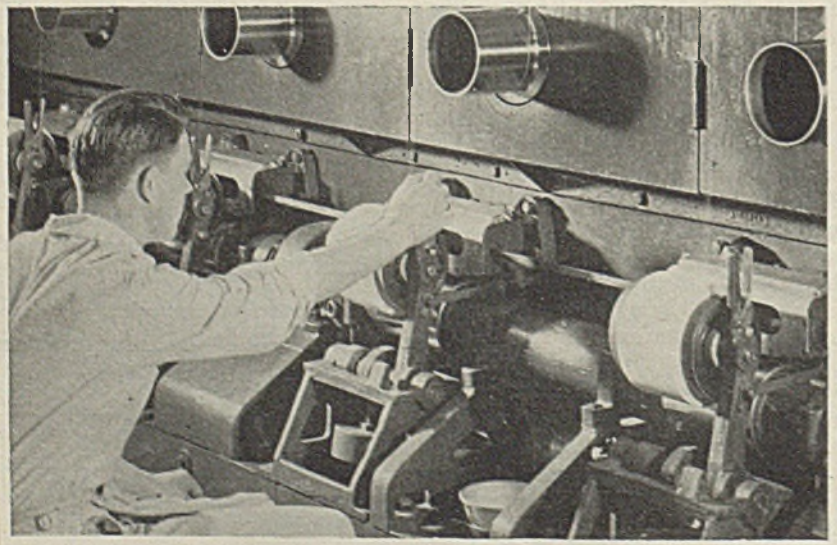
Chem. & Met. INTERPRETATION

Award of the Army-Navy "E" to the men and women of the Nylon Research Laboratory and Pilot Plant of the Experimental Station of the DuPont Company on December 29 was the occasion for the first inspection by the press of the processes and equipment used in producing this essential war material. Visitors were also shown a few of the new nylon products that await post-war development, such as coated fabrics, super-strong rope, and plastic "wire" window screens. Meanwhile all present production and that which can be salvaged from waste and cast-off stockings by a newly developed process must go for important military uses—for parachutes and flare canopies, shroud lines, harness webbing, tapes and belting, tow ropes for gliders—to mention but a few that are no longer military secrets.—*Editors*

THAT NYLON has gone to war is no longer news—at least to the ladies. In the first year it was on the market approximately 64 million pairs of nylon hose were quickly sold. By the close 1941 enough yarn had been shipped to make 175 million more pairs but some of it, we are told, went into women's undergarments, girdles, gloves, neckties, fishlines and leaders, football pants, tennis racket strings, brush bristles and surgical sutures.

Then came Pearl Harbor and the severance of all connection with Japan and Japanese silk. Fortunately, it found the nylon industry ready to play a strategic role in America's industrial and military economy. Experiments that had been started in 1940 with the Army Air Corps and the Navy Department looking to the possible use of nylon as a replacement for silk parachutes were pushed ahead with greatest intensity. Soon 100 percent of the output of the two large plants at Seaford, Del. and at Martinsville, Va. was going to the Government. Not only the canopy cloth of parachutes but also the tapes, shroud lines and certain of the harness webbing and belting were made of the new fiber. Nylon rope proved so superior in strength, lightness, and durability that it came into urgent demand. Its additional property of elasticity made it marvelously suited for use as the tow rope for gliders to be picked up by airplanes. Tires for trucks and gun carriages which undergo severest punishment have been made experimentally from this strongest of fibers for tire fabrics. Gun brushes with nylon bristles wear longer than the ones they replaced. Other war uses for nylon are still secret but its strategic importance and contribution to the war effort were officially recognized on December 29, 1942 by the presentation of the Army-Navy "E" to the men and women of the DuPont Nylon Research Laboratory and Pilot Plant at Wilmington, Del.

Fine filaments extruded from the spinneret are stretched to several times their original length greatly to increase strength and elasticity



Production of all nylon starts at the Belle, W. Va. plant of the Ammonia Department of the DuPont Company, where its two essential chemical ingredients, adipic acid and hexamethylene diamine are made by high-pressure synthesis from coke-oven gases and coal-tar intermediates. Solutions of adipic acid and the diamine are reacted in a stainless steel kettle to form nylon salt which is hexamethylene-diammonium adipate.

For large-scale production the salt is put into water solution to facilitate handling. It is run into tank cars, shipped to the nylon spinning plants and there piped to evaporators on the top floor to be concentrated to approximate saturation. At the pilot plant the concentrated salt solution is put into a cylindrical autoclave and heated by Dowtherm circulating through a jacket and coils. It is in this autoclave that the polymerization takes place to form the extremely long molecular chain or polymer known as the polyamide. Theoretically this polymerization might continue until chains of infinite length were formed. However, the desired consistency can be obtained by carefully controlling the temperature and the duration of the process and by the introduction at the proper moment of a chemical inhibitor that

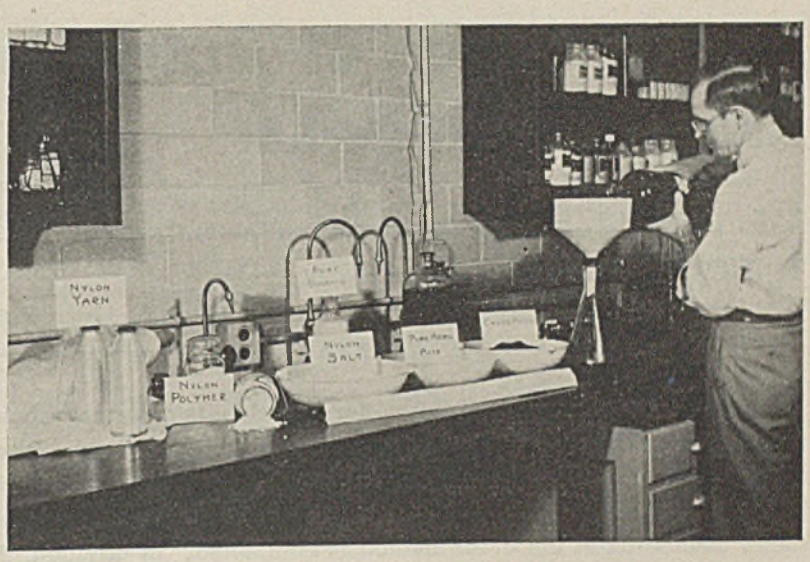
prevents further linkages. Thus accurate controls play a highly important role in the manufacture of nylon.

When polymerization has been completed, a slot in the bottom of the autoclave is opened and the viscous material is allowed to flow out on the surface of a broad, slowly revolving wheel. Here a shower of water causes the polymer to harden into a translucent, milky-white ribbon, on which play two rows of air jets, termed "blower-offers", which whisk the water from the ribbon as it leaves the casting wheel en route to the rotary cutter where it is chipped into flakes.

When the pilot plant was first set up it was thought it would be necessary to use a polished, silver-plated casting wheel. Fortunately, it was found that a fly-wheel from an old steam engine, covered with aluminum sheeting would do the job. Larger, specially made wheels are used in the commercial plants. The original drying process was carried out according to traditional textile fashion in a warm-air cabinet and took about 18 hours. The "blower-offer" method, combined with subsequent drying of the flakes, accomplishes the same result in far less time.

Next step is to blend the flakes from several autoclave batches in order to insure uniformity; then the blended flake is poured into the spinning hoppers and each charge of flake is purged of oxygen by passing into it a blast of pre-purified nitrogen (having an oxygen content of less than five-thousandths of one percent). Nitrogen is then removed by vacuum and this "washing" process is repeated.

The valve at the lower end of the spinning hopper is now opened and the flake falls onto a melting grid where, again, circulating Dowtherm supplies the heat. The molten polymer passes through the grid into a funnel-shaped melting chamber from which it is drawn by a special gear pump into and through the spinneret assembly. The spinneret is a thick disk of metal about 2 in. in diameter, pierced with fine holes flaring out like tiny funnels at the upper ends where the polymer enters. Before the polymer reaches the spinneret plate, however, it is filtered through a layer of hot sand, to insure smoothness and purity. In early experiments the filter was a layer of phonograph needles, packed together with points up to give an assemblage of roughly conical passageways. However metal corrodes and is difficult to clean, while cloth filters would be destroyed by heat. Sand was chosen, therefore, because it will withstand high temperature and because it is cheap and easy to handle. Spare spinneret packs, already heated to the proper temperature, are kept on hand in a special heated rack, much like a restaurant steam table.



Worn-out stockings and other nylon scrap are now being reconverted into adipic acid by acid hydrolysis and precipitation. The diamine is then recovered by neutralizing with lime, distillation and crystallization. It is estimated that at least a million pounds of nylon is available for salvage—enough to provide many thousands of parachutes

As the thick syrupy polymer is squeezed through the holes of the spinneret the filaments are formed at the rate of about 1,000 ft. per minute, and these pass down through a three-sided chimney where a draft of air blows across to cool them. The filaments then converge and pass into a steam jacket which moistens them sufficiently to make them stick together as a single strand. The steaming also puts the otherwise dry filaments into near equilibrium with the humidity in the atmosphere. During the wind-up process the yarn passes over a lubricating roll, which puts a finish on the surface. This also helps the filaments stick together and prevents the accumulation of static electricity.

The yarn is next pre-twisted and several strands or "ends" may be plied together at this point to make a heavier denier yarn. Denier, it will be recalled, is the term used to define the diameter-weight relationship and, therefore, indirectly the fineness of the yarn. A one-denier fiber is one of such size that 9,000 meters of it weigh only one gram. A one-denier filament of nylon has a diameter of about one 2,500ths of an inch.

Up to this point the yarn has undergone no real physical change since it was first formed upon emergence from the spinneret. But now it is drawn, or stretched, by traveling between rolls revolving at different speeds so that it becomes several times its original length. This cold-drawing makes the long-chain crystalline molecules of nylon snap out of their helter-skelter arrangement and line up parallel with each other and close together. This increases the opportunity for powerful intermolecular forces to come into play and the result is an exceedingly strong fiber. After the draw-twisting, as this operation is termed, the yarn is again twisted and then, if desired, it is sized. An important sizing material used to protect the yarn during the subsequent textile operations is polyvinyl alcohol, another synthetic polymer. The yarn is then twist-set in a steam oven. This relieves the internal stresses and prevents the yarn from kinking.

A number of ingenious tests have been designed to insure the maintenance of strict standards for the finished nylon. These include a visual check to discover broken filaments and weight tests to reveal the strength or tenacity and the percentage of elongation. Each spool of yarn from the Pilot Plant carries a tag to give its "pedigree" from the original batch of nylon salt on through the many steps to the finished yarn. In this manner the effect of any change in procedure can be accurately gaged and the proposed improvement evaluated.

Manufacture of Butadiene From Ethyl Alcohol—II

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Chem. & Met. INTERPRETATION

In the previous installment of this series, the authors gave flow sheets and a comprehensive review of published data on the direct conversion process for manufacturing butadiene from ethyl alcohol and began a discussion of the aldol process. In this concluding installment, discussion of the aldol method is completed. In addition, the acetylene, ethylene, acetaldehyde condensation, crotonaldehyde and other processes are reviewed. These two surveys now make technical data on these little-known processes easily available to chemical engineers engaged in the synthetic rubber program.—*Editors.*

A PROCESS widely used in Germany and proposed in the United States is the aldol method for the manufacture of butadiene. This process involves the conversion of either acetylene or ethyl alcohol to acetaldehyde, the choice between acetylene or ethyl alcohol depending upon the availability of these materials at the point of production.

When ethyl alcohol is used, the aldol method involves the following steps: (1) dehydrogenation or oxidation of ethyl alcohol to acetaldahyde, (2) condensation of acetaldehyde to aldol, (3) hydrogenation of aldol to 1,3-butylene glycol, and (4) dehydration of 1,3-butylene glycol to butadiene.

The reactions on which the process is based are represented by the following equations:

$$CH_3CH_2OH \rightarrow CH_3CHO + H_2$$

$$2CH_3CHO \rightarrow CH_3CH(OH)CH_2CHO$$

$$CH_3CH(OH)CH_2CHO + H_2 \rightarrow CH_3CH(OH)CH_2CH_2OH$$

$$CH_3CH(OH)CH_2CH_2OH \rightarrow CH_2{:}CHCH{:}CH_2 + 2H_2O$$

Dehydrogenation of ethyl alcohol to acetaldehyde, separation of the reaction products, condensation of acetaldehyde to aldol, hydrogenation of aldol to 1,3-butylene glycol and dehydration of the resulting mixture have all been previously discussed (see *Chem. & Met.*, p.100,Dec. 1942). The following discussion continues with methods for dehydrating the butylene glycol.

The liquid fraction, consisting of intermediate dehydration products and water, is then allowed to separate into two layers, the upper one of which will contain nearly all of the intermediate products. This upper layer is fed directly into the column or into the lower portion of the still, and the amount going to either is regulated so that the temperature of the still is maintained within the levels prescribed for the dehydration. The intermediate products are, in this way, utilized for further increase of the butadiene yield. The lower watery fraction contains small amounts of intermediate compounds, which are separated by fractional distillation, and are returned to the dehydration unit.

An alternative method for dehydrating butylene glycol is to pass it in vapor form over a catalyst. Red phosphorus with sodium phosphate is particularly efficient for this purpose. In Table I are given a number of catalysts for dehydrating liquid and gaseous butylene glycol.

Dehydrogenation and subsequent oxidation of alcohol is carried out in a chamber containing the catalyst and consisting usually of a copper or iron tube or an assemblage of such tubes for which external means of heating are provided. It will be noted that the dehydrogenation of ethyl alcohol to acetaldehyde is an endothermic reaction and, if carried out in the absence of oxygen, heat must be supplied. If air or oxygen is introduced with the alcohol, oxidation also takes place and the hydrogen that otherwise would appear as such in straight dehydrogenation is converted into water. By using the dehydrogenation-oxidation method the overall change becomes an exothermic one and it is only necessary to supply heat to initiate the reaction. The removal of hydrogen as water shifts the equilibrium in the direction favoring a larger conversion of alcohol to acetaldehyde per passage.

The reported degree of conversion varies greatly with different operating technique. Conversions of 95 percent in a single passage have been claimed, although a value in the neighborhood of 50 percent may be closer to the average.

Controlling the temperature of the catalysis chamber is all-important and is accomplished by introducing air, steam, carbon dioxide, and nitrogen as diluents for the alcohol vapor. The residual nitrogen from the reduced air is obviously recycled for this purpose. By keeping the alcohol and the produced acetaldehyde in such diluted condition, over-heating can more easily be prevented. This is important in that at higher temperature the oxidation proceeds beyond the acetaldehyde stage, with the formation of acetic acid, carbon dioxide and solids that are deposited on the catalyst and reduce its activity. The proportion of air and inert diluent gases to alcohol used varies. Two manufacturers report using about 15 cu. ft. of air per pound of alcohol, a third manufacturer used 5 cu. ft. of air and 10 cu. ft. of recycled inert gases per pound of alcohol. A high velocity is recommended for bringing about thorough mixing and better contact with the catalyst, as well as for keeping the catalyst surface free of deposits.

In the aldol condensation step the complete removal of oxygen from the alcohol-acetaldehyde mixture is essential to prevent the oxidation of the acetaldehyde to acetic acid. The acid, if present, neutralizes the al-

kali and makes it difficult to control the alkalinity. The condensation of acetaldehyde is controlled by the addition of water in order to keep the rate of reaction high enough but below the explosive level. The temperature of the medium is kept below 20 deg. C.

A point of difficulty arises also in the reduction of aldol to 1,3-butylene glycol. It is essential that the reduction be carried out in an acid medium, for even a trace of alkali will immediately destroy or inactivate the copper catalyst. On the other hand, it is not necessary to remove any of the neutralized alkali as long as the solution of crude aldol is acidic within a pH range of 1.5-6.0. The mixture of aldol and solvent best satisfying the conditions for the reduction consists of equal parts of crude aldol and ethyl alcohol. The presence of water in the solution invariably increases the time required for the reduction. A small amount of water is, nevertheless, present. This is the result of oxidation of alcohol and the presence of water in the original alcohol.

Reduction of aldol to butylene glycol begins at 60 deg. C., and it is inadvisable to run this reduction at temperatures higher than 80 deg. C. in order to avoid the formation of monohydric alcohols. At temperatures below 80 deg. C. nearly all of the aldol is hydrogenated to butylene glycol with the exception of small amounts which require higher temperatures, usually around 120 deg. C., for their conversion. This is evidently caused by the increase in concentration of the butylene glycol over that of aldol and the establishment of an equilibrium. By raising the temperature, the equilibrium shifts toward the aldol side. The heating at 120 deg. C. is carried out in the lower part of the reduction chamber so that just previous to being discharged the butylene glycol undergoes the final conversion.

An excess of water is to be avoided, because it tends to increase the time for the reduction, and also because it favors the formation of monohydric alcohols. By keeping the water at a minimum and using it in admixture with alcohol, the formation of butyl alcohol is avoided, as would be expected ordinarily in the reduction of aldol in an acid medium at temperatures of 80 deg. C. Furthermore, this procedure prevents the formation of condensation products.

Catalyst used for reduction of aldol to butylene glycol produces about 250-325 times its weight of butylene glycol. The activity of the finely divided copper deposited on a carrier is maintained for a considerably long time. Besides copper, metals of the first and eighth group of the Periodic System, their oxides, or other compounds, alone or as mixtures, may be used in conjunction with carriers and activators. Ordinarily, the catalysts are regenerated by oxidizing the copper with air at 250 deg. C. and reducing the copper oxide with hydrogen.

ETHYLENE METHODS

By dehydrating ethyl alcohol with the aid of sulphuric acid or phosphoric acid, or by catalytic methods, ethylene can be produced in very satisfactory yields. The ethylene is then reacted in one of several ways to produce butadiene (see Fig. 1). Derivatives produced from ethylene, such as glycol[22], or mono-halides and di-halides of ethylene[23], which under proper conditions condense with ethyl alcohol yielding butadiene. In this type of reaction, a mixture of barium chloride and aluminum oxide at a temperature of 400 deg. C. is used for catalyzing the condensation in order to remove water and/or hydrogen halides.

Instead of using the foregoing type of condensation procedure, ethylene can be pyrolyzed directly to butadiene. This is accomplished by passing a mixture of ethylene with carbon dioxide diluent over a catalyst consisting of a mixture of ferric oxide and ferric chloride at a temperature of 400 deg. C.[24] The same results are obtained by passing ethylene with nitrogen through a silica-lined chamber under a pressure of one atmosphere and at temperatures ranging from about 775-885 deg. C., so that the gas remains in the tube from 0.2 to 1.5 seconds.[25,26,27] Analysis of the product shows, besides the formation of butadiene and hydrogen, the presence of acetylene and other hydrocarbons. This leads to the belief that acetylene is an essential intermediate in the production of butadiene by pyrolysis.

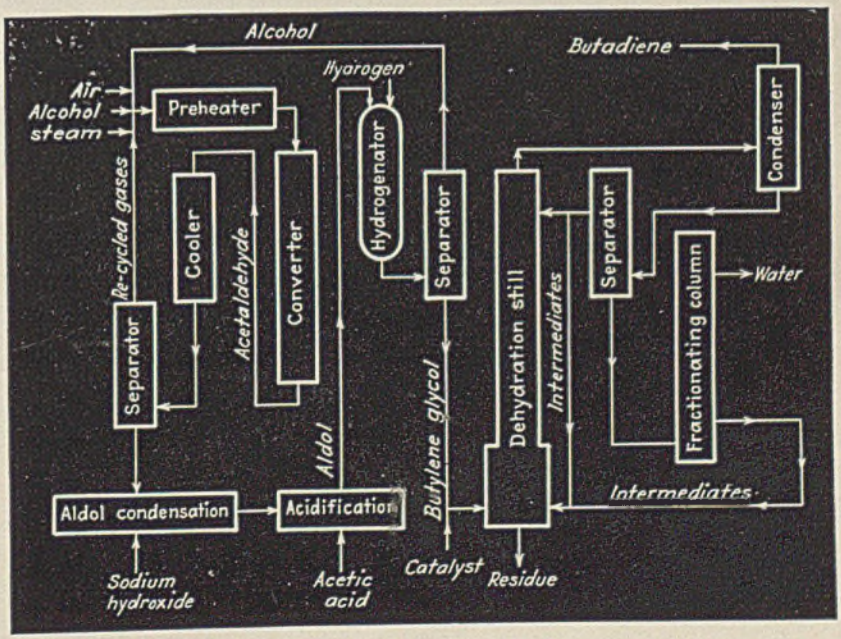
BUTADIENE FROM ACETYLENE

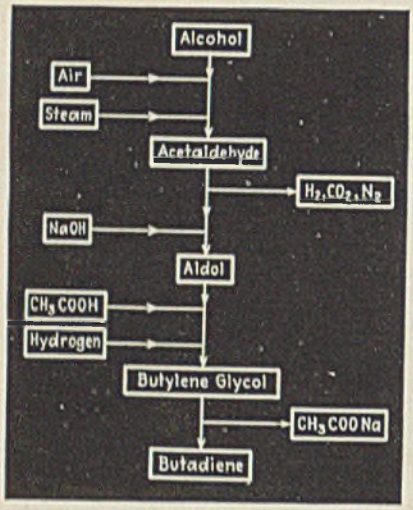
Acetylene is an important starting point for the synthesis of butadiene and has been used as such, particularly in Germany, in synthetic rubber manufacture. The source of acetylene there, however, is principally coal rather than ethyl alcohol.

Conversion of ethyl alcohol to acetylene is accomplished by way of ethylene by pyrolytic or by electric arc methods, by dehydrogenation, and also by dehalogenation of ethylene derivatives.

Mixtures of acetylene and ethylene produce significant amounts of butadiene by heating in the presence of a catalyst.[28,29] The most suitable mixture consists of 70-75 percent ethylene with 30-25 percent acetylene, respectively[29]. The catalysts used are either aluminum oxide, aluminum oxide on activated carbon, activated carbon, nickel oxide, stannous chloride, nickel oxide on asbes-

Production of butadiene from ethyl alcohol by the aldol process





Flow of materials in the aldol process for making butadiene

tos, or nickel on aluminum oxide. The pyrolysis is carried out at 200-600 deg. C.

Acetylene, when either pyrolyzed alone or polymerized thermally under the influence of a silver catalyst at a temperature of 300-800 deg. C.[30], is converted simultaneously to vinyl acetylene (CH_2:CHC:CH), a compound which is an intermediate in the production of butadiene, and other hydrocarbons. Direct conversion of acetylene to butadiene is brought about under the action of zinc chloride on pumice at 420-430 deg. C.[31]

When acetylene is polymerized in a concentrated solution of cupric ammonium chloride at 70-80 deg. C., yields of 20 percent butadiene are obtained, with the remainder consisting mostly of vinyl acetylene and small amounts of unconverted acetylene.[32,33] Since the butadiene yields cannot be appreciably raised by decreasing the vinyl acetylene concentration, butadiene is produced indirectly by increasing the vinyl acetylene yield to a maximum and then converting the vinyl acetylene to butadiene. By the addition of an ionizing agent such as a hydrogen halide to the aqueous solution of cupric ammonium chloride, vinyl acetylene is produced in practically pure form.

Butadiene is obtained in high yields by the hydrogenation of vinyl acetylene. The reduction is accomplished in either the liquid or the gaseous phase. In the gaseous phase, a contact catalyst such as palladium on a carrier or palladium-iron-kieselguhr is used at 80 deg. C. with the formation of butadiene and large amounts of butylene.[34] On the other hand, by conversion in the liquid phase with the use of catalysts such as palladium black or palladium-kieselguhr in a solution of ethyl acetate or acetone, 60-percent yields of butadiene are obtained in a single passage. By using zinc in an alkaline solution as a reducing agent, yields of over 95 percent butadiene are obtained, with the remainder consisting of unconverted vinyl acetylene. In the latter case the temperature is maintained below 20 deg. C. and above 5 deg. C.[35]

In another process utilizing acetylene, butadiene is produced by dehydrating 1,4-butylene glycol ($HOCH_2$-$CH_2CH_2CH_2OH$), which is produced in the following manner[36]. Acetylene and formaldehyde are caused to react in the liquid phase in the presence of acetylene compounds of heavy metals of the first and second groups of the Periodic System, preferably a copper acetylene compound, under a pressure of 25 atmospheres. The acetylene is passed into a solution of formaldehyde in water or an organic, inert solvent together with inert gases such as nitrogen. The resultant solution of 1,4-dihydroxy-2-butyne is hydrogenated to 1,4-butylene glycol under a pressure of 300 atmospheres in the presence of a hydrogenation catalyst, such as cobalt or nickel prepared from Raney cobalt or nickel, metallic nickel, cobalt, copper or silver applied to carriers such as pumice stone, Fuller's earth, silicic acid gel, asbestos, or aluminum oxide, capable of promoting the conversion of an unsaturated compound to a saturated one. Yields as high as 97 percent of butylene glycol are obtained. The dehydration of the glycol to butadiene is brought about in the gaseous phase in the presence of an acid catalyst such as acid phosphates of metals, at a temperature of 250-350 deg. C.[37]

Table I—Catalysts for Dehydration of Butylene Glycol to Butadiene

Catalyst	Temp. Deg. C.	% Yield	Reference
Aluminum oxide	300	19.4	14
Calcium sulphate	350	24	14
Phosphorus pentoxide on kaolin	500	37	14
Ferric oxide on kaolin in KOH	300	40.1	14
Naphthalene sulphonic acid with sulphonic acid, sulphuric acid, and aniline	180–240	78	13
Toluene sulphonic acid, or benzene sulphonic acid, sulphonic acid, sulphuric acid, and aniline	180–240	78	13
Sulphuric acid, 1%	140–200	80	15
Acid phosphates such as KH_2PO_4, $Na_2H_2P_2O_7$, $Ca(H_2PO_4)_2$, $NaCa(H_2PO_4)_3$ with potassium or ammonimum alum, or aluminum sulphate	200–300	80	16
Phosphorus oxychloride, 0.2%	300–350	85	17
Primary sodium phosphate	270	85–90	18
Anhydrous primary sodium phosphate, primary n-butylamine phosphate, and graphite	260	90	18, 19
Sec. calcium phosphate, sec. ammonium phosphate, and graphite	320–330	90	18
Primary sodium phosphate with graphite	250	90	18
Acid cerium phosphate on pumice	320–330	90	18
Acid bismuth orthophosphate with graphite	320–330	90	18
Neutral pyro- and orthophosphates of magnesium and alkaline earth metals	400	90	18
Sec. calcium phosphate, graphite and lampblack, cryst. ammonium oxalate, and primary ammonium phosphate	260	90	19
Volatile derivatives of phosphorus or phosphorus esters, such as $POCl_3$ and PCl_5, or tri-ethyl phosphate	300–350	90	20
Red phosphorus, 1.0% on pumice	300	99	21
Red phosphorus and monosodium phosphate	250–300	98–99	21
Red phosphorus and potassium aluminum sulphate	270	98	21

ACETALDEHYDE CONDENSATION

Acetaldehyde can be produced by either catalytic oxidation or dehydrogenation of ethyl alcohol, and can undergo reactions along several pathways leading to the formation of butadiene.

One of these methods follows the general reaction for the condensation of an aliphatic aldehyde, such as acetaldehyde, with an aliphatic alcohol, such as ethyl alcohol, in the presence of a suitable water-removing substance heated to a temperature of 300-450 deg. C.[5], so that the dehydration results in the formation of the diolefin. As an example of this process a modification of the Ostromysslenski method may be given, in which 54 parts of ethyl alcohol, 33.5 parts of acetaldehyde, and 12.5 parts of water are passed in the vapor phase over a catalyst consisting of basic aluminum sulphate ($Al_2O_3.3SO_3.12H_2O$) at temperatures ranging from 320 deg. C. to 360 deg. C. at atmospheric pressure[38]. Aluminum oxide also has been successfully employed as a catalyst over a temperature range of 300-450 deg. C. with equivalent quantities of alcohol and acetaldehyde diluted with steam, to produce significant amounts of butadiene.

Another process used consists in condensing ethyl alcohol by the method of Fischer and Giebe with acetaldehyde to form acetals which are catalytically converted to butadiene[39]. The acetals, which include hemiacetals ($CH_3CH(OH)OC_2H_5$) and ethyl acetals ($CH_3CH(OC_2H_5)_2$), are produced in the presence of dilute mineral acids or metallic salt solutions at temperatures ranging from 0 deg. C. to 8 deg. C. Ethyl acetal, moreover, can be prepared, if preferred, by the condensation of ethyl alcohol with acetylene by passing the vaporous mixture over a catalyst, such as salts or oxides of cadmium, zinc, mercury, barium, cerium, or silver[40]. The acetals, when passed through a catalytic mixture consisting of aluminum oxide and barium chloride at temperatures of 280-500 deg. C., lead to the formation of butadiene in yields of 16 percent[41]. The same result is obtained by using aluminum oxide as a catalyst at room temperature.

Acetaldehyde can be reduced directly to 1,3-butylene glycol by electrolysis in an acid electrolyte or in a solution of sodium acid sulphate, phosphoric acid, or an organic sulphonic acid, at temperatures below 40 deg. C. with a current of 2-3 amperes per square decimeter of lead plate cathode against an anode of platinum, lead, ferric oxide, carbon, or graphite[42]. The 1,3-butylene glycol is dehydrated to butadiene with very high yields.

CROTONALDEHYDE METHODS

By the catalytic dehydration of crude aldol in an acid medium at temperatures above 85 deg. C. crotonaldehyde is obtained as the product, with almost quantitative yields. Crotonaldehyde can be used to produce butadiene by converting it to an alkyl derivative, and subjecting the derivative to the action of barium chloride and aluminum oxide[43]. Another method can be undertaken for this purpose, namely, catalytic hydrogenation of crotonaldehyde to form crotonyl alcohol and butyl alcohol.[44] Of these two products the butyl alcohol is produced in higher yields, and for this reason the dehydration of small amounts of crotonyl alcohol, though giving high-purity butadiene, is of less importance than the catalytic dehydration and dehydrogenation of the butyl alcohol.

Butyl alcohol is converted to butadiene in several ways. In the catalytic dehydration and dehydrogenation of butyl alcohol, a mixture of a dehydrating catalyst, such as aluminum oxide, and of a dehydrogenating catalyst, such as chromium oxide simultaneously dehydrates and dehydrogenates the alcohol at a temperature of 625 deg. C. with the formation of 7.4 percent of butadiene and other diolefins, three times the amount of olefin compounds, and a large amount of carbon.[45] Higher yields of butadiene are obtained by carrying out the process in steps, that is, by first dehydrating to an olefin and then dehydrogenating in the following step.

By dehydrogenation, butylenes, whether in the pure form or a mixture of isomers, can be advantageously converted to butadiene. A complete conversion of butyl alcohol to a mixture of butylenes is accomplished by the action of strong dehydrating agents such as concentrated sulphuric acid or a mixture of phosphoric acid and aluminum oxide,[46, 47] the latter of which gives a gaseous mixture of 72.5 percent of butylene-2 and 27.5 percent of butylene-1 whereas aluminum oxide alone in the pure form gives only butlylene-1.[48] In cases where butylene-2 is necessary, although either isomer can be dehydrogenated to butadiene, isomerization is completed in the presence of diatomaceous earth impregnated with phosphoric acid at a temperature of 249 deg. C. and under a pressure of 7.8 atmospheres.[49]

Butylene-2 mixed with nitrogen is dehydrogenated by passage over magnesium oxide at a temperature of 700 deg. C. with 25-29 percent yields of diolefins.[50] When the gas is diluted with steam and passed over a mixture of oxides of zinc and chromium, a single passage converts, at temperatures of 640-660 deg. C., 75 percent of the butylene to butadiene.[51] A process using chlorine as an agent for the removal of hydrogen, in the presence of barium chloride heated to 360-400 deg. C., gives 30-40 percent yields of butadiene.[52, 53] A further method for dehydrogenating butylene consists in mixing it with oxygen and passing the mixture through a tube heated to 375-490 deg. C., which results in the formation of butadiene and by-products such as acetaldehyde.[54]

There is another method by which butyl alcohol can be converted to butadiene. The alcohol is treated with a halogen to produce butyl halides, which, when subjected to temperatures of 400-800 deg. C. with or without a catalyst, such as chlorides of alkali earth metals, produce butadiene.[55] The same results are obtained by passing a mixture of butane and chlorine through molten metallic chlorides, such as those of aluminum, potassium, sodium, iron, zinc, or bismuth, at temperatures of 175-550 deg. C.[56]

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PLANT NOTEBOOK

WIRE "UMBRELLA" SAVES STRATEGIC MATERIALS IN SHIELDING WAR PLANTS FROM LIGHTNING

A WIRE "UMBRELLA" to shield vital explosives plants and oil storage centers from lightning has been developed by Gilbert D. McCann, Westinghouse Electric & Manufacturing Co. engineer. It is already being used by some war industries and one huge ordnance plant. Using a minimum of strategic materials, the shield easily deflects lightning driving earthward at more than 11 million miles a minute.

The shield consists simply of a steel wire strung above the building to be protected and anchored on tall wood poles at each end. The wire is then connected to steel rods buried in the ground.

This method saves copper for other war uses. Previously explosives plants or oil depots were guarded by lightning rods which required about 250 lb. of copper attached to the building and buried in the surrounding ground. An umbrella for the same building can be erected with only 60 lb. of steel and two wood poles. With the new design, danger of lightning leaping to metal sections of the building and causing sparks has been eliminated.

Studies of lightning strokes on power lines show that each square mile of sky hurls about 10 thunderbolts at the ground each year. Modern ordnance plants have several hundred buildings spread over a large area so each plant will be a target for lightning several times a year. Just one of those strokes could cause disastrous explosion or fire if proper protective devices were lacking.

Another lightning protection plan suggested by Dr. McCann surrounds the building with six poles 10 ft. higher than the roof. Steel wires extending from the top of each pole attract lightning from the area above the structure so that an invisible lightning-proof "blanket" is suspended over the roof. Thunderbolts are drawn to the steel tips of the poles and thence to the ground.

This model, bombarded with man-made lightning at the Westinghouse high-voltage laboratory, is completely protected by the wire "umbrella" supported above its roof

Plugging Gas Mains

A RECENT ARTICLE (*Chem. & Met.*, p. 82, Dec. 1942) described methods that have been worked out for the plugging of gas mains in the event of rupture of the main by bombing. American Colloid Co., Chicago, has described a variation of one of the methods which appears to have interesting possibilities. Various plastic materials and greases have been injected into the main through a side branch near the point of break, to build up a dam which plugs off the main completely. The newly described method employs a similar technique, but uses as the plugging material a "mineral jelly" consisting of water and about 16 to 19 percent of Volclay bentonite. The higher clay concentration represents a rather stiff gel which is said to be particularly suitable for large diameter mains. The gel can be pumped into the main with an air-pressure pump. A typical plugging of a 16-in. main required 20 min. and 20 sec., using 263 lb. of gel containing 47.3 lb. of clay. A 24-in. main took 69½ min. to plug, requiring 962 lb. of gel containing 173 lb. of clay.

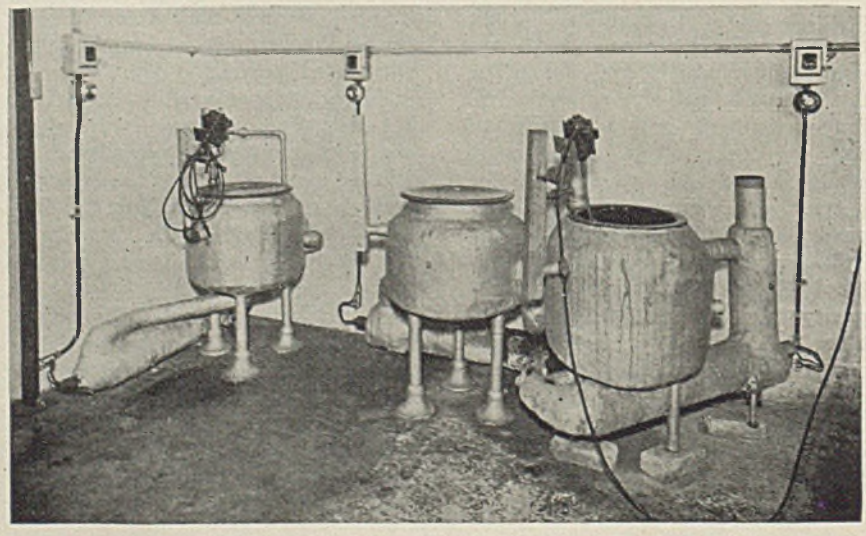
The bentonite plug can be ejected with water if there is enough pressure and an open end for exit of the water.

Conductivity Alarm

AN IMPORTANT new war plant having a number of acid coolers was faced with the problem of detecting possible leaks in these coolers, despite an insufficiency of attendance. According to Industrial Instruments, Inc., Jersey City, N. J., the problem was solved by the use of conductivity controllers of the type known as the Solu-bridge. During normal operation of the acid coolers the Solu-bridges remain inoperative. However, should acid enter the cooling water system from any source whatever, the conductivity of the water will increase and the instrument will sound a warning, light a danger light, and open a valve in the water recirculating system diverting the acid water to waste. When contamination ceases the instrument automatically restores the circulating system to normal.

Indirect Electric Heat for High-Temperature Kettles

These three glass-lined kettles in a mid-western chemical plant are heated electrically by an indirect method, oil in the jackets serving as the heat transfer medium. Since it was impractical to apply heat directly, it was decided to use circulating oil, with the oil heated by means of a 4-kw. General Electric Calrod immersion heater for each kettle. The heaters are installed in the horizontal, enlarged sections of pipe



Labor Relations and Collective Bargaining in Chemical Industry

Unionization on a large scale in the Chemical Industry is a development since 1937, yet probably some 35-40 percent of all workers in chemical industries as defined in this report are now covered by affiliated union agreements. However, many chemical executives and plants still have had little or no direct experience with the intricacies of collective bargaining. Yet it is generally agreed that once the war emergency has passed and business turns all its energencies toward satisfying hungry civilian markets, the problems of labor relations will rise to plague the chemical industry. Now, not when the storms break, is the time for chemical management, supervisors, and foremen to become familiar with the knotty problems of collective bargaining and to lay the foundations for harmonious labor relations after the war. It is in order to contribute toward this process of self-education for what is to come in the post-war period that this report has been written. The information herein has been gathered from many sources, chief of which has been a recent publication, Bulletin 716, "Collective Bargaining in the Chemical Industry, May 1942", of the Bureau of Labor Statistics.

THE CHEMICAL industry, as used in this report, includes establishments whose principal products are organic and inorganic acids, nitrogen and fixed nitrogen compounds, sodium compounds, potassium compounds, alums, coal-tar products, plastics, and miscellaneous organic and inorganic compounds. The chief chemical products not included in this study are compressed and liquefied gases, explosives, fertilizers, soap, and wood-distillation products.

While the chemical industry includes a large number of small plants, a few establishments employ a relatively large proportion of the total workers in the industry. According to the 1939 Census of Manufactures, over three-fourths of the plants, with approximately 15 percent of the total workers, employed less than 100 workers each. Slightly over one-fifth of the plants, with approximately 60 percent of the total wage earners, employed between 100 and 1,000 wage earners. Only 11 plants out of 630 in the industry employed over 1,000 wage earners, representing over one-fourth of the total workers.

Employment in the chemical industry has increased markedly since 1939. According to Bureau of Labor statistics, there were 110,000 wage earners in the industry in May 1942, compared with 66,400 in May 1939. Very few women are employed, the 1939 census indicating less than three percent of the total.

Between 35,000 and 40,000 workers, representing about 35 percent of the total in the chemical industry, were covered by affiliated union agreements in May 1942. Unionization on a fairly extensive scale in the industry is a development of recent years. Prior to 1937, there were no international unions primarily interested in organizing chemicals although a few plant-bargaining units had been chartered as federal labor unions by the American Federation of Labor.

UNIONS IN THE INDUSTRY

The United Mine Workers of America entered the chemical field in September 1936 by establishing District 50 with jurisdiction over the "coal-process" workers of the United States and Canada. Its jurisdiction was soon extended to cover all chemical workers. The nucleus of District 50 was the National Council of Gas and By-Product Coke Workers, a loose organization chartered by the A.F. of L. in 1935. District 50, known as the Gas, By-Product Coke and Chemical Workers, became an affiliate of the C.I.O. when the United Mine Workers joined the C.I.O. in 1937. The majority of District 50's agreements are with companies located in the East and Middle West.

Many of the federal labor unions which belonged to the National Council of Gas and By-Product Coke Workers, but which did not join District 50, together with other federal labor unions in the chemical industry, combined to form the National Council of Chemical and Allied Industries Unions, which was chartered in September 1940 by the American Federation of Labor. A large number of organized chemical plants on the west coast are under this Chemical Council, which also has agreements in the East and Middle West, as well as some representation in the South. In addition, there are a considerable number of A.F. of L. federal labor unions in chemical plants which are not yet affiliated with the Chemical Council.

Several unions whose jurisdiction is ordinarily limited to other industries have also organized a few chemical plants. The International Union of Mine, Mill, and Smelter Workers (C.I.O.) has a few locals in the industry, especially in those plants where mining operations are carried on in connection with production of chemicals. Other C.I.O. unions include the United Steelworkers of America, the Textile Workers Union of America, the United Electrical, Radio and Machine Workers of America, the Oil Workers International Union, and the United Cannery, Agricultural, Packing and Allied Workers of America.

Two A.F. of L. unions, the Interna-

tional Association of Machinists and the International Brotherhood of Electrical Workers, have organized some workers in a few chemical plants. The Federation of Architects, Engineers, Chemists and Technicians (C.I.O.) has organized the laboratory and technical staff in a few chemical plants. All of these unions (except A.F. of L. craft unions and the F.A.E.C.T.) organize on an industrial, plantwide basis and take in most or all production workers.

Since the membership of these unions includes many who are not attached to the chemical industry, no exact figures can be given for the membership of each union in this industry. Of the chemical workers under agreement, about 85 percent are represented in almost equal proportion by District 50 and by the Chemical Council and other A.F. of L. federal unions; about five percent by the Mine, Mill and Smelter Workers; and about 10 percent by other unions.

Within the past six months more than 1,800 labor-management committees covering over three million workers have been voluntarily established in virtually every industry and every state. The primary purpose of these committees is to increase war production, but all types of morale and informational activities relating to war activities have been reported. These include programs to clarify the worker's place in the war effort, increasing plant efficiency, extending material conservation, reducing absenteeism, solving manpower problems, etc. Seventeen percent have sub-committees to handle local transportation problems; 13 percent to collect salvage and waste material; 11 percent to train and upgrade workers; and 37 percent are conducting the greatest worker "suggestion box" in history.

Most of these 1,800 labor-management committees are single plants with an average of 1,950 workers, but approximately seven percent have less than 100 workers. There are large multiple plant corporations that have labor-management committees in each plant. Examples are U. S. Steel Co. with 65; E. I. duPont de Nemours & Co. with 56; Westinghouse Electric & Mfg. Co. with 28; Bethlehem Steel Co. with 27; and Anaconda Copper Mining Co. with 19. Other chemical companies having such committees include Aluminum Co. of America, Atlas Powder Co., Dow Chemical Co., Harshaw Chemical Co., Shell Development Co., Monsanto Chemical Co., Koppers Co., Celanese Corp. of America, Hercules Powder Co., Eastman Kodak Co., Niacet Chemicals Corp., and a number of others. These progressive companies, with their joint labor-management committees, are not only expediting production of war materials now but, in addition, they are laying the foundations for harmonious labor relations after the war.

Labor unions themselves have made tremendous contributions to the War Production Drive. Of 1,600 labor-management committees, 770 have a C.I.O. union background, 208 an A.F. of L. background, and 96 an independent union background.

Administrators of chemical plants who would like to understand and cope with the problems of collective bargaining and unionism after the war, as certainly there will be grave problems and increasing pressure from union groups, should become thoroughly familiar with the book "Collective Bargaining Contracts" published in 1941 by the Bureau of National Affairs, Inc., Washington, D. C. This is a handbook for employers, employees, and their representatives outlining techniques of negotiating and administering contracts. It includes a topical classification of some 2,000 contract clauses as well as texts of representative collective bargaining contracts. Included are data on a number of contracts with chemical plants.

Also useful is "How Collective Bargaining Works," published by the Twentieth Century Fund, New York, in 1942. This is a factual survey of labor-management relations in leading American industries. Although little is given on the chemical industries, certain other industries as rubber products, glass, electrical products, steel, coal mining and others are dealt with in great detail.

1941 Selected Trade Union Membership [1]

American Federation of Labor [2]	
Asbestos Workers, International Association of Heat and Frost Insulators and	4,000
Brewery, Flour, Cereal and Soft Drink Workers of America, International Union of United	42,000
Brick and Clay Workers of America, United	11,500
Cement, Lime and Gypsum Workers' International Union, United	16,800
Cleaning and Dye House Workers, International Association of	16,400
Distillery, Rectifying and Wine Workers International Union	3,300
Draftsmen's Unions, International Federation of Technical Engineers, Architects and	2,200
Electrical Workers, International Brotherhood of	201,000
Engineers, International Union of Operating	80,000
Glass Bottle Blowers' Association of the U. S. and Canada	20,000
Glass Workers' Union, American Flint	20,300
Hod Carriers' Building and Common Laborers' Union of America, International	183,700
Machinists, International Association of	221,800
Mine Workers of America, International Union Progressive	35,000
Paper Makers, International Brotherhood	25,800
Plumbers and Steam Fitters of the United States and Canada, United Association of Journeymen	45,400
Powder and High Explosive Workers of America, United	100
Pulp, Sulphite and Paper Mill Workers, International Brotherhood of	44,200
Teamsters, Chauffers, Warehousemen and Helpers of America, International Brotherhood of	408,300
Textile Workers of America, United	15,200
Congress of Industrial Organizations [3]	
Aluminum Workers of America (1939)	31,000
Architects, Engineers, Chemists and Technicians, Federation of	8,500
Distillery Workers Organizing Committee (1939)	3,000
Gas, By-Product Coke and Chemical Workers, District 50, United Mine Workers (Jan. 1942)	52,000
Glass, Ceramic, and Silica Sand Workers of America, Federation of	22,000
Mine, Mill and Smelter Workers, International Union of	60,000
Mine Workers of America, United	600,000
Office and Professional Workers of America, United	30,000
Oil Workers International Union (1939)	27,000
Rubber Workers of America, United	75,000
Steel Workers Organizing Committee	600,000
Stone and Allied Products Workers of America, United	3,600
Textile Workers Union of America	450,000
Transport Workers Union of America	95,000

[1] "How Collective Bargaining Works," Twentieth Century Fund, N. Y. (1942.)
[2] Based on per capita payments to the A.F. of L. for the fiscal year Aug. 31, 1940–Aug. 31, 1941.
[3] Unless otherwise indicated, figures are the latest obtainable for 1941. The figures are not necessarily based on dues payments.

UNION AGREEMENTS

The following analysis is based on a study of 84 agreements in the files of the Bureau of Labor Statistics, which cover chemical plants in 18 states. The analysis includes all the major agreements known to the Bureau to be in force in May 1942. The number of workers covered by these agreements varies: 34 agreements cover less than 100 workers each, 36 between 100 and 500 workers, five between 500 and 1,000 workers, and 10 over 1,000 workers.

Largest of these chemical companies and the number of plants for which agreements are in the Bureau's files, are as follows: American Cyanamid Co. (2); American Potash & Chemical Co. (1); Celluloid Corporation (1); Diamond Alkali Co. (3); Dow Chemical Co. (2); Electro-Metallurgical Co. (1); Monsanto Chemical Co. (5); Pittsburgh Plate Glass (Columbia Chemical Division) (1); Potash Co. of America (1); and United States Potash Co. (1). Important companies in the industry with all or most of their plants not under agreement include Bakelite Corporation, Carbide & Carbon Chemicals Corp., E. I. duPont de Nemours & Co., Mathieson Alkali Co., Rohm & Haas, and Tennessee Eastman Co.

DURATION OF AGREEMENTS

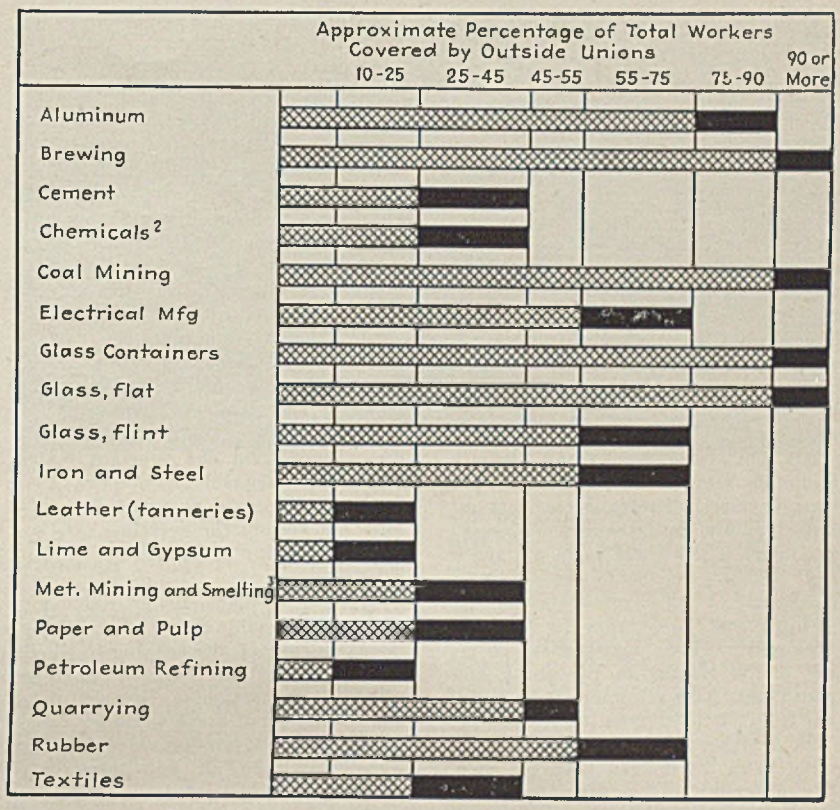
Approximately 80 percent of the agreements, including most of the major companies, are in effect for one

year, but are renewable automatically unless notice of intention to change or terminate is given by either party. The duration of all but one of the remaining agreements varies from ten months to three years.

Most of the agreements specify the amount of advance notice which must be given by either party to effect a change or for termination at expiration. The usual notice period, found in slightly over 60 percent of the agreements, is 30 days; in 11 agreements it is 60 days. Other periods specified are 40, 45, and 70 days. One agreement requires a 60-day notice for modification, and a 30-day notice for termination.

About one-fifth of the agreements specify that conferences must be held after notice is given in order to negotiate a new agreement. According to eight agreements, conferences must start within a specified period after notice, varying from 10 to 45 days. In the remainder, negotiations must begin within a specified period before the expiration date, five days in two agreements and 20 days in four agreements.

Thirteen agreements provide explicitly for extension by mutual consent if negotiations are in progress when the agreements expire. The extension is limited to 60 and 30 days in two agreements, and 10 days in one. The agreements of the Diamond Alkali Co., Pittsburgh Plate Glass (Columbia Chemical Division), and Jacques Wolf & Co., specifically make the term of any new agreement thus reached retroactive to the expiration date.



[1] From "How Collective Bargaining Works", The Twentieth Century Fund, New York, N. Y. (1942). These estimates apply to the period 1939–1940, so that a number of them may now be too low. [2] About 35 percent as of May, 1942. [3] Includes metal mining and non-ferrous smelting and fabrication (excluding aluminum).

UNION STATUS

About ten percent of the chemical workers covered by union agreements are employed under closed- or union-shop conditions. Of the 19 agreements with closed- or union-shop provisions, only one is with a large company. Nine require the company to hire through the union, usually with the requirement that the union must furnish needed men within a given time, ranging from 4-48 hours. If the union is unable to comply, the company may hire directly, but such employees must join the union within a short period. One closed-shop agreement provides recourse to arbitration should the company refuse to discharge any employee suspended or expelled from the union, except for non-payment of dues.

A modified union shop, under which all new but not old employees must join the union is specified in three agreements. One of these and one other provide for preference in hiring to union members. "Maintenance of membership" clauses are included in two agreements which require those employees who have joined the union or who may become members to maintain their membership in good standing as a condition of continued employment.

Two agreements contain clauses which strengthen the union's position without establishing maintenance of membership. One of these, the result of an arbitration award, specifies that the company shall "review" its relationship with the union with any new employee who fails to join the union. If the union then feels that the result of the review weakens the status of the union, both company and union agree to submit the matter to arbitration. In another, the company "reserves the right, although it is not obligated," to dismiss any employee who fails to maintain his membership or who fails to join within 30 days after employment.

Perhaps it is significant that, because of a strike staged in a powder plant by the Chemical Workers Union, A.F. of L., the W.L.B. took away during early December for the first time an established maintenance-of-membership clause from a union. The unanimous decision affected the East Alton Mfg. Co., East Alton, Ill., and resulted in closing of the adjoining Western Cartridge Co. plant, making more than 10,000 employees idle.

In this case, if the union convinces the W.L.B. of its "good faith and responsibility" after a six months' probationary period, it will be granted the usual voluntary maintenance provision, with a 15-day "escape clause" which was not included in the maintenance provision in the old contract.

In 49 of the 84 agreements reviewed by the U. S. Dept. of Labor, the unions are given recognition only as the sole bargaining agency for all workers. Certain occupational groups, such as office employees, supervisors and foremen, and laboratory technicians usually are excluded from coverage. Four agreements either grant the union the bargaining power for its members only, or fail to specify the recognition status extended to the union.

ACTIVITIES AFFECTING STATUS

Thirty-four of the agreements include clauses specifically forbidding company discrimination on account of union membership or activity. Four agreements provide disciplinary action which may include discharge by the company for employees who engage in anti-union activity on company premises. In another agreement the company must post the agreement and instruct the supervisory staff to comply with its terms. Approximately half the agreements which include clauses forbidding company discrimination against union employees also prohibit coercion and discrimination against non-union employees by the union.

Slightly over one-fourth of the agreements prohibit union activity (except by company permission) or solicitation of members on company time, and a few prohibit such activities on company property. One agreement, however, in which the company states that it will encourage union membership, permits the shop steward to solicit

union membership on company property during the 60 days following the signing of the agreement.

WAGE AGREEMENTS

Nearly half of the agreements contain detailed occupational wage listings. An additional 14 percent contain minimum wage rates. About one-fourth of the agreements specify beginners' or new employees' rates below the minimum for a stipulated period, ranging from two weeks to six months. The other agreements do not include wage rates as such, but usually indicate that present wage levels are to be maintained or increased by a specified amount.

All but three agreements specify minimum wage rates at 50 cents per hour or more. Twelve agreements establish minimum rates above 75 cents per hour. The highest rates are specified by an agreement which sets a minimum of 91¼ cents for helpers (white) and 85¼ cents for laborers (colored). Three agreements, covering plants located in the South and Southwest, have minimum rates ranging from 32 to 50 cents per hour.

Four agreements have lower minimum rates for women than for men. The difference ranges from five cents in any department to a blanket 20 cents per hour. One agreement protects the position of male employees by forbidding hiring of women if this results in the loss of a job or of work by male employees.

Wage adjustments during the term of the agreement are allowed in over one-half of the agreements, covering the same proportion of workers. Slightly over half of these permit the question of wages to be reopened whenever there is a change in cost of living. Only nine, negotiated with smaller companies, require automatic adjustment of wages to cost of living.

A common provision, found in over three-fourths of the agreements, requires payment of a minimum amount to employees who report to work at the usual hour or who are called to work, but are not given employment for a full shift. Usually, the minimum call pay varies from two to four hours, with the latter most frequent. Two agreements, however, guarantee employees a full shift's work. Ten agreements assure a minimum of two hours' pay if no work is available and four hours' pay if work is started.

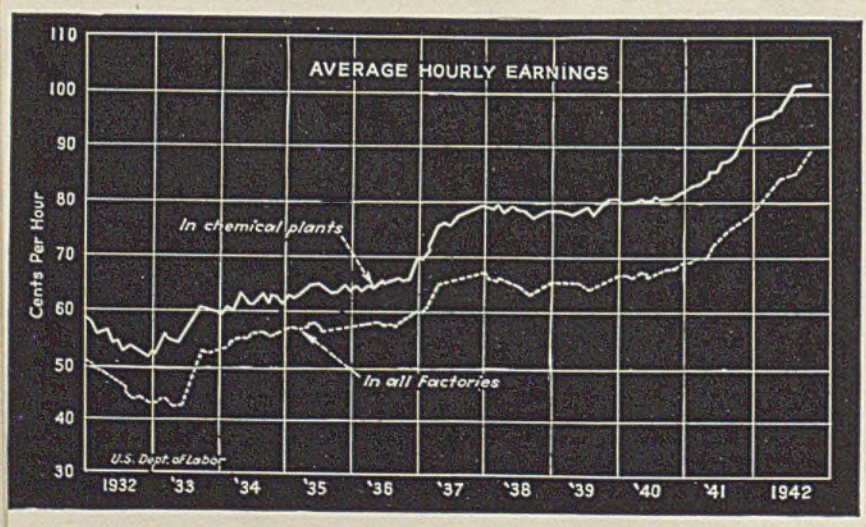
Two-fifths of the agreements guarantee pay for a specified number of hours to employees called back to work after having completed their regular shift. The rate specified is usually that allowed for overtime, although work in excess of the regular hours may not necessarily be involved. The minimum guaranty varies considerably and ranges from one to eight hours, but is most frequently two hours. Five agreements contain no minimum guaranty but specify the overtime rate for time so worked even though within regular hours.

Sick-benefit plans, under which employees are eligible for sick-benefit payments in case of absence due to illness or other disability, except in cases where compensation is payable under the provisions of State workmen's compensation laws, are provided in eight agreements. In all but three cases benefits are restricted to employees with at least one year of service.

In three agreements covering employees of the Shell Chemical Co. employees get half pay, beginning with the fourth day of disability, up to a total of four weeks during any year of service, and employees with less than one year of service are entitled to pro rata benefits. Another agreement states that injured employees shall be compensated during the one week "waiting period" provided under the State Workmen's compensation act.

HOURS AND OVERTIME

Almost all of the agreements provide for a regular eight-hour day and 40-hour week. Only five agreements contain provisions differing from this standard, although all workweeks in excess of 40 hours are affected by the overtime pay requirements of the Fair Labor Standards Act. Under the West End Chemical Co. agreement, production workers on continuous operations work six 40-hour weeks and two 48-hour weeks in an eight-week period; other production employees, however, follow the prevailing standard. Under the terms of the Dow Chemical (Great Western Division) agreement, shift workers average 42 hours per week in any period of 20 consecutive weeks; other employees are on an eight-hour day, 40-hour week basis. One agreement fixes an eight-hour day without specifying weekly hours; another stipulates a 40-hour week without limiting daily hours.



SHIFTS AND OVERTIME

Most chemical companies operate on a multiple-shift basis owing to the continuous nature of the manufacturing processes. Shift rotation is required in 11 agreements, covering about one-fourth of the workers under agreement. Two-day notice of shift changes (except in cases of emergency) is specified in two General Chemical Co. agreements and an employee failing to receive such notice is entitled to the overtime rate for time worked within such two-day period for which he has failed to receive notice.

Extra pay ranging from two to six cents per hour, and in one case 10 percent, is provided for employees on shift work by 14 agreements. Four of these provide for rotation of shifts. One agreement, which does not provide for shift rotation, specifies time and a quarter for regular employees on night shift, while temporary employees receive a five-cent differential. The Pacific Coast Borax Co. agreement provides that employees "regularly required to work in rotation" shall "while performing such shift work" be paid a differential, but that only the second and third shifts are entitled to the differential on fixed shifts. The Monsanto Chemical Co. (Springfield, Mass.) provides a 2½-cent hourly differential for all rotating shift workers; Catalin Corporation pays a five-cent hourly shift premium for night-shift workers on rotating shifts. The Diamond Alkali Co. agreement (Fairport Harbor, Ohio) provides for shift rotation and grants a three-cent hourly differential for afternoon and night shifts for those not on rotation.

Overtime rate of time and one-half applies to work in excess of either eight hours per day or 40 hours per week, with but few exceptions. About 15 percent of the agreements specifically stipulate that there shall be no duplication of overtime pay although others may, in practice, be so interpreted. In a few cases, particularly for shift workers, overtime is permitted only for work beyond 40 hours. The Shell Chemical Co. agreements require a minimum of one hour overtime pay even though actual overtime

worked is less. Four agreements provide that any changes made in the legal overtime provisions of the Fair Labor Standards Act shall supersede the hours and overtime provisions of the agreement.

Approximately one-fifth of the agreements, including most of the large plants, state that overtime is to be distributed equally among all employees affected. To enforce this provision, the Diamond Alkali and several Monsanto agreements require the company to post a record of overtime worked in each department. About 15 percent of the agreements provide that employees do not have to take time off to offset any overtime worked.

HOLIDAYS

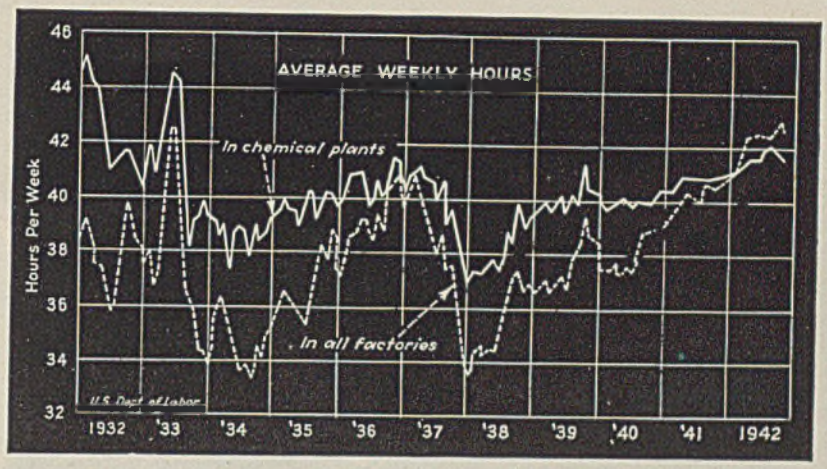
Sixteen of the 84 agreements provide penalty rates for Saturday work for all or some of the workers. Five (three plants employing less than 100 workers, and two with less than 300) provide time and one-half for all work on Saturday regardless of whether or not such work comes within the 40-hour week. In the Dow Chemical (Midland, Mich.), American Cyanamid (Bound Brook, N. J.), Celluloid Corporation, Harshaw Chemical, General Aniline Works (Rensselaer, N. Y.), and six other agreements (covering over 9,000 workers) the penalty rate for Saturday work excludes the majority of the production workers, variously described as "shift workers," workers on "continuous process," on "necessary continuous operations," on "7-day operations," and employees "regularly scheduled for Saturday work."

Fourteen agreements provide penalty Sunday rates for all workers regardless of whether such work is within the 40-hour week. In 29 agreements penalty rates for Sunday work are provided only for production workers whose regular schedules do not include Sunday work. As in the case of Saturday work, employees exempted from the Sunday penalty rate include "shift workers," employees "regularly scheduled" for Sunday work, and those engaged in "continuous process," "continuous operations," or "7-day operations."

Over two-thirds of the agreements establish a penalty rate for work performed on designated holidays. The number of such holidays recognized ranges from two to ten, with six most frequent. One-third of these require the payment of double time. The remainder, including most of the other large companies, specify time and one-half.

VACATIONS AND LEAVES

Annual paid vacations are established in about 95 percent of the agreements. About 70 percent provide one week's vacation with pay after a year of service. Five agreements provide two weeks' vacation after one year of service. American Cyanamid (Bound Brook, N. J.), General Chemical Co. (Port Chicago, Calif.) and five other agreements require two years' service for one week's vacation; one agreement requires 2½ years; and three agreements require three years' service.



Provision for longer vacations for employees with additional years of service is found in 60 agreements including all the major plants. With one exception the agreements set a limit of two weeks' vacation for varying periods of service. Five years' service is required in 20 agreements; two years' service in 14 agreements; three years' service in 10 agreements. Other agreements set a requirement of from 15 months to 10 years. One agreement grants one week's vacation with 80 hours' pay after five years' service.

Half the agreements permit limited leaves of absence. Of these, approximately four-fifths specifically cite leave for union business. In the others, leave on account of illness or death in the family, or for other personal reasons, educational purposes, or for Government service, is mentioned. The two United States Potash Co. agreements grant up to 30 days' leave to seek a new job without loss of seniority rights with the company. General Chemical Co. (Chicago, Ill.) cancels the seniority of employees who work elsewhere while on leave.

One agreement provides that if an employee of the company who is not essential to its continued operation procures a job in a defense industry, and the defense industry certifies that such employee is essential in that industry, then the union and the employer will determine whether such employee shall be granted a leave of absence without loss of seniority.

SENIORITY AND PROMOTIONS

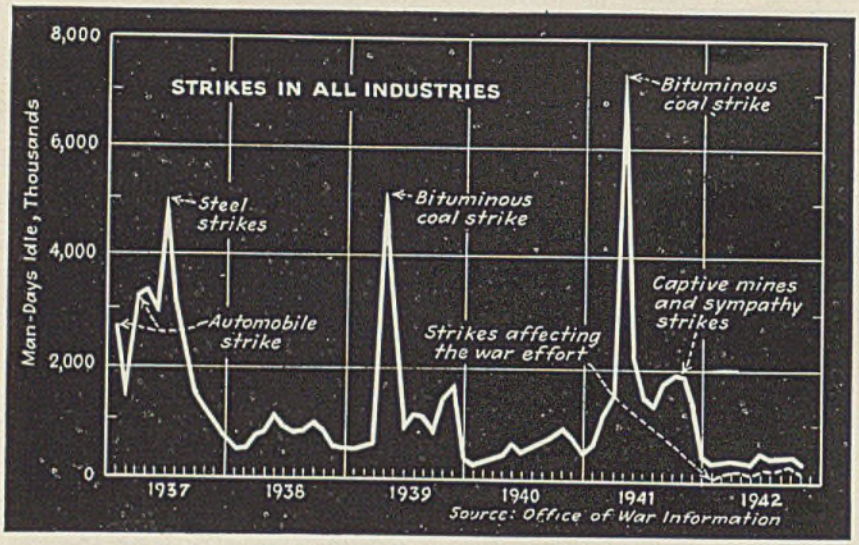
Seniority provisions granting preferential treatment based on length of service are found in all the chemical agreements. They apply principally to lay-offs and reemployment, although seniority is recognized also as a factor in promotions. Most of the agreements require a probationary period of from three weeks to six months, although in about one-third of the agreements no probationary period is specified.

Where both plant and department seniority are in effect, workers who

October Turn-Over Rates of Factory Workers[1]
Rates per 100 Employees

		Separation Rates					Accession Rates		
		Quit	Discharge	Lay-Off	Misc.	Total	Rehire	New Hire	Total
Cement	1942	4.21	0.31	0.19	1.65	6.36	0.32	4.88	5.20
	1941	0.91	0.14	1.14	0.29	2.48	0.30	1.72	2.02
Chemicals	1942	4.02	0.44	0.55	1.90	6.91	0.40	7.06	7.46
	1941	1.39	0.41	0.71	0.36	2.87	0.29	3.72	4.01
Dyeing & finishing textiles	1942	6.58	1.06	0.69	2.08	10.41	1.37	9.56	10.93
	1941	3.01	0.34	1.14	0.28	4.77	1.36	3.68	5.04
Glass	1942	4.66	0.34	2.06	1.76	8.82	1.43	7.82	9.25
	1941	1.63	0.26	1.48	0.61	3.98	1.81	4.19	6.00
Paints & varnishes	1942	6.45	0.50	0.40	2.14	9.49	0.76	7.31	8.07
	1941	1.78	0.28	1.17	0.44	3.68	0.12	2.59	2.71
Paper & pulp	1942	5.88	0.39	0.72	2.07	9.06	0.86	7.45	8.31
	1941	1.68	0.27	1.07	0.28	3.30	0.48	3.20	3.68
Petroleum refining	1942	2.04	0.20	0.37	2.14	4.75	0.20	3.26	3.46
	1941	0.53	0.03	1.05	0.42	2.03	0.35	1.56	1.91
Rayon & allied products	1942	2.03	0.24	0.27	1.65	4.19	0.30	4.26	4.56
	1941	0.88	0.19	1.40	0.39	2.86	0.53	1.92	2.45

[1] U. S. Dept. of Labor, Bureau of Labor Statistics.



are laid off on the basis of seniority in the given department may qualify for positions in other departments on the basis of their total plant seniority and displace the workers already filling these positions. A few agreements provide that in order to claim jobs in other departments, employees must have had previous experience in the other department. In several agreements, displacing or "bumping" an employee with less plant seniority is permitted only in the "yard" or general labor department. Some agreements restrict "bumping" rights to employees with at least one year's seniority.

Seniority rights are commonly forfeited by employees who quit, are discharged or fail to return to work after a lay-off within a specified period of time (from 24 hours to three weeks) when requested by the company to report; also by employees absent without an acceptable excuse, or who work elsewhere during a leave of absence without company permission, or who fail to return by the expiration of their leave.

Over 60 percent of the agreements specifically require that seniority lists are to be posted by the company or be kept available for inspection by the union or by the employees.

LAY-OFFS AND PROMOTION

Under about one-half of the agreements, seniority is the determining factor in selecting workers for lay-off and rehiring. Other agreements specify that seniority is to be given due consideration along with ability, skill, qualifications, and in a few instances, family status, physical fitness, or citizenship. Where these other factors are relatively equal, seniority is to govern. Seniority qualified by other factors in determining the order of lay-off and rehire is provided in agreements of Monsanto Chemical Co., General Chemical Co., American Cyanamid Co., and Potash Co. of America.

Advance notice of lay-offs to employees or to the union is required in about one-third the agreements, including most of the major companies.

Method of promoting and filling vacancies is outlined in about three-fourths of the agreements. In most of these, seniority is considered along with other factors, such as ability, skill, and competence. If these qualifications are approximately equal, seniority is then made the determining factor. In only a few agreements with small companies does seniority alone govern promotion.

Under about one-fourth of the agreements, successful bidders must serve a trial period, generally 30 days, on the new job in order to qualify for the vacancy. If an employee fails to prove his ability to fill the job during the trial period, he generally returns to his former job without loss of accumulated seniority rights. Seven agreements also set a lower rate for the new job while the employee is serving his trial period.

DISCHARGE AND QUITS

The subject of discharge is taken up in three-fourths of the agreements, and it is usually provided that in the event of summary dismissal of an employee, the company must show reasonable cause for such dismissal if requested to do so by either the union or the individual involved. Several of the agreements give a detailed list of reasons justifying discharge. Some merely require that any discharge be for "good cause"; others make violation of posted company rules sufficient cause for discharge. Eight agreements allow disciplinary action against employees who fail to report to work as scheduled without notifying the company in advance. One agreement prohibits discharge because of age.

To safeguard the worker against arbitrary discharge, one agreement provides one week's notice of the discharge before the employee's actual separation from the pay roll and prohibits discharges until after consultation with the union committee.

Most of the agreements provide for handling disputed discharge cases through the regular grievance machinery. In some cases, however, special time limits for settling discharge cases are specified. One-fourth of the agreements require the discharged employee to appeal his case within a specified time (24 hours to five days) of notice of termination in order to receive further consideration. A few agreements order that the case shall be disposed of within five days.

Reinstatement with back pay for a worker found to be unjustly discharged is specified in half the agreements. In three cases, the amount of back pay is to be jointly decided by the company and union.

FOREMEN AND APPRENTICES

Sixteen agreements regulate productive work by foremen or other supervisory employees. Of these, most prohibit any work by foremen except in an emergency or for instruction. The Pittsburgh Plate Glass (Columbia Chemical Division) agreement limits work by foremen to not more than one hour per week; and the Catalin Corporation agreement to not more than 20 percent of the time worked by regular employees, and then only if the work of the shift cannot be finished in time to fit in with the operations of other departments.

Provisions regarding apprentices are included in 13 agreements, most of which are with the larger companies. Seven agreements establish the apprenticeship period at four years; the remainder have two- and three-year periods. In one agreement, helpers with four years' actual experience as helper who can pass a regular examination for second-year apprentices are required to serve only two instead of three years of apprenticeship.

One apprentice to every ten journeymen is allowed in seven agreements; one to five in one agreement; a definite number for specified departments in another provides a maximum of one to four journeymen, with the actual ratio determined by the company with the advice of the union committee.

Six agreements specify the age limits for beginner apprentices (five have a range from 16 to 23 years) and one agreement, in which apprentices must be selected from among helpers in the craft with at least two years' service, sets an upper limit of 40 years.

References to the training which apprentices are to receive are found in only eight agreements. Four merely contain a statement that apprentices shall be "given an opportunity to acquire a complete knowledge of the trade," two provide for a joint union-management committee to work out an apprenticeship-training system and to conduct periodic examinations to test the apprentices' progress; and one provides that the company is to appoint an apprentice instructor to supervise the training of apprentices and that apprentices shall be rotated every three

months among journeymen and spend a maximum of six months on any operation.

Six agreements specify that apprentices shall receive periodic wage increases (every six months or, in one instance, yearly) until the journeyman's rate is reached. In two agreements with the Shell Chemical Co., negotiated by craft unions, the apprentice rate after the first two years of apprenticeship is to be negotiated between the company and union. These agreements also prohibit apprentices from working overtime until the last year of apprenticeship.

MILITARY SERVICE

Fifty-four of the 84 agreements refer to reemployment and seniority rights of employees who volunteer or are drafted for military service. Many of them include provisions similar to the Selective Service Act. Over half of these agreements specifically provide for cumulation of seniority during an employee's absence. The Michigan Alkali agreement provides that if no work is available on his return, an employee accumulates seniority not to exceed one year from the date of his discharge from military service. The Dow Chemical Co. (Great Western Division) agreement protects the promotional rights of a selectee when an employee who replaces him receives a promotion during his absence. On his return, the selectee is entitled to consideration for promotion if he applies within 30 days after his return and the qualifications of both employees are then referred to a bipartisan committee for consideration. In the event of disagreement, the case goes to arbitration.

Supplementary pay or a bonus to employees who are drafted or who volunteer for military service is provided under the American Cyanamid, American Potash and Chemical, Niagara Alkali, Vanadium Corp. (Niagara Falls), and eight additional agreements. In a few cases, these benefits are restricted to employees with a given length of service, either six months or one year. The sums paid vary from one week to two months' pay, one month being most common. Thirteen agreements, including five which grant supplementary pay, grant earned vacation pay to employees called for military service.

The F.A.E.C.T. has just announced successful organization of the Permanente Magnesium laboratory at Los Altos, Calif. to include "research and control chemists and their associates" such as "professionals, chemists, metallurgists, radiographers, analysts and junior chemists engaged in research and control work." The contract proposal "will include salary increases befitting professional workers, patent protection, severance pay and the setting up of a Labor-Management Committee." Thus it seems that once again so-called "professional" chemical workers have chosen to be included in an outside union. In a decision handed down Jan. 13, 1942, the N.L.R.B. held that professional employees cannot be forced into a heterogeneous bargaining unit unless a majority indicate by vote that they wish to be included.

While all the chemical agreements provide some machinery for the adjustment of disputes, and a large majority place restrictions on strikes and lockouts during the term of the agreements, a substantial number do not provide for the final settlement of disputes by an impartial arbitrator.

ADJUSTMENT OF DISPUTES

About 32 percent of the agreements grant the employee the option of presenting grievances to the foreman alone or of being accompanied or represented by the shop steward or other union official. Twenty-two percent specify the steward or union representative, without the employee, shall take up grievances with the foreman. The remaining agreements stipulate that the employee is to take up any grievance with his foreman directly before taking it to the union.

If no settlement is reached with the foreman, most agreements provide that the matter shall be referred to the union grievance committee which meets with the plant management. If the grievance is not adjusted at this point, it is then generally referred to a national representative of the union, who takes the matter up with the responsible official of the company.

For example, the section covering adjustment of differences in the contract entered into April 23, 1941 by E. I. duPont de Nemours & Co., Paulsboro, N. J. plant, and the United Mine Workers of America, District No. 50 (C.I.O.) is as follows:

"(a) The union shall select a committee of not more than five employees who shall act as the Shop Committee.

(b) In the event that differences shall arise between the company and the union or its members employed at said Paulsboro Works, the company shall not lock out employees on account of such differences; nor shall there be a suspension of work by the union on account of such differences unless and until an earnest effort is made to settle such differences in the following manner:

First, between the aggrieved employee and a member or members of the Shop Committee of the union and the foreman or supervisor directly in charge;

Second, between the aggrieved employee and a member or members of the Shop Committee of the union and the Works Superintendent.

Third, between the Shop Committee of the union and the Works Manager; and

Fourth, between the Shop Committee of the union and representative of the International Union and the Works Manager.

(c) In the event that such differences are not settled as hereinbefore provided, nothing contained in this agreement shall deny to the union or its members the right to cease work if it or they so desire."

In order to forestall undue delay and protracted negotiations at any one stage of the negotiating process, approximately one-fourth of the agreements stipulate time limits for the handling of grievances. Many of them provide for regular meetings between the union committee and management.

Most of the agreements specify the size of the union committee, the number specified varying from two to seven. In nine agreements only employees of the company with seniority standing of from one to four years may be committee members and in one of these, only American citizens. Agreements covering 40 percent of all the workers under agreement provide that committeemen shall be paid for time lost in attending meetings with management.

In a few cases special protection against discrimination is given the shop steward and members of the shop committee. Nine agreements, including several for the larger plants, grant special preference to shop stewards and grievance committeemen by stipulating that they shall be the last to be paid off and the first to be returned after a shut-down.

ARBITRATION

Fifty-six of the 84 agreements analyzed, covering about 50 percent of

Wage Scales at Shell Development Co., Emeryville, Calif., as Defined in the F.A.E.C.T. Contract[1] (Not Applicable to Professional Chemists and Engineers)

Pilot Plant Operators	Per Month
Operator—start	$145
After 4½ years	205
Relief supervisors	210
Shift supervisor	215
Supervisory operator	215–225
Chief operator	220–240
Technicians	
Technicians—start	145
After 5½ years	205
Technicians, first class—start	200
After 3 years	230
Glassblowers	
Glassblower's helper—start	145
After 2½ years	170
Glassblower, group III—start	175
After 2 years	190
Glassblower, group II—start	175
After 2 years	210
Glassblower, group I—start	215
After 2 years	230
Laboratory Helpers, Laboratory Assistants and Monitors	
Laboratory helper—start	130
After 1½ years	160
Laboratory assistant, start	160
After 5 years	205
Monitors	160–165

[1] As specified in Appendix A of the agreement made May 25, 1942, by the Shell Development Co., Emeryville, Calif., and International Federation of Architects, Engineers, Chemists and Technicians (Chapter 25), C.I.O. From *The Vortex*, American Chemical Society, San Francisco, p. 282-295, November, 1942.

The classifications are those covered by the certification of representatives issued by the National Labor Relations Board on March 26, 1942. Schedules for Engine Operators and Engine Mechanics, Drafting Room and Machine Shop, and General are omitted.

the workers under agreement, provide for automatic impartial arbitration of unsettled disputes. In addition, two agreements with small companies specify that the U. S. Department of Labor and one agreement, the N. Y. State Board of Mediation, shall be called in to mediate any dispute which cannot be settled directly. Under one agreement, the union is obligated to call in a state or national conciliator in an attempt to settle a dispute before resorting to strike action. The Diamond Alkali and Pittsburgh Plate Glass (Columbia Chemical Division) agreements set up a permanent joint labor relations committee, composed of representatives from both sides, to whom grievances are referred for settlement: however, no arbitration to resolve any deadlock is provided.

Five other agreements call for arbitration only by mutual consent of both parties. Among the latter, however, the Celluloid Corp. agreement provides that cases involving discrimination, suspensions, demotions, or discharges shall be submitted to arbitration automatically. If no agreement can be reached to arbitrate matters other than those specified, the party proposing arbitration may, within one week after the refusal of the other party to agree to such arbitration, give 30 days notice of its intention to cancel the agreement. Such notice of cancellation must be authorized and approved by the national office of the union or by the president and works manager of the company.

Among the major agreements which do not provide for arbitration are the Dow Chemical Co. (Midland, Mich.), Southern Alkali Co., Michigan Alkali Co., and American Cyanamid (Bound Brook, N. J.). With but one exception, which contains no work-stoppage prohibition, work stoppages are restricted until the grievance machinery has been exhausted. Thereafter a strike or lock-out may be resorted to if either party remains dissatisfied.

Most frequently, a tripartite arbitration board consisting of one or two representatives chosen by each side, together with a jointly selected impartial chairman, is set up at the time of the dispute. In 11 cases, the impartial member is not added unless the bipartisan board is unable to reach a decision. Six agreements state that a dispute shall be referred to an individual or agency to be chosen by the parties at the time of the dispute. In one of these, should the parties fail to agree on an impartial arbitrator, they must appoint a bipartisan board to make the selection.

When the two parties are unable to agree upon the person to act as impartial chairman and no provision is made for outside assistance to select such a person, the entire arbitration machinery may fail through default. In 22 agreements, or almost half of those which leave the choice of impartial chairman to be determined at the time of the dispute, an outside agency or individual is designated to make the selection if the employer and the union, or their representatives as the arbitration committee, are unable to reach an agreement within a specified time, usually three to ten days. Eight agreements designate the Conciliation Service of the U. S. Department of Labor; others, the Commissioner of Labor and Industries of Massachusetts, specified judges or individuals, and the American Arbitration Association.

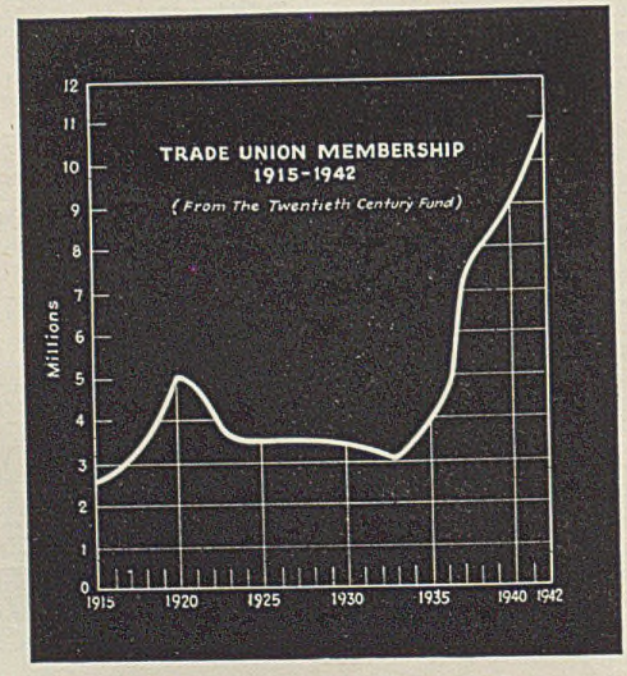
STRIKES AND LOCK-OUTS

Over half the agreements prohibit stoppages of work for the entire life of the agreement. All but one of these provide for arbitration. In three agreements the no-strike provision is waived if either party refuses to join in the arbitration proceedings or to abide by the arbitration decision, or where both parties fail to agree on the arbitration procedure or on a mutually agreeable arbitrator for the final disposition of the dispute. One of these latter agreements also requires a majority vote by union members and two weeks' advance notice to the company of intention to strike before a strike is called.

In about 30 percent of the agreements, stoppages are prohibited only until all the steps in the grievance machinery have been exhausted without arriving at a settlement. In four of these agreements, automatic arbitration is included in the grievance machinery; in three, arbitration is optional. Three of the agreements which do not provide for arbitration impose additional restrictions. A maximum period of 60 days during which efforts to settle the grievance must be made is set by one agreement. Another prohibits strikes and lock-outs until two weeks after the grievance machinery has been exhausted and the international union has authorized a strike and notified the company.

The Michigan Alkali Co. agreement requires, in addition to a majority vote by secret ballot under the supervision of the national union, that the union post a notice stating the matter in dispute three days before the election is held. The company retains the privilege of posting its views. If a strike is voted, the international union president or his representative shall authorize the strike, give the company written notice of the date, and confer with the company president or his representative. The company agrees to cease production in case of an authorized strike and further agrees not to lock out the employees. The Diamond Alkali and Pittsburgh Plate Glass (Columbia Chemical Division) agreements prohibit strikes until a national officer of the union has conferred with company officials after having been furnished with a full statement of the dispute by a bi-partisan grievance committee.

Under eight agreements which prohibit or restrict stoppages, the union agrees to protect company property in the event of a strike or suspension of work. In seven agreements, the union agrees to permit maintenance employees to work the necessary time to stop operations without damage to the equipment. In the other, a union committee is allowed to inspect the plant to see that no production is being carried on. In addition, necessary "protective production" in specified departments is to be performed by a union committee.



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PROCESS EQUIPMENT NEWS

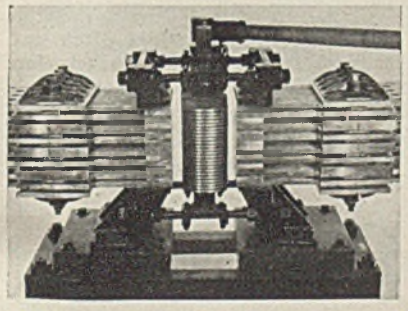
Heavy-Ampere Switches

NEW SWITCH DESIGNS for handling heavy currents in electrochemical applications, in the range from 5,000 to 30,000 or even 50,000 amp. have been designed and are being offered by Electrical Engineers Equipment Co., 25th Ave. and Division St., Melrose Park, Ill. For example, the accompanying illustration shows a 30,000-amp. switch which is one of several shipped to a magnesium plant. In the case of the switch shown, not only was it required to carry 30,000 amp. continuously without undue rise in temperature, but it also had to be constructed so that it would close as well as open the heavy current with no more than a 10-volt potential difference across the switch in the open position.

Since a certain amount of wear and burning takes place when opening such heavy-current switches, it was necessary to construct the switch so that reasonable wear and burning would not limit its useful life unduly. This was accomplished by designing the contacts so that they would automatically advance and seat at new points to assure clean and perfect contact surfaces.

It will be observed that the design provides for free and unrestricted air circulation. With the pivoted design employed, no manual effort is necessary in lifting or handling the tremendous weight of the switch blades and all effort can be applied usefully in applying the necessary contact pressure. The design is such that considerable additional load capacity can be added to switches already in service by adding more unit members.

30,000-amp. switch for magnesium plant



Wood-Base Asphalt Floor

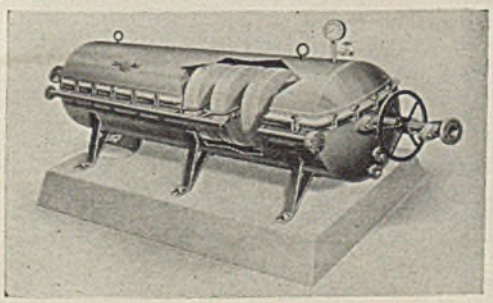
A SIMPLE SOLUTION to the problem of finding suitable flooring materials in the face of the structural steel shortage is assured, according to the Philip Carey Mfg. Co., Lockland, Cincinnati, Ohio, through the use of this company's Elastite industrial flooring. Plants heretofore using steel or reinforced concrete are, according to the manufacturer, finding a solution to their flooring problem in this asphaltic composition floor, laid over a solid wood base. The floor is claimed to be hard, tough and dense and to have remarkable resistance to wear and abuse. It withstands moving loads, is resilient and comfortable under foot and reduces the likelihood of workers slipping. The material is dustless and resistant to fire and moisture.

Continuous Pressure Filter

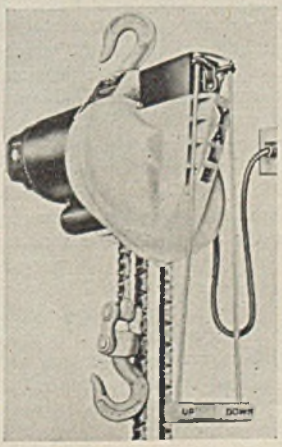
A NEW FILTER design, designated as Type H, for use where high flow rates are required and where this company's porous stone filter disks in diameters from 18 to 36 in. are to be used, has been announced by the LeVal Filter Co., 925 Wrightwood Ave., Chicago, Ill. These units, when properly operated, require opening only at long intervals, as the filter stones are cleaned with powerful sprays, plus compressed air or steam. The cake is sluiced from the tank by means of water between runs. In the larger sizes, the filter stones may be revolved during backwashing by means of a motor instead of by the handwheel used in smaller sizes. Hand holes are provided for easy inspection of the stones.

In an installation described by the manufacturer, three of these filters, each having 96 sq.ft. of filter area, are to be operated on a 24-hr.-per-day, 7-day-per-week schedule, one being shut down for cleaning at all times. However, the estimated total time for cleaning and precoating is only 12 minutes, and each unit will operate about 7 hours before cleaning is necessary. Filters of the size mentioned require a space of about 10x3 ft. and weigh about 2,000 lb. each. Test runs have indicated a flow rate of 300-400 g.p.m. for this size filter.

Continuous pressure filter



Midget electric hoist



Midget Electric Hoist

NEW MIDGET electric hoists in capacities of ¼, ½, ½ and 1 ton are now being offered by the Yale & Towne Mfg. Co., Philadelphia Division, Philadelphia, Pa., under the name of Midget King. These hoists, available in both a-c and d-c models, are economical in operation, costing only about 2 cents a day to operate. They require no extra equipment, being ready to hang in place and plug into any available electric outlet. The hoists are compact and of durable, sturdy construction, according to the manufacturer.

Static Hazard Indicator

TO DETERMINE whether machinery is properly grounded and to what extent employees constitute potential hazards as static electricity generators in plants handling explosives and flammable materials, a new instrument known as the Resistometer has been developed by Davis Emergency Equipment Co., 45 Halleck St., Newark, N. J. This instrument employs an indicating meter calibrated in ohms from zero to 20,000,000, and also a calibration used in testing employees, with the scale divided into two zones, safe and unsafe. Through the use of the instrument, each morning before employees go to work in hazardous areas they may be asked to stand on two plates. Immediately their resistance to ground is indicated by the meter as being either safe or unsafe.

It is well known that under favorable circumstances the human body can generate a stored charge of static electricity as high as 10,000 volts, simply by scuffing over a woolen rug on a cold, dry day. It is also well known that such a charge can ignite explosive material and flammable gases. Investi-

gation has shown that the conductive shoe soles now available for use in plants having static electricity hazards are not always effective and it has been found that the cause lies in the socks worn by the employees. Even with conductive soles, men wearing woolen socks immediately become unsafe, the same being true of silk socks since both types are insulators. The Resistometer can therefore be used to detect this condition. The instrument also has other applications. For example, tests on conductive flooring have shown that such flooring can be laid in such a way that electrolysis can set up between the flooring and the conductor, exerting a destructive action which will eventually result in a faulty floor. The instrument immediately shows this condition and can also be employed in determining whether machines are properly grounded.

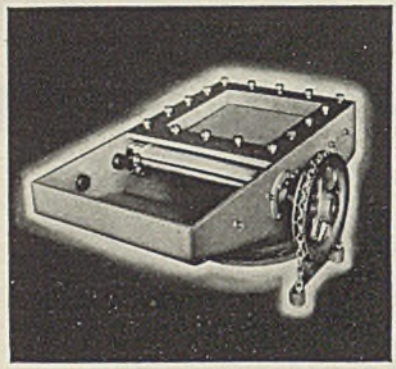
Cast-Iron Coal Valve

A NEW SERIES of coal valves in sizes ranging from 14- to 20-in. openings is now available from Beaumont Birch Co., Philadelphia, Pa. These valves, which are intended particularly for installation in chutes feeding coal to pulverizers or stokers, are said to incorporate many new features. A shaft and pinion assembly with dust-tight ball bearing rollers supports the gate which is U-shaped to prevent coal from clogging the racks and pinions. It is claimed that the valve can be operated easily even when the discharge chute is plugged. Valves can be furnished either with a smooth handwheel, or equipped with a 12-in. rag wheel, chain guard and 10 ft. of chain for chain operation.

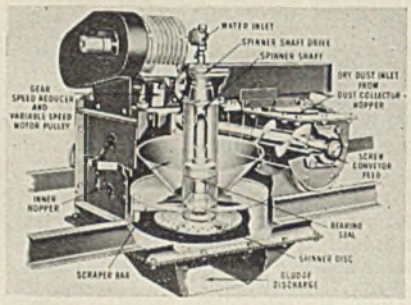
Wet Disposal Unit

CONSTANT AND UNIFORM rate of feed of discharged dust from dry type dust collectors into the sludge forming device is assured, according to the manufacturer, by a new screw conveyor feed which has been added to the wet disposal unit made by American Foundry Equipment Co., 555 South Byrkit St., Mishawaka, Ind. This device, introduced in its original form in 1941, is designed to make a wet sludge of the dust discharged from the hoppers of dry type dust collectors by centrifugally mixing the accumulated dust with water or another liquid. Mixing is almost instantaneous, eliminating the possibility of dust dispersing into the atmosphere.

Dust falls from the dust collector hopper through a flexible coupling and is deposited directly into a screw conveyor. The rate at which the dust is fed into the mixing chamber can be controlled through a gear speed reducer and variable speed motor pulley. As dust enters the unit, water or another liquid is discharged at the center of a high speed mixing disk, causing immediate mixture of the two. Sludge is then discharged at the bottom of the unit at any desired consistency.



New cast-iron coal valve



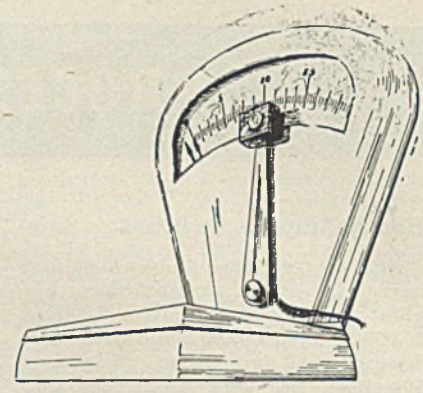
Improved wet disposal unit

Photoelectric Cut-off

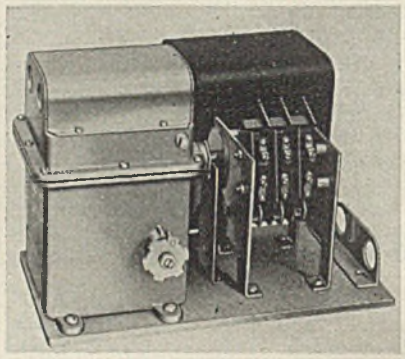
A RECENT DEVELOPMENT of United Cinephone Corp., Torrington, Conn., is a small photoelectric cut-off which has been designed for application to scales and other indicating instruments for the purpose of automatic control. The equipment comprises a scanner, consisting of a small housing containing a light source, a photocell and an amplifier tube; and a control housing containing an amplifier and a relay. The scanner is mounted on the indicating instrument in such a way that its position is adjustable for operation throughout the entire indicating range of the instrument. For example, the method of mounting on a dial scale is shown in the accompanying illustration.

The scanner position is adjusted to the point on the scale at which actuation of the control is desired. The light source within the scanner projects a beam of light through an aperture to the scale face. When the pointer, the reflection from which differs from that of the scale face, reaches the aperture communicating with the photocell, the fluctuation in the quantity of light reaching the cell causes an electrical impulse which is amplified, first by the amplifier tube in the scanner and then by the control amplifier, causing operation of the relay which in turn actuates the control mechanism. The accuracy of this method of control is limited only by the precision of the scale or other instrument on which it is used.

In addition to use on weighing scales, the new cut-off may be employed in the control of temperature, speed, electric current, liquid flow and a variety of other variables. For maintaining the variable between maximum and minimum limits, two cut-offs may be employed on the same indicating instrument.



Photoelectric cut-off applied to scale



Cycle-control switch

Fire Blanket

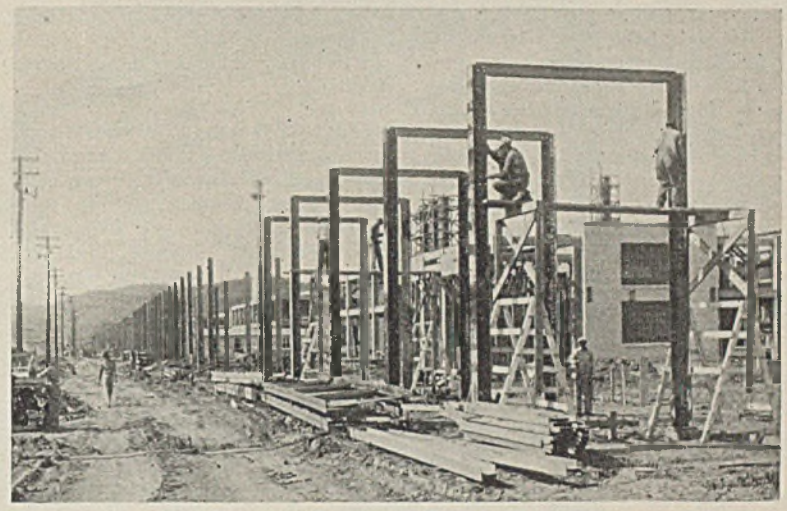
TO ELIMINATE difficulties often encountered in the use of blankets for the extinguishment of fires in workers' clothing, the C. Walker Jones Co., East Germantown, Philadelphia, Pa., has developed the Jomac fire blanket, a specially knit, flexible blanket which is completely flameproof, regardless of the intensity of the fire. These blankets are available in flame-proof containers which may be hung on the wall beside fire extinguishers, first aid stations or other equipment used where there is danger of a workman's clothing being ignited.

Cycle-Control Switch

MICRO PROGRAM SWITCH is the name of a new cycle-control switch for the operation of compressor motors, pumps, solenoid valves, or motor-operated valves, which has been announced by Barber-Colman Co., Rockford, Ill. This cycle controller is intended for general industrial process use. One of this company's Microtrol driving units op-

erates a series of snap-acting, cam-operated switches. The cams are adjustable and may be rotated to change the operation of the switches, while the timing of the Microtol driving unit is also adjustable. The device is available with single-pole, single-throw, or single-pole, double-throw switches.

Another recent development announced by this company is the Motorelay, a relay device for use in control applications using a floating contact primary device, where the control current exceeds the contact rating of the control instrument. The device consists of a shaded-pole, reversible, geared-head motor which, through a crank, closes one of two switches having a non-inductive load capacity of 10 amp. at 110 or 230 volts a.c. The control circuit current is 0.35 amp. at 25 volts.



End Use for Brooklyn "El"

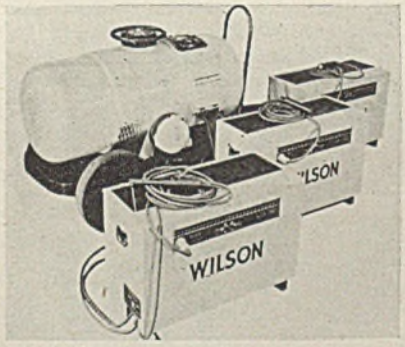
Scrap iron we didn't sell to the Japs! This structural steel from an abandoned elevated railroad structure in Brooklyn is now serving as a pipe rack in a new butadiene plant which is just going into production in West Virginia

Welder Arc Control

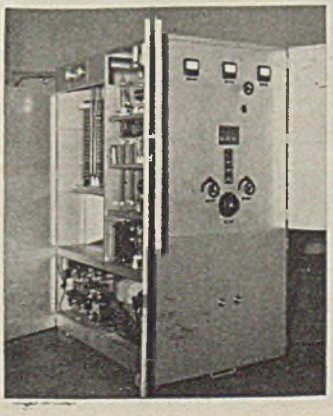
According to Wilson Welder & Metals Co., New York, N. Y., greater welding output per machine, better control by the operator, and improved welds on thin-gage metals are obtainable through the use of the new Honey Bee arc-control stations recently developed by this company. These stations are made in capacities of 75 to 150 amp. They are auxiliary electric devices which are connected in series with the welding circuit of any constant-potential arc welding generator. Furthermore, most conventional drooping-voltage generators can readily be converted to the constant-potential type.

With this control a portable switch which may be combined with the electrode holder gives the operator remote control of the welding current within predetermined limits. Two or more of these arc-control stations may be hooked to a single generator, and a like number of welding arcs operated simultaneously. Each operator can regulate his own current and weld as he wishes without affecting the others. Each operator can not only set his control to deliver the desired definite current, but can use his hand switch to vary the current remotely without breaking the arc.

Welder serving three arc-control stations

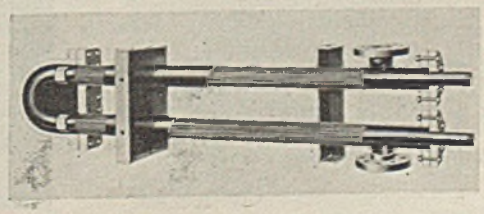


Thermex high-frequency heating equipment



Safety siphon in use

Double-pipe fin-tube heat exchanger



High-Frequency Heater

As a result of the development of new applications for its Thermex high-frequency heating equipment, the Girdler Corp., Louisville, Ky., has recently expanded manufacturing facilities, research laboratories and the engineering staff of its Thermex division. The new Thermex process, which at present is being used primarily in the manufacture of resin-bonded plywood, appears to have many applications in the production of heat for drying and heat processing of nonconductive materials.

The process utilizes the principle of generating heat within a mass by exposing it to a high-frequency field which sets up molecular friction uniformly throughout the material being treated. As a result of this "inner-penetration" action, rapid and uniform heating is effected, regardless of the thickness of the mass exposed to the high-frequency electrostatic field. In the plywood industry, for example, the equipment is said to have achieved remarkable results in speeding up production and in insuring uniformity of heat application at all points within the plywood, since the heat is produced directly at the point of use and need not be transferred to it from a point of higher temperature.

(This new development will shortly be the subject of a detailed article which will appear in *Chem. & Met.*—Editor.)

Safety Siphon

Use of flexible plastics and a built-in vacuum pump for starting are said to impart complete safety to the new safety siphon designed by T. P. Callahan and recently introduced by The Alden Speare's Sons Co., 156 Sixth St., Cambridge, Mass. As shown in the accompanying illustration, the siphon incorporates an outlet valve

which can be used in shutting off the flow. The short end of the siphon is first inserted into the mouth of the carboy bottle. The flow control outlet valve is then closed and the siphon primed by using a slow, medium pumping stroke on the trombone-like short leg which contains the vacuum pump. The flow is then started by opening the flow control valve. The siphon is readily unloaded by first closing the flow control valve and lifting the siphon above the surface of the liquid to drain the short leg, then opening the flow control valve to drain the long leg. Thorough washing is said to be easy.

Fin-Tube Exchanger

AS A SERVICE to buyers who are unable, on account of the rush of war work, to get needed heat transfer equipment from their usual sources of supply, the Brown Fintube Co., Heat Exchanger Division, Elyria, Ohio, will build and sell complete ready-to-use heat exchangers for the duration of the War. These exchangers will be built in all standard types, including the twin-section unit shown in the illustration on page 109. They will be made in any capacity desired to meet practically any heating or cooling problem. The heat exchange elements, comprising this company's Brown Fintubes with their welded-on fins, are said to result in high thermal efficiency and trouble-free operation. Such tubes will be employed as the heat transfer surface in all cases. The company has retained experienced engineers particularly for the purpose of heat exchanger design and these engineers, according to the manufacturer, will have the advantage of the company's well equipped heat transfer laboratory.

Equipment Briefs

FORMERLY fabricators of metal equipment only, the H. K. Porter Co., 4914 Harrison St., Pittsburgh, Pa., has now added to its line of process equipment, agitated wood tanks made from cypress, redwood, long leaf yellow pine, fir, oak and poplar, and equipped with this company's inclosed, speed-reducing agitator drives. Tanks are available in all sizes and shapes, including cylindrical, rectangular and elliptical, up to 100,000 gal. capacity.

A VARIETY of improvements are evident in the redesigned Utility Conveyor recently announced by the Lamson Corp., Syracuse, N. Y. The new model, superseding the earlier Utility Conveyors announced by this company, is of the adjustable belt type and is portable and reversing, capable of operating at angles from horizontal to a maximum of 35 deg. The length is 11 ft. and the belt width 14 in. Operating speed is 60 ft. per minute. The conveyor is adapted to the piling of cartons, packages, bags and boxes, to unloading and loading, and to similar operations. The unit is readily portable.

FACTORY SWEEPING can be handled at a high rate of speed, according to the manufacturer, through use of the Moto-Sweeper, which is said to replace a whole crew of sweepers for floor cleaning purposes. Manufactured by the Moto-Mower Co., 4600 Woodward Ave., Detroit, Mich., the new sweeper is power driven and power turned, by means of separate clutches controlled at the handle bar.

FOR THE PROTECTION of workers exposed to water, acids, fire, alkalis and chemicals of all kinds, the Milburn Co., Detroit, Mich., has introduced a new type of protective clothing known as Ply Garb, designed to supplement the creams and liquids for the prevention of industrial dermatitis which are made by this company. The clothing is light in weight, flameproof and vented to guard against excessive perspiration. It is made of a tough plastic-laminated cotton cloth which is said to be resistant to tears and snags on rough surfaces.

Cut-Off Wheel

FELKER MFG. CO., Torrance, Calif., has developed a new diamond abrasive cut-off blade, named the Di-met Rimlock, which is intended particularly for cutting all hard, brittle, nonmetallic materials, such as quartz, glass, porcelain, tile, ceramics and other clay products. The blade differs from former diamond abrasive blades in the special bonding process which rigidly locks the diamonds in the rim of the wheel without crushing and with the claimed result of longer life and considerably faster cutting ability. Two types are available: a hard steel bond which makes an exceptionally stiff and fast cutting blade, and a copper bond which, although not quite so stiff or fast, operates with a softer action, giving some increase in life.

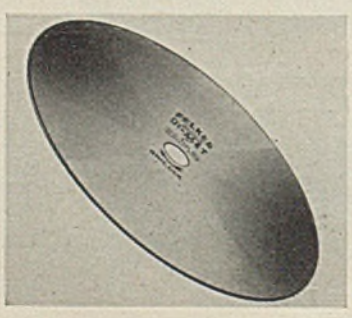
Artificial Respiration Device

TO INSURE successful administration of artificial respiration, E. D. Bullard Co., 275 Eighth St., San Francisco, Cal., has introduced a new device known as the rubber lung, which is used to supplement and increase the effectiveness of the Schaefer prone-pressure method of restoring breathing after shock, drowning, etc. The device is strapped to the back or stomach of the victim and adheres to the body through suction. Raising and lowering of a handle attached to the lung at normal breathing rate activates the muscles of the victim, causing them to draw in and exhale air. The device does not force air in or out of the lungs but rather stimulates action of the normal body muscles, helping them to do the work required for breathing until they regain strength to do this work without assistance. Because of the gentle, natural action, the rubber lung may be used safely even by totally inexperienced persons, the only point to watch being timing to assure a rhythm as close to normal breathing as possible.

Flexible Heating Element

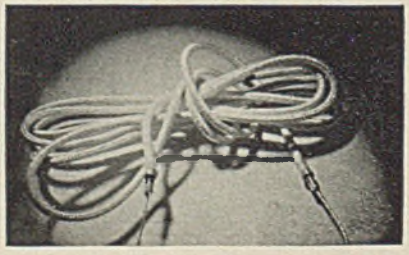
PARTICULARLY for use in limited space is a new glass-insulated flexible heating element known as the Glasohm which is being made by Clarostat Mfg. Co., 285 North Sixth St., Brooklyn, N. Y. The resistance wire is wound on a fiber-glass core and is protected by a glass braided covering. Owing to the flexibility of the glass fibers, the unit can be readily bent and compacted to fit snugly about parts to be heated, or jammed into tight spots. Typical Glasohm heating elements range from a few inches to several feet in length, in wattage ratings from 1 to 4 watts per body inch, depending on the application, for operating temperatures up to 750 deg. F.

Abrasive cut-off blade



Rubber lung facilitates artificial respiration

Glass-insulated heating element

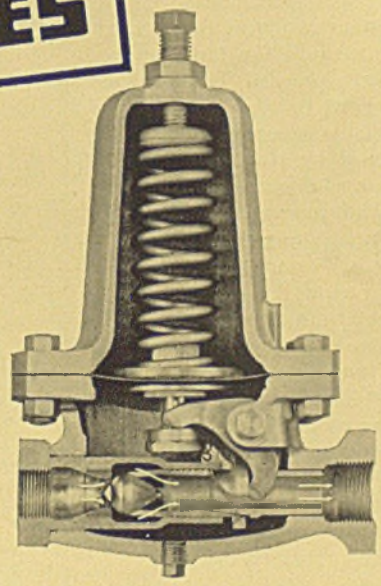


Streamlined
FOR SMOOTH, EVEN FLOW OF STEAM, WATER, AIR, OIL, ETC.

TURBULENCE ELIMINATED
The streamlined form of the inner valve produces the flow pattern shown here. It is the reason users of the "1000" valve get maximum capacity when it is needed most and accurate pressure control even when production hits non-stop proportions and operating conditions really are tough.

Tops IN PERFORMANCE EVEN WHEN PRODUCTION HITS AN ALL-TIME TOP.....

CASH STANDARD *Streamlined* TYPE 1000 PRESSURE REDUCING VALVES



● Maximum capacity when needed most — accurate pressure control under toughest working conditions — those are points to carefully consider in selecting a valve to fully fit in with all requirements. You get them in the "1000" valve. Here are some actual operating results . . . "To maintain a good uniform quality and to get the utmost out of the machine in the way of production, sensitive pressure control is of prime importance. And, because the machine runs 24 hours a day, dependability is equally important. Your valve never missed a trick." Case No. 340 . . . "We had to have capacity and close regulation, but most of all we wanted a good dependable valve so we would lose no working time with the engine. We got all of that and more. This valve has given excellent service for almost five years without any service attention whatever." — Case No. 325.

Write today for Bulletin 1000—it describes and pictures how, from inlet to outlet the fluid flows through this valve in a straight line—a streamline. Steam, air, and water capacity charts are shown. Eight pages of valuable valve facts.

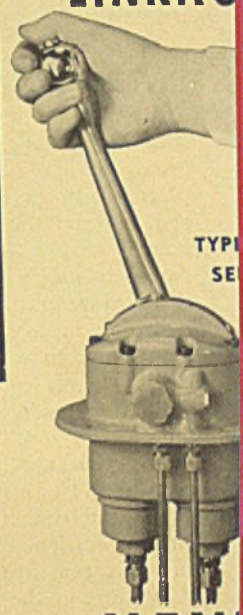
These advantages too add up to your benefit

- Trouble-free service
- Smooth operation
- Tight closure
- Accurate regulation
- Elimination of failures
- Constant delivery pressure
- No spoilage
- Practically zero in maintenance costs
- Speedier production results
- Cost-saving operation

CASH STANDARD CONTROLS . . VALVES

A. W. CASH COMPANY

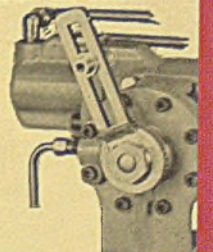
CONTROL APPARAT REMOTE *without* MECHANI LINKAG



TYP SE

NEW CASH STAN *Remote* HYDRAU *Contro*

This type 550 Remote Control may fit your ne so dependably doing at aircraft manufacturers a tical laboratories on cells for controlling th tion and mixture. IT OSCILLATING MOTION MECHANICAL LINKAGE ate, depress button in c with thumb. This releas matic brake. Move co to any desired positi button, and control is a locked in that positio will remain indefinitely. a Type 550 Sender (Type 550 Receiver (positive hydraulic pow directions—no springs, piston, it transmits the applied to the control is no lost motion in eith The lever of the Receiv degrees. It can be ind position. For easy m bracket of the Receive dexed to four position ceiver can be installe below the Sender.



TYPE 550 RECEIVER

Chrome Tanning Leather

TWO PROCESSES, chrome and vegetable tanning, are commonly used in the preparation of leather. The accompanying flowsheet illustrates the essential steps used in the former.

The first step is to soak hides or skins, washing them until they are soft and clean. To assist in the softening, caustic soda, borax, salt soda, or even acids are used. Skins are next placed between rollers of a fleshing machine and the excess fat and flesh left by the butcher is removed by a knife exposing a clean surface for the chemical treatment to follow. It is carried out in a paddle containing a lime liquor to which is added, in the early stages, a small quantity of sodium sulphide. The action causes the skins to swell, the fiber bundles are opened and the pores so enlarged as to permit of easy penetration of the liquors subsequently used in the tanning operation. Next loosened hair and epidermis are removed.

Swelling of the skins is reduced and they are again softened by bating in paddles. Chemicals commonly used for bating are oropon and puerine, prepared from dried pancreas mixed with ammonium chloride and some inert substance such as cornmeal. Skins coming from the bate are in a delicate and sensitive condition and would decompose if not given a protective treatment. This treatment consists of working the skins in a paddle containing a solution of sulphuric acid and salt in water.

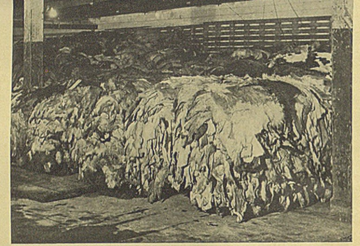
The tanning operation is carried out in revolving drums with a capacity of several hundred skins. Water, salt and green basic chromium sulphate are used for upper leather, and later a solution of sodium bicarbonate is added. The action requires several hours. Tanned skins are split, dyed and given various finishing operations.

The photographs were taken in the plant of the Ohio Leather Co. at Girard. The diagrammatic flowsheet showing the process in general use for chrome tanning was prepared by Dr. Fred O'Flaherty, director of the department of leather research at the University of Cincinnati.

CHEMICAL & METALLURGICAL ENGINEERING

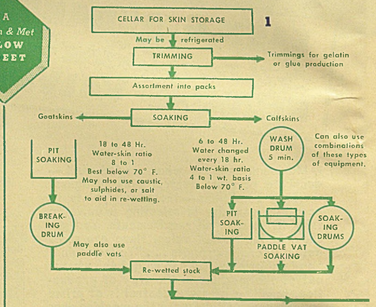
January, 1938

PAGES 112 to 115

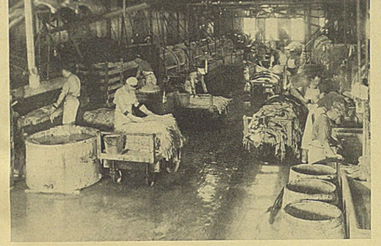


1 Hides and skins are shown in cold storage. The first step is to soak and wash them until they are soft and clean

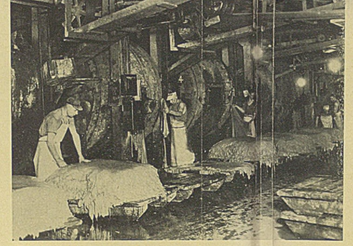
A *Chem & Met* **FLOW SHEET**



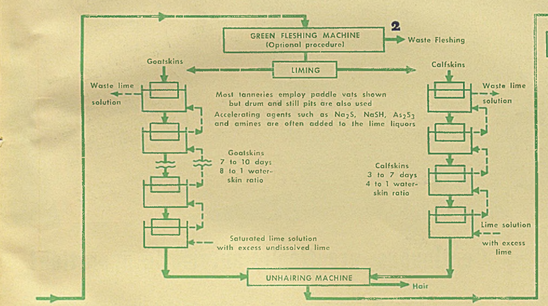
2 Excess of fat and flesh is cleaned off in a fleshing machine and a clean surface is left for the chemical treatment to follow

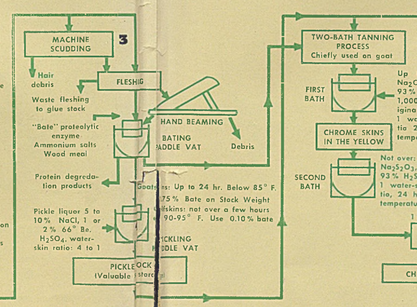


3 Lime paddles and scudding machines. Hair and epidermis are removed in a paddle containing a lime liquor to which is added sodium sulphide

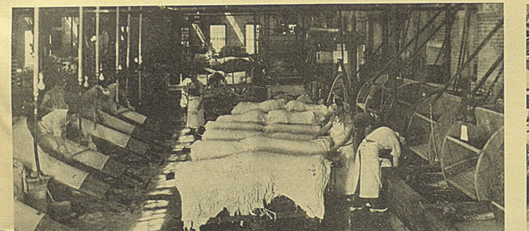


5 In the chrome room several hundred pickled skins are placed together in drum-like tanks with water and several pails full of salt

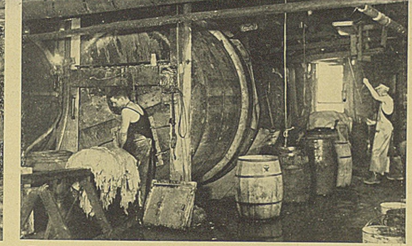




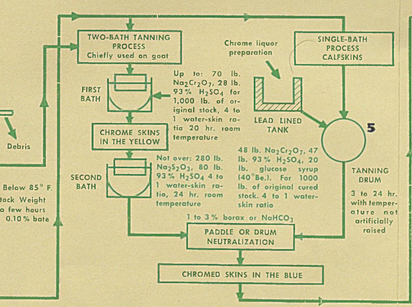
4 The action of bate is due to the affinity of ammonium chloride for lime and solvent effect of pancreatic trypsin upon albuminous matter. The operation is carried out in pickle paddles

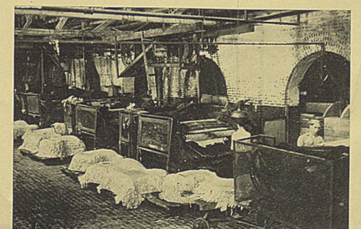


6 Shaving machines both the flesh side of the skin making a clean cut. The entire skin is brought by as possible to uniform thickness

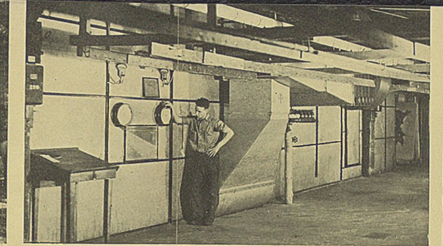


7 From the shaving and splitting rooms the truck load of skins is taken to the dye house. The stock is placed in drums and the dye added through the trunnion

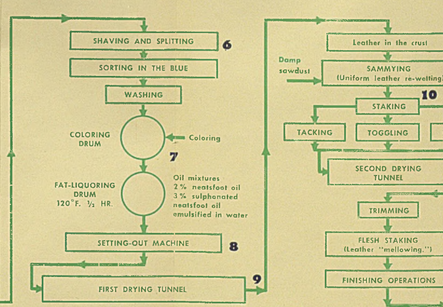


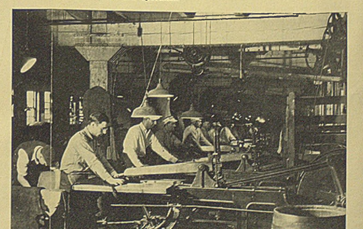


8 Tanned skins are placed on platforms preparatory to being set out on aerial setting out machines to remove excess water prior to shaving

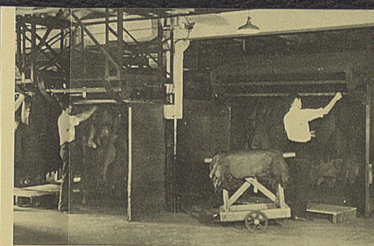


9 Tunnel dryers are used at several stages in the preparation of the skins. The skins are hung from sticks on the conveyor

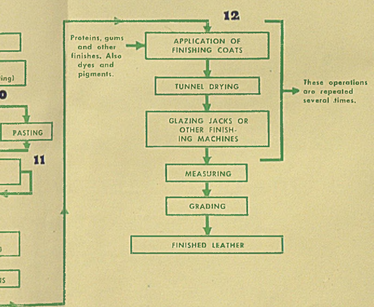




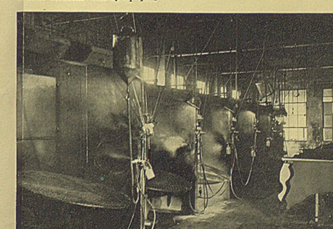
10 The function of the staking machine is to stretch and soften the leather. Sammied stock is best for this operation

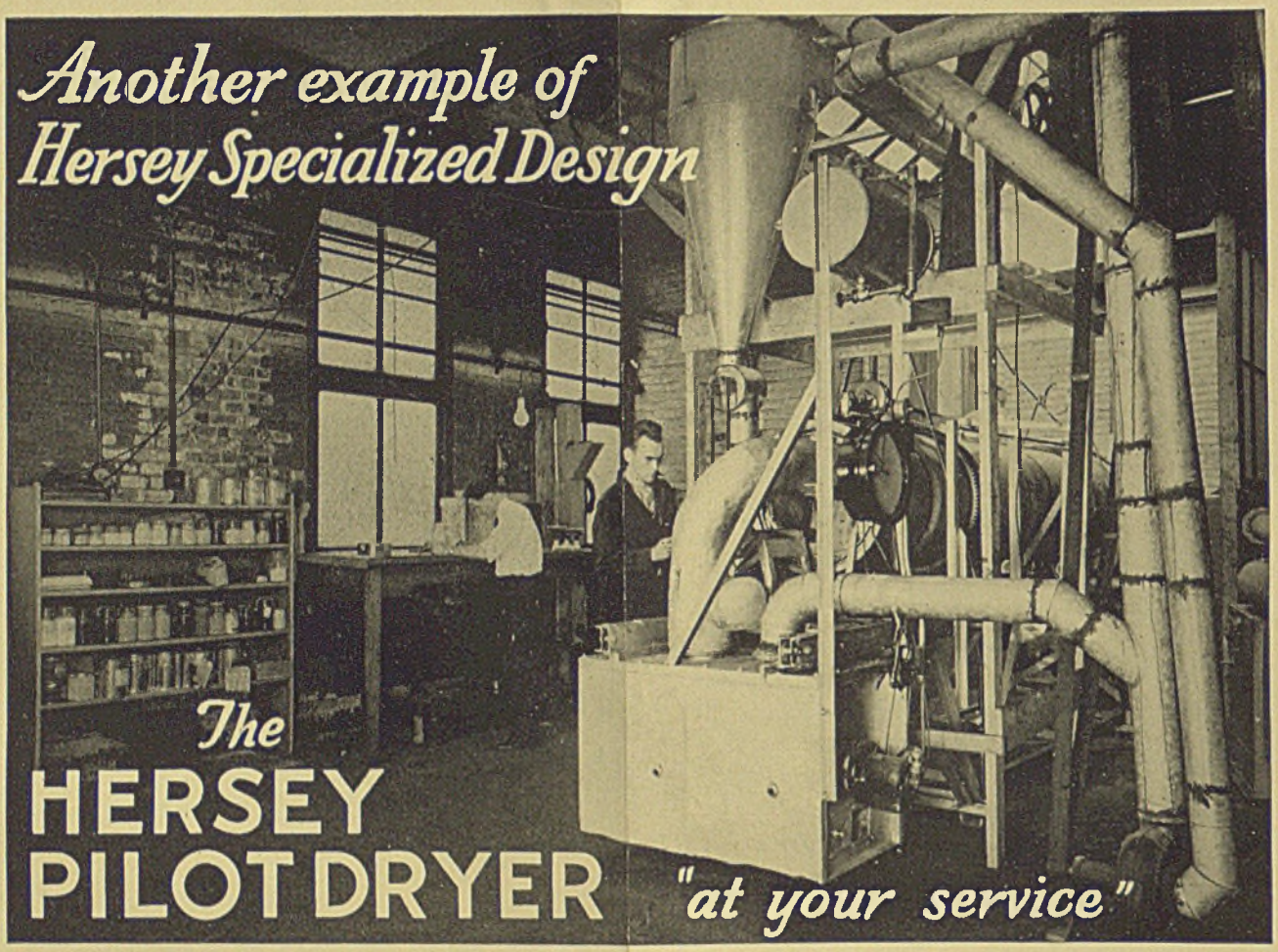


11 Stock must be bone dry before glazing. After application of each coat skins are again passed through tunnel dryers



12 Many fancy grain effects are made by spraying various types of color solutions with spray guns





★ One of 25 Hersey Dryers . . . for 13 different products . . . built during the past year . . .

From tests made during the past year in this Pilot Dryer, highly efficient Hersey Dryers were designed and built for Bagasse, Sweet Potato Meal, Starch, Cranberry Waste, Silica Gel, Sliced Potatoes and other products which are, at present, military secrets. The Hersey Dryers built during 1942 range in temperature from 140°F to 1500°F, using concurrent, countercurrent, and intermediate feed flow of gases and material. Have YOU a drying problem? The Hersey Pilot Plant and Hersey Engineers can help you solve it. *Send for Information Sheets on which to outline your requirements.*

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HERSEY MANUFACTURING COMPANY, E and SECOND STS.
HERSEY DRYING MACHINERY DIVISION, SOUTH BOSTON, MASS.

LET'S GET IN THE SCRAP —but not make it!

"Piping Pointers" Show You How To Reclaim Valves

THE steel mills need all the scrap they can get. But, first salvage all readily usable equipment when practical. Every reclaimed valve, for example, means that another new one is available for essential war industry—that another valve is on hand to keep production lines flowing. For practical, valuable hints on reclaiming valves, get a copy of this Crane "Piping Pointers" Bulletin No. 5.

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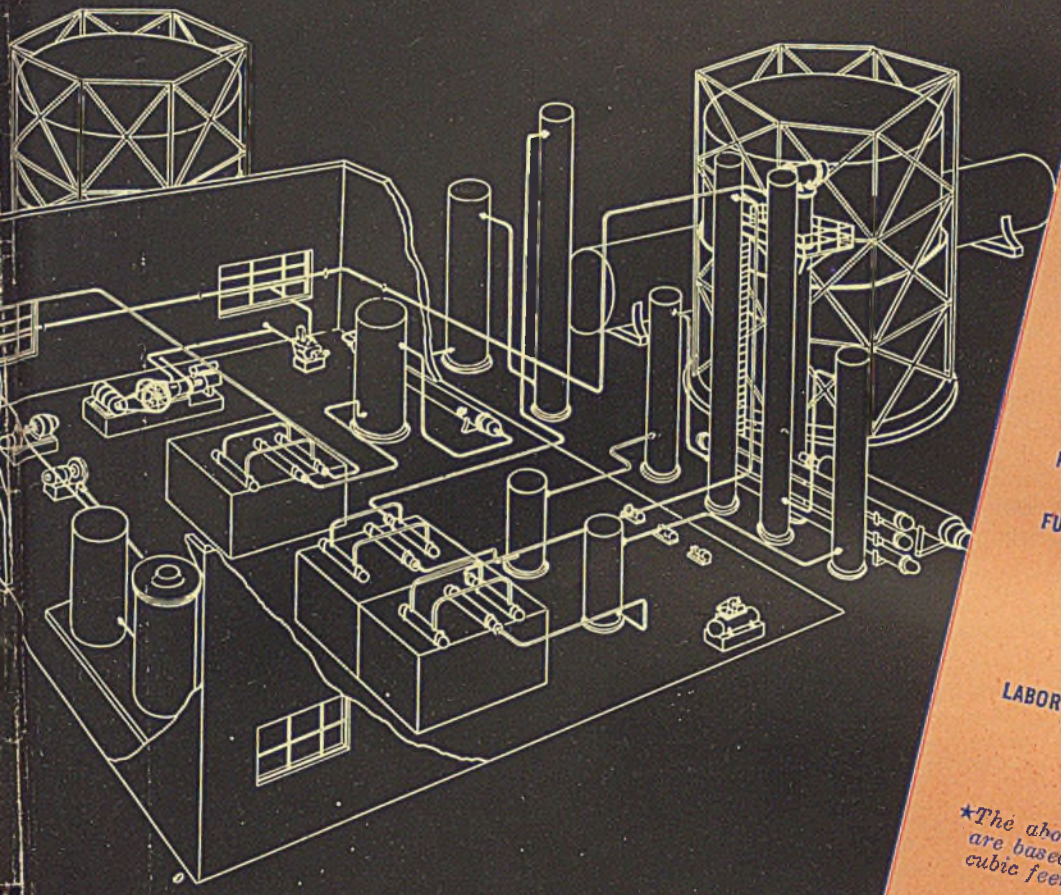
"Piping Pointers" Bulletins help you do three important wartime jobs: (1) Train new men for piping maintenance work; (2) Get better service from piping equipment; (3) Conserve critical metals. By using these Bulletins in maintenance shops and employee training classes, as many plants are doing, you share in Crane Co.'s *basic* information—gleaned from Crane's 87-year leadership in producing valves and fittings. Just ask your Crane Representative or write direct for your supply. No obligation!

Crane Co., 836 S. Michigan Ave., Chicago, Ill.

CRANE VALVES

NEW GIRDLER PROCESS MAKES HYDROGEN AT LOWER COST THAN ANY OTHER KNOWN METHOD!



PROOF OF ACTUAL OPERATING ECONOMY!

COKE	40-42 lbs.
STEAM	375 lbs. (325 lbs. of this quantity may be 15-25 gauge exhaust steam)
WATER	1,800 gallons
POWER	1.5 kilowatts
FUEL OIL	0.2 gallons (Natural gas or other heating medium may be used.)
LABOR	1 man per shift can operate a Girdler plant with capacity up to 500,000 cu. ft. of gas per day. (In larger plants, an additional man would be required on each shift.)

**The above figures are approximate and are based on the production of each 1000 cubic feet of hydrogen.*

5 OTHER ADVANTAGES

- Coke, steam, air and water only raw materials necessary.
- May be operated from 20% to 100% of rated capacity *continuously.*
- Practically automatic. Saves labor.
- Savings will pay for new plant in short time.
- Carbon dioxide is valuable by-product—used for fire protection or many other purposes.

Continuous, practically automatic operation!

● Compare any of the many methods for manufacturing hydrogen and you will find the Girdler Process produces raw hydrogen at lower cost than any other process.

The only raw materials necessary are coke, steam, air and water.

The purity of Girdler hydrogen permits its use in most cases without further treatment. However, for those who require super-purity, a Girdler Hydrogen Purification unit can be added. The hydrogen thus produced may be substituted for uses where electrolytic hydrogen heretofore has been required, as there is no measurable difference in behavior. Yet, the cost of producing hydrogen with the Girdler Process is far less than other methods.

The Girdler Process may be operated from 20% to 100% of rated capacity in a *continuous* manner. This means practically automatic operation and a big saving in labor costs. Units are available in capacities from one thousand to one million cubic feet *per hour.*

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Chemical Engineering NEWS

TRADE AGREEMENT WITH MEXICO SIGNED LAST MONTH

A trade agreement between the United States and Mexico was signed Dec. 23 and becomes effective 30 days after proclamation by the President. It is to remain in force for 3 years unless terminated earlier. If it is not terminated at the end of three years, it will continue indefinitely, subject to termination on six months' notice. From 1931 to 1940 the annual exports into Mexico averaged $67,000,000 and U. S. imports about $49,000,000. Mexico reduced tariffs on 76 items and bound the treatment on 127 others. The U. S. reduced tariffs applying to 57 paragraphs and bound treatment on 46 paragraphs. The provisions of the agreement include the most-favored-nation provision assuring that tariff concessions accorded by either country to a third country will be extended to the other party to the agreement.

Concessions granted by the United States included declines in import duties from 25 percent to 12½ percent on naphthenic acid; from 1¾c a lb. to 1 7/10c a lb. for zinc oxide, dry; from 2¼c a lb. to 1¾c a lb. for zinc oxide ground in or mixed with water or oil; from 5 percent to 2½ percent for turpentine and rosin; from ¾c a lb. to ½c a lb. for zinc sulphate; from $5 a proof gal. to $2.50 a proof gal, for spirits distilled from grain or other material and compounds of which spirits are the component material of chief value.

Tariff reductions conceded by Mexico included mixtures of ethers and alcohols for varnishes and paints from .25 to .15 pesos per legal kilo; bicarbonates of potassium and sodium, Mexican tariff fraction 6.12.71 weight with immediate content of more than five kilos, specified dutiable unit gross kilos from .07 to .04 pesos per gross kilo.

ADVISORY COMMITTEE REVIEWS SULPHURIC ACID SITUATION

A meeting of the Inorganic Acids Industry Advisory Committee, Chemicals Division, was held in Washington in December. Discussion included means of assuring an adequate supply of sulphuric acid for the manufacture of aviation gasoline on the West and Gulf Coasts, and recovery of alkylation sludge acid; the possibility of extending use of hydrofluoric acid in aviation gas production; ODT requirements on justification for tank cars now in acid service; elimination of cross hauling and speeding up loading and unloading of tank car; current procedure for disposition of spent acid; 1943 requirements of maintenance and repair materials.

The personnel of this committee includes: H. I. Young, American Zinc Lead & Smelting Co.; Hans Stauffer, Stauffer Chemical Co.; Edward Ryland, Virginia-Carolina Chemical Co. Park Kelley, Ozark Chemical Co.; C. F. Garsche, National Lead Co.; J. B. Lowery, American Cyanamid Co.; Mark Biddison, General Chemical Co.; George Whiting, Standard Wholesale Phosphate Co.; John Sanford, Armour Fertilizer Works; Joseph Mullin, Southern Acid & Sulphur Co.; Elmer Heubeck, The Davison Chemical Corp.; Wm. M. Rand, Monsanto Chemical Co.; and E. C. Thompson, E. I. du Pont de Nemours & Co.

RESEARCH SCIENTISTS ENGAGED IN WAR WORK

After a nationwide canvass, Dr. Harvey N. Davis, Director of the Office of Production Research and Development of WPB, has announced that research scientists are heavily engaged in the war effort. All the larger industrial research laboratories are carrying heavy war research loads and only a few of the smaller laboratories, representing a small percentage of the countries research workers, are fully available for new war problems. Likewise, in the universities the number of scientists still available for war research represents less than one percent of the total research manpower.

On the basis of the returns it is estimated that less than two percent of all the industrial laboratories are now completely available for research on war problems and that more than two thirds have less than a quarter of their capacity available. Less than 650 industrial research workers were represented by those laboratories reported as completely available. The smaller the laboratory the greater the percentage of availability reported. The greatest proportional availability of manpower was in the field of biology where 17 percent were reported as available.

MICHIGAN ALKALI AND FORD IN MERGER

In the interest of more efficient operation and distribution, the Michigan Alkali Co., and its affiliate the J. B. Ford Co., have been merged into a new company to be known as the Wyandotte Chemicals Corp. E. M. Ford, previously vice-president and treasurer of Michigan Alkali Co. will serve as president of the new corporation. F. S. Ford and W. F. Torrey were elected vice-presidents and Ford Ballantyne secretary and treasurer. Other officers elected were S. T. Orr, vice-president in charge of manufacturing; I. H. Taylor, vice-president in charge of sales; G. H. Schwarz, controller; C. B. Robinson, vice-president in charge of sales for the Ford division and Bert Cremers vice-president in charge of sales for the Michigan Alkali division.

SYNTHETIC RUBBER PLANT WILL BE BUILT IN LOUISIANA

Another in the series of units which will contribute to the program for the production of synthetic rubber will be a plant to be built in Lousiana by the Defense Plant Corp. and operated by the Copolymer Corp. under a contract with the Rubber Reserve Co. Copolymer Corp. has been formed by the Armstrong Rubber Co., Dayton Rubber Mfg. Co., Gates Rubber Co., Lake Shore Tire & Rubber Co., Mansfield Tire & Rubber Co., Pennsylvania Rubber Co., and Sears, Roebuck & Co.

ADVISORY GROUP NAMED FOR ALKYD RESIN INDUSTRY

The War Production Board has formed an advisory committee for the alkyd resins industry. E. H. Bucy of the Chemicals Division will act as government presiding officer and the industry members are: W. T. MacAdam, American Cyanamid & Chemical Corp., E. M. Flaherty, E. I. du Pont de Nemours & Co., J. L. McCloud, Ford Motor Co., E. T. Feininger, General Electric Co., H. C. Cheetam, Resinous Products & Chemical Co., C. J. O'Connor, Reichold Chemicals, Inc., A. J. Wittenberg, Stroock & Wittenberg Co., E. J. Probeck, Jones-Dabney Co., W. H. Lutz, Pratt & Lambert, Inc., and A. Nathan, California Ink Co.

KREBS PIGMENT & COLOR CORP. BECOMES DIVISION OF DU PONT

E. I. Du Pont de Nemours & Co., has announced that effective January 1, its wholly owned subsidiary, the Krebs Pigment & Color Corp. became the Du Pont Pigments Department. The change is merely in name as it does not involve any change in personnel, management or policy. The Krebs company had been a DuPont subsidiary for the last eight years.

CHEMICAL INTERESTS OPPOSE BILL TO CONTROL RESEARCH

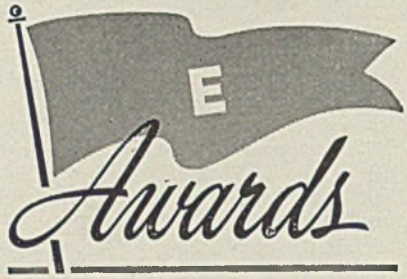
Manufacturing Chemists' Association, through its secretary Warren N. Watson, has filed a statement protesting against the adoption of Bill S. 2721 which purports to establish an office of technical mobilization. The statement maintains that any plan to regiment research would retard our vast program of industrial research. It points out that when this war began, the United States possessed the largest chemical industry of any nation in the world which development is due largely to the tremendous expenditures for chemical research, the progressive attitude of management, and the encouragement of Congress.

Referring more specifically to the provisions of the proposed measure, the statement declared "It would be difficult to imagine anything better calculated to demoralize the work of our existing research laboratories, to which we must look for research to prosecute the war, than some of the provisions embraced in S. 2721." For example, the Office of Technological Mobilization is directed to: (a) investigate the number, location, qualifications and current activities of all scientifically trained personnel; (b) investigate "the use being made of all scientific technical facilities, public or private;" (c) review projects for research and development; (d) review established production facilities, techniques and products, with a view to their improvement; (e) investigate the use of inefficient designs, processes or materials; and (f) to compel the licensing of all patents, secret processes and special technical information, as set forth."

"Advocates of the bill have placed much emphasis on research, and have referred, too often in vague terms, to researches which could have been carried out in the decade immediately preceding the present war, but which were not carried out due to lack of foresight concerning problems and requirements which a national emergency would evoke. However, the administrative and functional problems inherent to an agency of the size contemplated in the bill would retard rather than advance effectuation of any specific project. Furthermore, even if a program of such magnitude were practicable, it would involve the segregation of a large group of scientific personnel, crippling existing research facilities of both industry and educational institutions. The net effect would be to curtail rather than to promote scientific effort."

CHEMICAL DIVISION, WPB AGAIN IN NEW QUARTERS

The Chemical Division of the War Production Board has been moved again, this time from the Municipal Center to Temporary Building S. The division had only been able to get its telephone lines properly hooked up when the notice came that new quarters would be ready the first of the year. The constant shifting of organizations from one place to another is one cause for inefficiency in Washington. The staff no more than gets located in one place and learns its new telephone numbers and where all the elements of its own organization can be found when a move is ordered and the whole procedure begins over again.



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.

Advance Plating Co., Detroit, Mich.
Aetna Ball Bearing Mfg. Co., Chicago, Ill.
Allis-Chalmers Mfg. Co., Springfield, Ill.
American Chain & Cable Co., Wright-Manley Mfg. Division, York, Pa.
American Cyanamid Co., Calco Chemical Division, Bound Brook, N. J.
Anaconda Copper Mining Co., Anaconda, Mont., Anaconda Reduction Works, Great Falls, Mont.
The Austin Co., Cleveland, Ohio.
Babcock & Wilcox Co., Refractories Division, Augusta, Ga.
Bethlehem Steel Co., Terminal Island Yard, Terminal Yard, Calif.
Bucyrus-Erie Co., South Milwaukee, Wis.
Chickasaw Ordnance Works, Millington, Tenn.
Chromium Corp. of America, Waterbury, Conn.
Cleveland Automatic Machine Co., Cleveland, Ohio.
Continental Rubber Works, Erie, Pa.
Converse Rubber Co., Malden, Mass.
Crane Co., Chicago Works, Chicago, Ill.
Cummins Engine Co., Columbus, Ind.
The De Vilbiss Co., Toledo, Ohio.
Dolomite Products Co., Gates, N. Y.
Dow Chemical Co., Midland, Mich. and Midland Chemical Warfare Service.
Fairbanks, Morse & Co., Freeport, Ill.
The Fulton Sylphon Co., Knoxville, Tenn.
General Electric Co., Ontario, Calif. and Pittsfield, Mass.
Granite City Steel Co., Granite City, Ill.
Ilex Optical Co., Rochester, N. Y.
Inland Steel Co., Indiana Harbor, Ind.
International Business Machines Co., Endicott, N. Y.
Jones & Laughlin Steel Corp., Aliquippa, Pa.
Kankakee Ordnance Works, Joliet, Ill.
Keokuk Electro-Metals Co., Keokuk, Iowa.
Koppers Co., American Hammered Piston Ring Division, Baltimore, Md.
Eli Lilly & Co., Indianapolis, Ind.
Mack Molding Co., Wayne, N. J.
Monsanto Chemical Co., St. Louis, Mo., Monsanto, Ill., and Chemical Warfare Service, St. Louis.
Oldbury Electro-Chemical Co., Niagara Falls, N. Y.
Pittsburgh Coke & Iron Co., Pittsburgh, Pa.
Redstone Ordnance Plant, Huntsville, Ala.
Republic Steel Corp., Birmingham, Ala., Gadsen, Ala., Canton, Ohio, and Massillon, Ohio.
Rohm & Haas, Bristol, Pa.
Sacramento Engineering and Machine Works, Sacramento, Calif.
Sharples Chemicals, Inc., Wyandotte, Mich.
Shell Oil Co., Wood River Refinery, Ill.
Southern Steel Co., San Antonio, Texas.
Star Iron & Steel Co., Tacoma, Wash.
Stromberg-Carlson, Telephone and Mfg. Co., Rochester, N. Y.
Struthers Wells Corp., Warren, Pa.
Superior Steel & Malleable Castings Co., Benton Harbor, Mich.
Sylvania Industrial Corp., Fredericksburg, Pa.
Thermador Electrical Mfg. Co., Los Angeles, Calif.
Tyson Roller Bearing Corp., Massillon, Ohio.
United Drill and Tool Corp., Whitman & Barnes Division, Detroit, Mich.
United States Rubber Co., Mishawaka, Ind.
Vitale Fireworks Mfg. Co., New Castle, Pa.
Wallace & Tiernan Co., Belleville, N. J.
Walworth Co., South Boston, Mass.
Weldon Springs Ordnance Works, Weldon Springs, Mo.
Westinghouse Electric & Mfg. Co., East Springfield, Mass.

The following firms have been added to the list of those who have received the "M" award given by the United States Maratime Commission in recognition of outstanding production achievement.

American Locomotive Co., Dunkirk, N. Y.
The Cooper-Bessemer Corp., Mount Vernon, Ohio and Grove City, Pa.
Davis Engineering Co., Elizabeth, N. J.
M. W. Kellogg Co., Jersey City, N. J.
Production Engineering Co., Berkeley, Calif.
Tube-Turns, Inc., Louisville, Ky.

FUNGICIDE PRODUCERS DISCUSS COPPER REQUIREMENTS

The first meeting of the Copper Fungicide Manufacturers Industry Advisory Committee was held in Washington last month. Discussion included industry production schedules and requirements of copper metal, distribution, agricultural needs for copper insecticides, use of low grade scrap (copper) in the production of copper sulphate, and exports.

Members of the committee are: Warren H. Moyer, WPB, government presiding officer; L. G. Matthews, American Smelting & Refining Co.; C. G. Bless, Morris P. Kirk & Co., Inc.; H. A. Mefford, Mefford Chemical Co.; F. B. Porter, Tennessee Corp.; J. C. Haprov, Los Angeles Chemical Co.; H. C. Davies, California Spray-Chemical Co.; M. L. Somerville, Sherwin-Williams Co.; Daniel Murphy, Rohm & Haas.

INTERNATIONAL MINERALS BUYS AMINO PRODUCTS CO.

Louis Ware, president of International Minerals & Chemical Corp. of Chicago, has announced that, through its subsidiary companies, the corporation has acquired ownership of Amino Products Co. of Detroit. Amino operates a large chemical plant at Rossford, Ohio, a suburb of Toledo, where it produces mono sodium glutamate and glutamic acid products and derivatives.

Mono sodium glutamate, the principal Amino product, is used primarily as a vegetable protein for dehydrated foods and soups and is in large demand for certain army rations. During recent years, the market requirements for this material have greatly increased and the Amino plant at Rossford is a leading producer.

WASHINGTON NEWS

Effect of the broad powers granted the new Food Administrator Claude Wickard may not be felt by the chemical industry as much as the terms of the Executive Order of December 5 might indicate. Paragraph 10 of the order defined food to include starches, and vegetable and animal fats and oils along with tobacco, cotton, wool and other fibers. Paragraph 12 provided for the transfer of personnel, funds and functions over any of these items to the Department of Agriculture.

By year end it was indicated that the WPB Chemical Division would lose control of fats and oils to the Department of Agriculture but would retain some control over fertilizers and insecticides as in the past, but no official action had been taken at that time. The impact of these changes on the chemical industry should be practically nil.

The Department of Agriculture has had fairly close control over fats and oils anyway. Agriculture was responsible for the huge 1942 growing program that resulted in the greatest crop of oilseeds in the nation's history. Agriculture has had control of the crushing and marketing arrangements designed to insure an orderly movement of the oil crop to the crushers and also price maintenance through the Commodity Credit Corp.

In the case of fertilizers the Chemical Division of WPB has always worked closely with the Department in allocating the available supplies. The Chemical Division is in better position to increase the production of the mineral products used for fertilizers and that may have been one of the determining factors in the final decision as to what organization would have control of the fertiiizer program.

Supplies of Fats and Oils

Fats and oils have become first page news in the daily press. The butter shortage has made the general public fats and oils conscious. At the turn of the year two moves were made to ease the situation. First was the release of two million pounds of butter "frozen" for use by the armed forces and Lend-Lease for distribution to the civilian population through regular trade channels. This action was followed promptly by an order permitting an increase in the amount of fats and oils used in the manufacture of margarine from 110 per cent of the amount used in the base period to 180 per cent. The government estimated that the order would result in the use of an additional 230,000,000 pounds of oils being used for the purpose. It will go a long way toward making up for the shortage of butter for civilian use.

This action came on top of a revision of Order M-71 governing the use and distribution of fats and oils which was issued in the middle of December. The revision is a continuation of the effort to improve the supply of fats and oils for war needs. (*Chem and Met*, Nov. '42, p. 135.)

The previous amendment of M-71 provided a means for extending the exemption for military and lend-lease to the lowest supplier on the ladder. The amendment of December 17 broadened the quota restriction exemptions in the export field. Suppliers may now ship their export quotas even if they are incorporated in finished products. But to this is added the provision that the shipments may be made only when permission has been granted by the Board of Economic Warfare at the time the export licenses are issued.

Other provisions of the order were aimed at preventing or stamping out practices that would exhaust reserves. What might be called a "gray market" was developing through the manipulations of the manufacturers that were within the letter of the law but certainly not the spirit.

Recently the trend has been toward edible products and away from the non-edible. The manufacturer that is in both sides of the business will be hurt in one way and benefited in another. The small soap manufacturer definitely is in an unenviable position. Some effort has been made to cushion the blow by permitting a manufacturer whose quota is based on edible fats and oils to shift to the use of foots on the same basis as the manufacturer whose quota is based on foots.

Generally speaking the recent action has been directed toward the protection of the present stocks of fat and oils. There are also indications that the glycerine business will no longer run the program.

The fat salvage program does not show the vigor that it should. The published figures are far below the goals that were originally set and they look almost as bad when compared with the revised goals that have been set for 1943. Some Washington observers have suggested that soap men ought to get behind the fat salvage drive.

New Alcohol Plants

Lack of alcohol will not limit the production of synthetic rubber. The recent announcement that three new plants would be built in Kansas and Nebraska adds about one third of the 100,000,000 gallons production recommended by the Baruch report to the productive capacity of the country. These plants will be in operation next August or September.

At that time the total alcohol making capacity of the country will be sufficient to take care of the minimum requirements of the butadiene plants, plus the total requirements for smokeless powder and other industrial uses. In the meantime the alcohol stockpile is growing steadily. The construction program for new plants to make alcohol and to use alcohol has been arranged so that the new alcohol plants will be in operation a reasonable time ahead of when needed. Thus a good backlog will be built up before the butadiene plants are finished.

The problem of scheduling has been somewhat complicated because the requirements of the synthetic rubber program cannot be stated except as some place between a maximum and a minimum amount. The minimum requirements are taken care of by the plants now scheduled for construction. When everything is running full blast late in 1943 it will be determined whether or not additional capacity for the production of alcohol will have to be provided.

In the event that some new alcohol plants have to be put up, the stockpile of alcohol now being accumulated will be sufficient to take care of the situation until the new plants can be put in operation some time during 1944. By late summer the alcohol reserve will exceed any possible need above the estimated minimum requirements of the butadiene plants for the remainder of 1943 and all of 1944.

This is so simple and so obvious that the congressional investigations of the alcohol program seem slightly ridiculous. Particularly is this true of the efforts of Senator Gillette's investigation to see why a larger portion of the raw materials do not originate on the farm. So much alcohol is being made from grain now and so much more will be in the near future that a partial crop failure could seriously effect production.

Some of the more conservative officials who are informed on the situation have privately expressed the feeling that by the end of next year the situation may be reversed. They predict that there will be a hue and cry to prevent the further use of alcohol for the manufacture of alcohol on the ground that the grain is needed as a food.

Rubber Mission To Russia

Rubber Czar Jeffers in mid-December appointed a four-man mission to go to Soviet Russia to collect chemical and engineering data on the Russian experience in manufacture of synthetic rubber. Such a project has been a political bone of contention in this country for some time.

Heading the mission is Ernest W.

Pittman, New York, president of the Interchemical Corp. who was a consultant to Arthur Newhall when the latter was rubber coordinator. Mr. Pittman was an ordnance captain in the last war, has been connected with a number of large engineering enterprises since then.

Other members of the party are Dr. Willis A. Gibbons, director of development for the United States Rubber Co. and holder of some 60 patents in rubber processes; Irving L. Murray, chief process engineer for the Carbide & Carbon Chemicals Corp. and supervisor of design and construction of Carbide's butadiene and styrene plants, and Dr. Aristid V. Grosse, a native Russian who has been engaged in war research work for the Office of Scientific Research and Development at Columbia University.

Manpower Control

Paul V. McNutt is the wartime manpower boss, with "final authority" over all phases of the problem except the determination of the number of men to be called into the armed services. The long struggle between McNutt's War Manpower Commission and Selective Service ended in December with a new executive order modelled after the WPB "charter" placing all authority in a single man who will be advised by a board.

Selective Service was transferred to McNutt's orbit, and enlistments halted. The Secretaries of War and Navy, however, retain authority to inform McNutt, after "consultation" with him on labor supply, how many men they require for uniformed service. Thus, the final determination of the ratio between men in uniform and men in overalls remains with the President.

McNutt's power over the men in overalls, however, appears complete. His grant of executive authority permits him to prohibit employers from retaining in their employment "any worker whose services are more urgently needed elsewhere." This is in essence the western mining and lumbering formula, in which individual workers are not specifically ordered to shift jobs but rather are "guided" into war positions through limits upon the rights of employers to hire.

Enforcement of this "sanction" against employers is available through another provision in McNutt's order permitting him to require that all hiring be through the U. S. Employment Services. Invocation of this authority must, however, await a strengthening of USES to handle the enlarged job and in the meantime, employers are being urged to cooperate voluntarily in urging workers to make shifts into more essential work, etc.

It's worth noting that the manpower czar job was first offered by the President to Secretary of the Interior Ickes in what would have been a three-way cabinet shift of Ickes to Labor, Miss Perkins to Federal Security Administrator and McNutt to Interior. Ickes declined on the ground that he considered himself more valuable "husbanding" the nation's resources and because he wants another job which he sees in the offing—fuel czar. He is boss of hard fuels and petroleum now and would like to take over control of gas and electric power from WPB.

Coincident with McNutt's emergence to full authority was the issuance of a stop-gap for an "orderly withdrawal" of draftable workers from industry, pending the time when Manning Tables (*Chem. & Met.*, Dec. '42, p. 122) become generally operative. The new scheme is called an interim replacement schedule and is really a skeleton Manning Table. Notable difference is that Replacement Schedules need only State Selective Service Director okay to be used on occupational deferment requests for not more than six months, rather than formal validation both by WMC and the Director. Users of Replacement Schedules are expected to graduate into Manning Tables within the six-month period.

College and university students specializing in chemistry, physics and bacteriology who are within two years of completion of their specialized curricula are now deferred from military service. Formal recogntion of the importance of continued training of replacements and new talent in scientific and professional fields came in mid-December from the War Manpower Commission. The deferment order was issued to all Selective Service Boards.

Leon Henderson Out

Leon Henderson is out as the wartime price boss and, by the time this issue is printed, Prentiss M. Brown, probably will be in. Brown was a Senator from Michigan and the man who piloted the Administration's inflation-control law through Congress last Fall only to be beaten at the polls in November, partly for this achievement.

Henderson's demise represented an attempt by the Administration to head-off outright inflation by appeasing the farm bloc and other special interests which threatened, through the new Congress, to hamstring price control in order to "get" Henderson. It also represented an attempt to conciliate the flaring popular resentment against the administration of rationing.

Whether the groundswell against Henderson actually resulted from OPA's bungling or from a philosophy which accepts price control and sharing of inadequate stocks of necessities for "everybody but me" remains to be seen. More sober Washington opinion is afraid there has been too much of the latter attitude in the artillery fire aimed at Henderson.

Inevitably, with this background for his arrival, Prentiss Brown's policy will have to be one of appeasement, for a while anyway. Farm prices at least will be allowed to rise somewhat, which, in turn, will bring renewed demands from labor and will threaten the general price lid. In the rationing sphere, the attempt will be to make going without more popular, first, by emphasizing the necessity and, second, by simplifying the procedures. There is little reason, however, to expect that simplification will go to the extreme of replacing coupons with a voluntary abstinence campaign—although this will be seriously proposed.

Fluorspar Production Aided

Reserves of fluorspar are down in spite of efforts to maintain or increase them. A price increase went through about a month ago which was a part of the program to encourage production. On the effective date, November 23, the ceiling on crude ores was removed so that custom mills could pass on the price increase. The order did not remove the ceiling on the prices of finished products sold to the ultimate consumer. Although the order as written says exactly that, from the legal standpoint, there have been frequent misinterpretations by the trade.

Results of the price increase were not known before the publication of a restricted shipping list about the first of the year. This list names plants to which metallurgical and ceramic grades of fluorspar cannot be shipped because of their excessive inventories. It is hoped that this will insure a more equitable distribution of present supplies by sending them where they are immediately needed.

In the meantime efforts are being made to expedite the completion of new plants. One of these is the 30,000-ton flotation mill of the Zumi Milling Co. which is being put up with Defense Plant Corp. funds. Programs covering prospecting, development and expansion of production are going in Colorado, New Mexico and Newfoundland where metallurgical grades are to be produced and an addition to the milling capacity in Illinois for the production of acid grade fluorspar will soon be ready.

Questionnaires Restricted

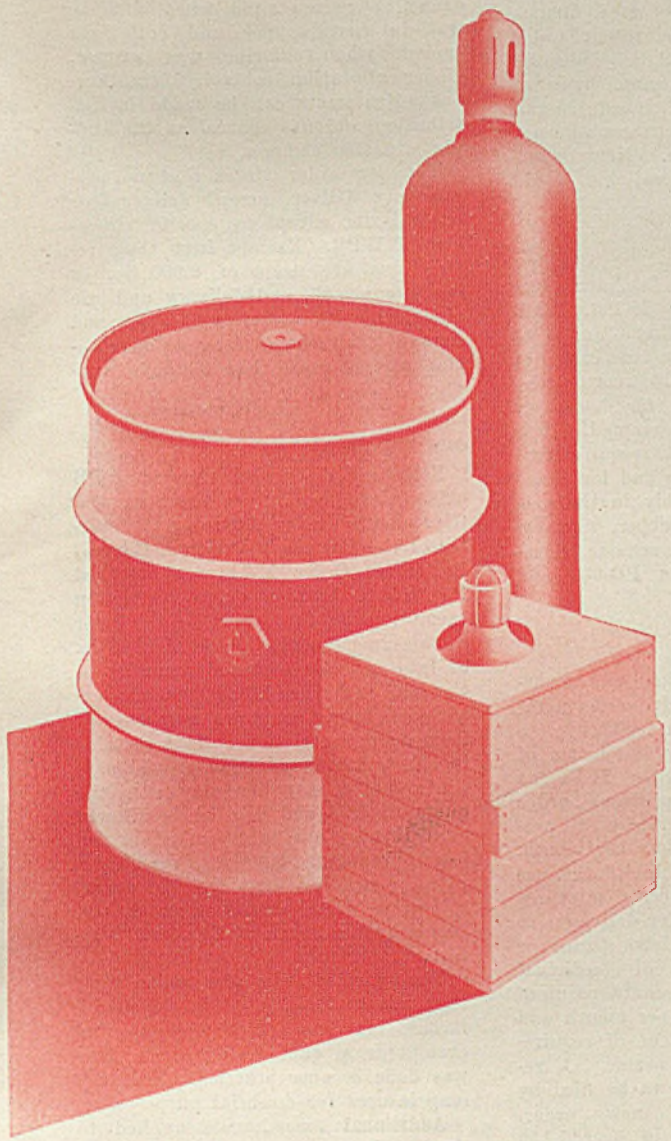
Since Jan. 1, Government requests for information must bear the approval stamp of the Budget Bureau. Questionnaires and report forms without Budget okay don't have to be answered—unless they happen to be specific requests of individual concerns or of a small group in an informal manner.

It's the first step toward relieving business and industry of the time-consuming burden of filling out endless reports for Washington. The action stems from the President, who anticipated Congressional revolt growing out of December committee hearings at which numerous examples of questionnaire hamstringing of busy concerns were aired.

Budget's job is two-fold. First, it is instructed to prevent needless requests for data and needless detail on information which really is required. Second, the agency is undertaking to consolidate and coordinate Government requests for data in an effort to eliminate much duplication resulting from two agencies—say OPA and WPB—each seeking approximately the same information.

CONTAINERS ARE VITAL

✓ handle carefully ✓ return promptly



CONTAINERS today are worth their weight in gold. Every drum, cylinder and carboy must do the work of three or four in peacetime.

YOU can help to keep essential chemical materials moving smoothly and quickly and *assure speedier delivery of your next order* by following these five simple steps:

1. Handle all containers with care.
2. Empty contents as soon as possible.
3. Don't use for other materials... don't even rinse drums and carboys with water.
4. Replace bungs in drums, outlet caps on cylinders, and thoroughly drain carboys.
5. THEN RUSH THEM BACK WHERE THEY CAME FROM!

Every user of chemicals who follows those five suggestions will be helping save materials... and time ...two vital ingredients for victory! MONSANTO CHEMICAL COMPANY, St. Louis, Missouri and Everett Station, Boston, Massachusetts.

"E" FOR EXCELLENCE—The Army-Navy "E" burgee, "representing recognition by both the Army and the Navy of especially meritorious production of war materials," has been awarded to Monsanto and replaces the Navy "E" first awarded Monsanto December 31, 1941.

MONSANTO CHEMICALS

SERVING INDUSTRY...WHICH SERVES MANKIND

INTERPRETING WASHINGTON

EDITOR'S NOTE: *With this issue we inaugurate a new service designed to help* Chem. & Met. *readers keep informed of the increasing number of governmental orders, rules and regulations affecting production in the process industries. Lacking official interpretation of these often complicated legal documents, an attempt will be made in this digest briefly to evaluate their technical significance. Should the reader desire more complete information, he is urged to write to the appropriate federal agency citing the order number or release date of the regulation. The present installment covers the calendar month of December, 1942.*

LABORATORY EQUIPMENT

Additional control over the purchase of laboratory equipment was put into effect by the issuance Dec. 5 by WPB of Limitation Order L-144, as amended. This provides that no purchaser of laboratory equipment shall be permitted to acquire an item valued at more than $50 or any quantity of the same item to the value of more than $50, without securing an authorization for such purchase from the Director General for Operations. Application should be made on Form PD-620. Purchases authorized on the basis of this form will be assigned an AA-4 rating.

As defined in this order, laboratory equipment means material, instruments, appliances, devices, parts thereof, tools and operating supplies for laboratories, or for use in connection with operations usually carried on in laboratories, not including secondhand items.

ELECTRIC MOTORS

In an effort to put every usable electric motor in the country to work producing war materials, WPB is appealing to manufacturers who have idle motors of any size to make them available for sale. It is also asking all manufacturers to use their motors to best advantage and as long as possible. The recently issued General Conservation Order L-221 is designed to encourage maximum use of existing motors and to conserve materials in future production.

Under this order all purchasers desiring new motors must certify to the motor manufacturers that they have no idle motors in their possession that can be adapted to the desired use; that they have attempted to obtain used motors from at least three dealers; that the motor is not being purchased for replacement purposes; and that it is required for immediate use. Manufacturers who have idle motors in their plants should sell them to war producers or used equipment dealers or inform the General Industrial Equipment Division of WPB of their availability.

USED STEEL DRUMS

Chemical producers and other industrial users of stainless steel drums will be aided by the recent order (Amendment to Revised Schedule 43) of OPA fixing a maximum price of $35 each for reconditioned 55-gal. drums held by manufacturers who are ineligible to use them. New drums of this size, were any available, would be priced at $46.50.

CALCIUM CARBIDE

Through issuance on Dec. 9 of General Preference Order M-190, WPB prohibited deliveries after Jan. 1 of calcium carbide except in cases of monthly shipments of 10 tons or less. That used for resale for house or mine lighting is also exempted. It is reported that industrial requirements for cutting and welding and for chemical manufacture, notably in the production of synthetic rubber, now exceed production. The regular chemicals application forms PD-600 and PD-601 are to be used.

GLYCERINE

Control over glycerine was tightened Dec. 10 to limit deliveries without specific WPB authorization to 1,150 lb. per month by the terms of General Preference Order M-58 as now amended. The previous order exempted any shipment by a producer of 10,000 lb. or less per month. The amended order prohibits the use of glycerine in anti-freeze mixtures but sets up procedures for deliveries to hospitals, clinics and laboratories or for the manufacture of medicinal preparations where amounts required are less than 1,150 lb. per month and do not exceed 100 percent of requirements used in a base period. A revised form PD-363A is to be filed by suppliers under the new order. Holders of inventories of over 1,150 lb. must file Form PD-600 by the 15th of each month whether or not new allocations are sought.

CHLORINE

Restrictions on the use of chlorine end products such as liquid sodium hypochlorite, calcium hypochlorite, sodium chlorite and other similar products containing available chlorine have been removed from Conservation Order M-19. Also exempted from the order, as now amended, are deliveries and use of 2,000 lb. of chlorine or less per month. The new form of M-19 is a straight allocation order replacing the previous conservation and allocation order. This change from end-use restriction to complete allocation control is made necessary because the restrictions on consumption, as first drawn, were too rigid when chlorine was in easy supply and not tight enough when chlorine was scarcer. Under allocation control, instantaneous adjustments can be made in distribution and use control as the supply situation changes.

The new order states that no person may deliver, accept delivery, or use chlorine except by specific allocation of WPB. Exempt from these restrictions are users of 2,000 lb. or less per month, and delivery and use of chlorine for water purification and sewage treatment so long as inventories are not more than 30 days' supply.

OILS AND FATS

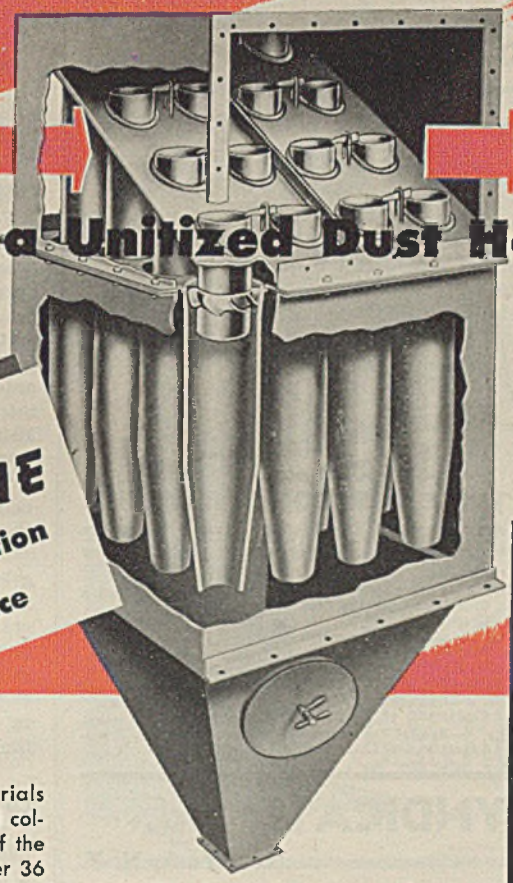
Following discussion between WPB officials and members of the Soap and Glycerine Industry Advisory Committee of the Chemicals Division, General Preference Order M-71 was amended Dec. 17 to broaden quota restriction exemptions in the export field. Prior to this amendment, the 200,000,000 lb. of fats and oils exported annually to Canada, and the 170,000,000 lb. exported to other countries were exempt from quota restrictions. This remains in effect, but in addition provision is made that a supplier may ship the quota of fats and oils he is allowed even if they are incorporated in finished products. However, permission to ship such products may be granted only when export licenses are issued by the Board of Economic Warfare.

The amended order also makes clear that fats and oils used in the manufacture of non-detergent soap are exempt from quota restrictions. This was done because practically all such soap is used for essential purposes.

Additional amendments applied to the purchase or use of facilities of another manufacturer make it no longer necessary for a manufacturer to buy such facilities in order to obtain the quota of the seller in a particular class of use. The amended order also allows a manufacturer whose quota is based on fats and oils to shift to the use of foots on the same basis as the manufacturer whose quota was originally based on foots. In addition, the amendment provides that fats and oils processed by one

ONE inlet → ONE outlet

and a Unitized Dust Hopper



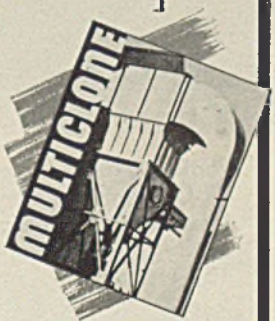
This is how the MULTICLONE simplifies installation and saves space

FOR recovering suspended materials from gases, no other mechanical collector can match the advantages of the MULTICLONE. It is the result of over 36 years of concentrated research and development in the science of recovery and incorporates many exclusive advancements that reduce installation costs, increase operating efficiency, save valuable space and greatly simplify maintenance and inspection.

FOR EXAMPLE . . . *the patented vane design of MULTICLONE tubes eliminates need for the complicated manifolding and costly multiple ducts of conventional side-entry cyclones. This important advancement permits any number of tubes to be compactly installed in small areas,* **using only ONE inlet and ONE outlet header.** *In addition, the particles removed by an entire bank of tubes are collected through* **one** *unitized hopper, further simplifying installation and operation over the conventional multiple hopper arrangement.*

Advantages are many. The smaller surface exposed to the gas minimizes erosive wear, and because all tubes can be quickly reached through a single manhole, maintenance is easy and quick without dismantling entire unit. • Heat radiation is reduced to a minimum by the simplified header construction, improving temperature control and reducing costs of insulation. • The great saving of space permits MULTICLONE installation in existing structures where manifolding would be impossible—and in all new structures where space is valuable.

These are only a few of the *many* engineered advantages that are yours when you install a MULTICLONE. It will pay you to get the full story before you install *any* dust recovery equipment!



SEND FOR BULLETIN containing detailed information and specifications on MULTICLONE construction features.

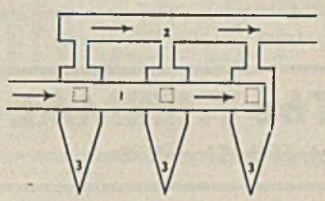
WESTERN Precipitation CORPORATION

Engineers, Designers and Manufacturers of Equipment for Collection of Suspended Materials from Gases and Liquids.

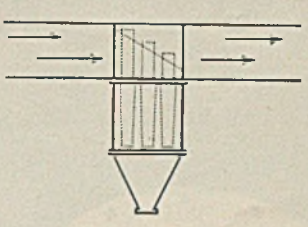
MAIN OFFICES: 1017 WEST NINTH STREET • LOS ANGELES, CALIF.
NEW YORK: CHRYSLER BLDG. • CHICAGO: 140 S. DEARBORN ST.
SAN FRANCISCO: HOBART BUILDING

PRECIPITATION COMPANY OF CANADA, LTD. • DOMINION SQUARE BUILDING, MONTREAL

WHY MULTICLONES ARE MORE COMPACT, EASIER TO INSTALL, SIMPLER TO SERVICE!



Conventional Cyclone Collector design uses side entry of gas to produce centrifugal whirling action. This necessitates costly and complicated manifolding of inlet and outlet ducts (1 & 2)—is space-wasting and difficult to insulate. Individual hoppers (3) further complicate installation and maintenance.



In the exclusive Vane Type MULTICLONE design gas enters tubes through one simple manifold chamber that reduces duct work to a minimum and permits compacting many tubes into an extremely small space. In each tube, *(right)* vanes then whirl the gas into eight miniature cyclones, giving more complete distribution of gas and higher dust recovery. Cleaned gas can be discharged either horizontally or vertically from a *single* outlet . . . and *one* dust hopper handles recovery from many tubes simplifying installation and maintenance requirements.

manufacturer for another under contract shall be chargeable not to the quota of the processor but to the quota of the owner. Title to the product must remain in the hands of the owner, and the owner must market, invoice, and collect for the product through his own organization.

CHEMICAL FERTILIZERS

Fertilizer order, M-231, has been amended in order to institute a grade-substitution program expected to reduce consumption of chemical nitrogen in mixed fertilizers by approximately 20 percent, according to WPB estimate. Schedule B of the amended order lists the grades of fertilizer by nitrogen content, used during the 1940-41 season in the several states. Opposite these are the approved grades to be substituted in 1942-43. Fertilizer manufacturers are required to produce the approved 1942-43 grades in the same proportion as the 1940-41 grades. Many other changes are made including placing manufacturers on the same basis as dealers with respect to stocks on hand and permission for sale, delivery and use of stocks of unapproved grades located in warehouses more than 50 mi. from the manufacturer's nearest plant.

COBALT DRIERS

Use of cobalt in all paint driers will be permitted under an amendment to Order M-39, issued Dec. 28 by WPB because previous restrictions on the use of cobalt in driers were found to interfere with the manufacture of certain essential protective coatings, such as ship-bottom paint, camouflage paint, and similar materials. It was pointed out by the Ferro-Alloys Branch of the Steel Division of WPB that restrictions on other materials which enter into the manufacture of protective coatings, such as naphthenic acid, drying oils, and fatty acids would automatically limit the quantity of cobalt driers which can be used. The amendment also permits the use of cobalt in all non-ferrous alloys, to take care of carbide cutting tools. Previously use of cobalt in non-ferrous alloys was limited to preference orders of AA-5 or higher.

OTHER PRICE RULINGS

Consumer ceiling prices on mixed fertilizer and superphosphate were raised in specified areas on Dec. 29 by OPA in order to give manufacturers relief from part of their recent cost increases. The increases vary from area to area, with the highest adjustments allowed in the Northeastern States and no increase permitted on the Pacific coast. The upper adjustments, OPA said, represent an absolute minimum needed to secure sufficient production of commercial fertilizer for farmers of the United States who are asked to produce increased quantities of food, feed and

fiber crops in 1943 to fill war requirements. At the same time it offers relief to fertilizer manufacturers who have been deprived by the war of many of their lower cost sources of raw materials and have been forced to use more expensive products. Detailed information will be found in OPA release 1,360 referring to Part 1,367 "Fertilizers" (Revised MPR 135).

The base date upon which maximum prices for fuel gas from oil fields are determined has been changed from October, 1941, to May 1, 1942, according to OPA order of Dec. 28, 1942 (Document 8,903), Part 1,340 "Fuel" (RPS 881 Amendment 51). This action takes into account the cost of increasing dry-gas production through expanded drilling programs and operation facilities of the petroleum industry. It will permit, in some instances, increase of prices paid for the gas in the field but will not affect consumer prices, OPA stated. Price increases occasioned by the new base date will vary as between producing areas, facilities and methods of operation, notably in the Appalachian region and in California. In some important sections, such as the Mid-Continent, where no substantial price increases occurred between Oct. 1 and Apr. 28, 1942, prices will not be materially affected.

Increasingly widespread use of rubber substitutes has resulted in the production of new articles which have had to be priced by application to OPA. To relieve manufacturers of this necessity, substitute rubber products were brought under Regulation 220 effective Jan. 4 by an amendment establishing self-executing pricing methods with definite formulas and specifications. OPA Release T-450 of Dec. 30, 1942, lists in Document No. 8,974, Part 1,315, "Rubber and Products and Materials of Which Rubber is a Component" (MPR 220, Amendment 2), a wide variety of consumer and industrial products made in whole or in part from natural, synthetic, reclaimed or balata rubber, and of various other materials serving as rubber substitutes.

Ceiling prices for processors of soybean, cottonseed and peanut oil meals and oil cakes in car lots are fixed at the same levels as those set under their contracts with the Commodity Credit Corp., according to announcement of OPA Dec. 24, (OPA-T-427). At the same time, some existing provisions of the General Maximum Price Regulation were simplified and restated to set differentials and profit margins for sales by processors of less than carload lots and for sale by jobbers, wholesalers and retailers. The move, taken in Amendment No. 81 to Supplementary Regulation No. 14, effective Dec. 29, should further effectuate the $3 to $4 per ton reduction in costs of all oil meals and oil cakes to the individual farmer-feeders, which, according to this announcement, was the purpose of OPA in designing this order.

PROOF that ARMSTRONG STEAM TRAPS Can Take it!

THIS picture shows how from 1/16th to 3/16th of an inch of hard scale was deposited on the inside of the body and cap as well as on the working parts of a No. 212 Armstrong Trap before cleaning was necessary. Note particularly the following:

1. Bright line on valve which shows that valve parts were still working.
2. Scale broken from bucket hook to indicate thickness of scale.
3. Scale around bucket vent but the vent was still open.

It takes an Armstrong free-floating lever trap to operate for long under such bad water conditions!

ARMSTRONG Traps won't do the impossible, but Armstrong's free-floating lever and quick-opening, tight-closing valve action have come through with flying colors on many a job that would have put an ordinary trap out of commission.

Ability of equipment to stay on the job with a minimum of maintenance takes on increasing importance every day. More reason why you should buy Armstrong Traps, install them properly and keep them in good repair. An Armstrong representative is ready to help you do this. Send for him today.

ARMSTRONG MACHINE WORKS
858 Maple St., Three Rivers, Michigan

MONTHLY MAINTENANCE TIP

You Can "Grind the Valves" in Armstrong Traps!

Armstrong Trap valve parts are so designed that they can be kept in service for an indefinite period without replacement by lapping valves and seats and by facing seats as illustrated at the right. Inspect your traps regularly. If the valves fail to seat properly, it will be worth your while to make repairs—a fast, simple job with Armstrongs. (Remember the Armstrong cap carries the works—disassembly is easy.)

Fig. 1: You can make several grindings on thickness "A" and still leave enough of the hex head to get a wrench hold.

FACING VALVE SEATS—See Fig. 1. Hold face of seat against flat side of grinding wheel or put in surface grinder. Relap after grinding.

LAPPING VALVE PARTS—See Fig. 2. Use breast drill and a fine lapping compound. No pressure—the weight of the drill is enough. Remove all traces of compound when finished.

Fig. 2: Lapping valves with breast drill.

SEND FOR THIS BOOK

"Service Guide and Wartime Conservation Suggestions for Steam Trap Users". Your copy free on request.

NEW PRODUCTS AND MATERIALS

SPECIAL GLASS

Some types of glass developed for use in military aircraft by Libbey-Owens-Ford Glass Co. are bullet-resistant glass, golden plate glass, and a special laminated safety glass for use in gliders and training planes. Originally intended for decorative mirrors, golden plate had been found to solve a major problem of substratosphere flying through its ability to filter ultra-violet rays which cause severe sunburn to pilots. The company's case-hardened glass known as tuf-flex is being used extensively in naval craft for portholes and screens and also is being substituted for other materials in the dials of navigation and other control instruments. The Army's 800,000,000 candlepower searchlights have tuf-flex covers to protect their reflectors and light sources. Termopane, an insulating glass, has been channeled into the stream of war production as multiple glazed units for mobile army equipment.

CUTTING OILS

Development of a new line of cutting oils which will help speed the American battle of production by increasing machine productivity in war industries is announced by Standard Oil Co. of Indiana, Chicago. The new cutting oils permit faster speeds and new methods of tooling, closer tolerances in sizes and finishes, and increased use of alloy steels which have lower machinability ratings than the metals commonly encountered, according to Standard chemists and engineers who developed the new line in test plants and proved their worth by increasing production.

Many shops which formerly operated on a "job shop" basis are now specializing in war production and operate continuously on the same job. In such plants engineers are now able to prescribe the grade of cutting oil which will give the best results on a particular operation instead of a compromise product to fit the miscellaneous demands of a wide range of machine operations and metals as in the past, the company explained.

ELIMINATE DAMP AIR

To end damage caused by humidity, condensation, rust, mold, mildew, warping, and prevent musty odors, has long been an accomplishment of Tamms Silica Co., Chicago, Ill., makers of Dri-Air chemical powder. Now, regardless of metal curtailments in the production of Dri-Air containers, two new units of non-essential materials are being placed on the market. One of these known as a commercial tripod unit is designed for warehouse, factory, and general store use. The unit has a sturdy, special treated wood tripod under which 10 lb. of Dri-Air powder can be suspended in a mesh bag. The drippings from moisture absorbed by the Dri-Air powder are collected in user's own bucket or pan. The other Dri-Air unit is ideal for household, store or office use, it has double mesh bags for holding 10 lb. of the powder and has a handsome walnut finish. The unit is complete with built-in basin for collecting the drippings. Either outfit is adequate for removing excess moisture from 1,000 to 1,200 cu.ft. of air, and provides protection for any place where excess moisture in the air is apt to cause damage.

VARNISHED SILK SUBSTITUTE

Varnished rayon, cotton cloth and nylon have been developed by the Irvington Varnish & Insulator Co., Irvington, N. J., for electrical insulation formerly provided by varnished silk. All these materials possess good dielectric strength with tensile and tear strengths equal to or better than varnished silk and can be punched into special shapes. They are available in thicknesses from 0.003 to 0.008 in., in straight-cut rolls or bias cut strips, in 51-in. lengths. Each base material is coated with Irvington special insulating varnish.

High tenacity varnished rayon is the most suitable alternate for varnished silk, comparing favorably with it in strength and flexibility. It has a dielectric strength of 1,200 VPM and is used for wrapping leads, small magnetos and coils. Varnished cotton cloth has greater tensile strength than varnished silk. Its pliability permits application on odd shapes. Dielectric strength is 1,200 VPM. Varnished nylon has qualities of flexibility and high tensile strength with dielectric strength of 1,200 VPM. At this time, Nylon is only available by government allocation.

COLORATION OF ARTIFICIAL FILAMENTS AND FOILS

Two U. S. letter patents were granted recently to the Celanese Corp. of America, one relating to the preparation of colored textile material and the other to the coloration of artificial filaments and foils of cellulose acetate or other organic derivatives of cellulose. According to patent No. 2,300,470, oxides of aluminum and antimony are mixed with titanium dioxide, all in finely divided condition, and the mixture then added to a spinning solution, such as cellulose acetate in acetone, from which the filaments are spun. Such filaments are not only of improved strength, but when colored with dyestuffs of various types they are found to possess an improved fastness to light.

In accordance with the second patent, No. 2,300,472, cellulose acetate filaments or foils are brought to a highly swollen condition by treatment with a liquid solvent or swelling agent for the cellulose acetate which has a dyestuff or dyestuff component incorporated therein. The filaments or foils are then stretched while in this swollen condition.

This process results in a uniform impregnation of the filaments or foils by the dyestuff by immersion for one-half second to two minutes so that the coloration can be carried out continuously with the high-speed production of artificial filaments and foils by modern wet spinning methods.

OIL-RESIN EMULSION WATER PAINT

The idea of a concentrated paste paint, to be thinned with water, which dries quickly and produces a beautiful decorative effect on walls and ceilings has always been attractive to the public. The idea certainly is worth considering as it makes the interior painting job so much simpler and more convenient especially in these days of shortage of skilled painters and all mechanics. But Truscon Laboratories, Detroit, Mich., probably because of its "waterproofing background," feels that such a paint though convenient to use, should also possess a very important additional property, namely, washability. In Opaltone, Truscon has produced an oil-resin emulsion wall coating that is remarkably washable. Comparative tests have shown this product capable of resisting not only washing but actual scrubbing to a very unusual degree. Along with its quality of ready washing, it applies very easily, with a roller, a brush, or by spray. It hides most surfaces in one coat. The colors are clear, bright and modern. Best of all, there is no objectionable paint odor with Opaltone. Two gallons of Opaltone makes three of paint, ready for application. There are eight pastel shades and pure white. It requires no primer or sealer, yet it may be applied over a painted surface as readily as over porous surfaces such as wall board, concrete block, brick or plaster. Wallpaper can now be painted over—no need to remove it.

LIQUID DUSTPROOFS CEMENT FLOORS

A new transparent penetrating liquid not only permanently dustproofs but also makes the concrete waterproof and crumbleproof, thus greatly increasing its resistance to traffic and preventing the formation of ruts and holes. Ever-

crete is easily applied; without interfering with the general business routine in any manner, it penetrates immediately and can be applied during working hours. Put the liquid in a pail or watering can, flush it on the floor and slosh it around evenly with a long handled broom or brush until the concrete will not absorb any more. It is an excellent binder too, for surfaces that are to be painted it is said to keep the moisture from entering and locks in the lime and alkalis, preventing burning off or hot spots on painted surfaces. It is said to be impervious to acids and is absolutely odorless. It is made by Evercrete Corp., New York City.

RED PIGMENT

A recently developed color designated as Red Lake RE-517-D which fills the need for an economical red possessing good color permanency and excellent resistance to water bleed has been announced by Krebs Pigment & Color Corp. This product is suitable for use in the wallpaper and coated-paper industries in the production of tag stock and other papers where resistance to water bleed is desirable.

TRANSFORMER CORES

Seeking a better magnetic material for transformer cores, a physicist at the Westinghouse Research Laboratories is lining up atoms as if they were a squad of army recruits on the parade ground. By melting and then slowly cooling an iron-aluminum alloy, Dr. Sidney Siegel gets atoms of the two metals to assume orderly positions with respect to one another, because when they are arranged this way the atoms exert their magnetic force together. Dr. Siegel states that success of his search ultimately may increase the efficiency of electric transformers. As a result transformers will weigh less for a given capacity. This will save copper and steel, make it easier to transport and install transformers and eventually reduce the cost of transmitting electricity to homes and factories.

CONTINUOUS BLEACHING PROCESS

Production of military textiles is greatly speeded by a new continuous bleaching process which turns cloth white in two hours at rates up to 200 yards per minute, E. I. du Pont de Nemours & Co. announced recently. Kier or batch bleaching, a method which requires 8 to 24 hours, is replaced by this fast, continuous bleaching with hydrogen peroxide. Hailed by textile men as the most important contribution to bleaching in half a century, this process not only hastens the bleach but allows precise control of all conditions, speed, steam, chemical absorption, and other factors, from start to finish. It guarantees uniformity in color and appearance. Fabrics thus bleached take on

dyes and other finishing materials with evenness. This production-line method erases bottlenecks. Materials flow steadily into the busy cutting, packing and shipping rooms, eliminating both rush and slack periods. Furthermore, it minimizes wasteful seconds and rejects from the inspection rooms, and economizes on chemical, steam and water costs. Maintenance and labor costs are no higher, and substantial savings are foreseen.

Processes are operating or being installed in mills in Massachusetts, Rhode Island, Delaware, Virginia, North and South Carolina and Georgia.

RESIN-EMULSION PAINT FOR INTERIOR SURFACES

Interior wall surfaces may now be treated with Speed-Easy, DuPont's new resin-emulsion flat paint. Prepared in paste form, it is easily reduced to painting consistency with water; no special thinner is required and it is economical. One quart of paste makes one and one-half quarts of ready-to-use paint that can be brushed on interior walls and ceilings, and even over figured wallpaper—without bothering about a prime coat. Usually a single coat gives ample coverage. It is applied easily and dries in less than an hour. It can be kept clean with soap and water. It is available in eight attractive pastel shades and white.

WETTING AGENT FOR PULP AND PAPER

Use of Nopco 2211 as a processing material during the cooking of rags and raw cotton fibers in paper making has resulted in manufacture of a finer quality finished paper, it has been announced by the National Oil Products Co., Harrison, N. J. In both rotary and vertical kiers, use of the processing material has aided materially in wetting the raw fiber during the loading of the cooking chamber, and in removing naturally occurring impurities such as waxes, pectins, stem particles and oils which may have been used in textile processes. In addition, it has lessened materially the reddish stain sometimes present after cooking. The use of this new product has resulted in substantially reducing the cooking time. In some cases, the length of the cook has been lessened by as much as 20 percent without detriment to the quality of the fiber produced. More important from a war conservation standpoint, however, is the substantial reduction in the amount of chlorine needed during the process. In test mill runs where this material has been used, cleaner stock has been delivered to the bleaching cells, clogging of washer screens has been eliminated, and the number of washes has been reduced. In spite of this, fiber brightness has been maintained and black specks in the finished wet lap have been eliminated.

MISCO STAINLESS STEEL CASTINGS

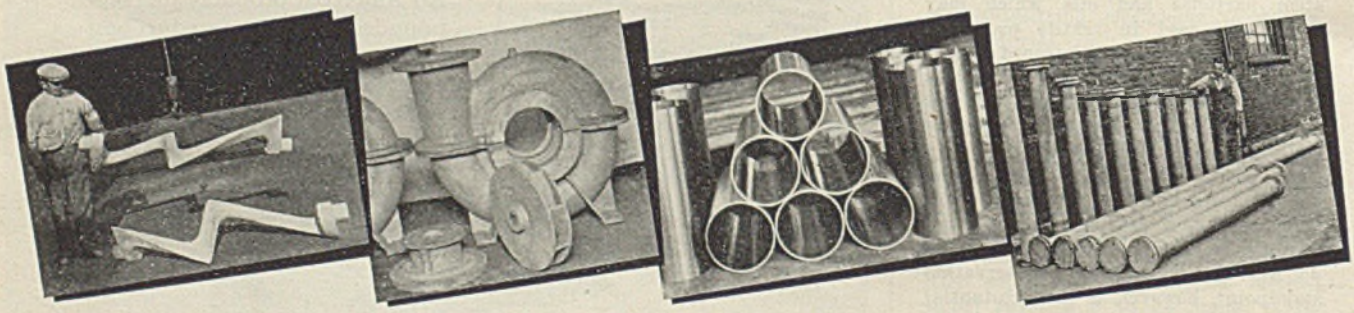
for the Process Industries

MISCO specializes in the manufacture of stainless steel castings for industrial uses. Misco stainless steel castings represent the peak of alloy casting development. They offer high resistance to the destructive action of many corrosive materials and can be depended upon for maximum performance.

In hundreds of war plants, in numerous and varied process industries, manufacturers are availing themselves of Misco's facilities. These facilities include the most modern foundry equipment and represent more than 25 years experience in production, fabrication and use of stainless steel castings. Our complete engineering, metallurgical and production resources are at your command, whenever problems arise which involve the use of stainless steel castings.

BUY U. S. WAR BONDS and STAMPS

Conserve Scarce Materials



Michigan Steel Casting Company

MISCO
Heat and Corrosion Resistant Alloys

One of the World's Pioneer Producers of Chromium-Nickel Alloy Castings

1999 Guoin Street
DETROIT, MICHIGAN

FROM THE LOG OF EXPERIENCE

EDITOR'S NOTE: *To many Chem. & Met. readers the author of this new "column" will need no introduction. For the benefit of those others who have not had the fortunate experience of knowing him personally, or of reading his earlier articles, "Dan" is chief engineer of Pennsylvania Sugar Co., at Philadelphia, and author of the famous Gutleben Log. His present commission is to write what he wishes, on any subject that takes his fancy. We think you will like what he has to say as well as we do.*

Dan Gutleben, Engineer

DISTRESSING NEWS has just arrived of the death of Harrison Howe. On leaving college, Harrison joined our crowd of sugar tramps as a chemist at Croswell, Michigan, in '02 and from this spring-board he rose to international esteem. His first job was the 12-hour night shift in the laboratory of the sugar house. The operating season of the Michigan beet sugar factories lasts three months. During the idle season and before field work begins, the perennials perform maintenance work in overalls. Harrison's niche was the pipe fitting gang under Bill Hoodless (now managing director of the Pennsylvania Sugar Co.) and he could get just as greasy as any of the rest, despite the silk topper and gold-headed cane which he sported on Sundays. The renowned, immaculately-groomed raconteur and Editor-in-Chief of the American Chemical Society, thus acquired the "humanities" at the grass roots.

During the beet-growing season, the laboratory of a sugar house cooperates in the development of the desirable biological and chemurgical qualities in the beets. The growers around Croswell were a confusion of Slavic immigrants. Every one spoke the dialect of his family, plus some formal language in which he paid his taxes and received instructions as to what the "Little Father" expected him to do. In Croswell there was no polygot who understood them all. Harrison knew German and he could make signs in several other languages. He found one among the farmers who could take his message in German dialect. By permutation and trial and error, this man located another who could understand his official language together with some jargon that made sense to a third. The third man in turn found a fourth to whom he could pass the word. Finally, Harrison observed the end man's nod which is Esperantic for "OK, Boss" and the actions that followed indicated that the message had come down correctly.

During the operation of the works, the chemist had many and varied duties, especially at night. Night Superintendent Bill Hoodless used to drop in at low 12 and the twain prepared delectable dishes of oysters or scrambled eggs, the while all manner of subjects, technical and otherwise were discussed. On the other hand there was the extra curricular job of bandaging wounds. This included not only wounds of the body but also of the mind and heart. Harrison's jovial and sympathetic disposition made his ministrations superbly effective.

IN SPITE of the fact that the labor of homo sap. has been removed from the status of a commodity, such as for example the labor of a jackass, there is still some evidence that a Union button attached to the ear of a beast of burden does not impart intelligence. In the public garage where I park my car, a young lady laid her cigarette butt on the seat while she needed both hands to maneuver her car into the stall. Then she disembarked and beat it for the beauty parlor, oblivious of the smoldering butt. Directly the colored hostler observed a cloud of smoke issuing out of the car door. Impetuously he picked up a filled mop bucket and threw the contents into the plush. Then, bingo, out came the flame and enveloped the entire car. Fortunately the garage was sprinklered. The bucket had been filled with kerosene to be used for cleaning.

WE STILL encounter our daily mysteries and according to the records in my log, we've always had them. During the installation of the main cables connecting No. 3 generator to the switch board in 1919, two of the cables became crossed. Al Chapman was at the switchboard. At the other end of the tunnel that terminated at the generator was Al Bradley. The Wizard was within earshot of both ends but could not see them. He turned towards Al Chapman and hollered, "Al, interchange those cables." Both Als heard the order and obeyed. The bell indicated that they were still wrong and the Wizard hollered, "Change them back." Both Als obeyed the order again! The Wizard couldn't figure it out. That night the boys went home to sleep over it. The next day Al Bradley stayed home leaving only one Al on the job and the cables were straightened out. The mystery however was not clarified till three days later when the two Als sat down to compare notes.

RECENTLY one of the 200 hp. motors on the main water pumps at the dock burned up. When Herman got the rotor to the shop, he found a roast rat within. Over the week-end the motor had been shut down and so the rat had found a nice warm and protected location for a comfortable snooze between the commutator and the brush holders. It was pleasant while it lasted.

NOT LONG AGO we fixed up the Laurel Street Warehouse for the storage of alcohol. In storing alcohol in bond in oak barrels there is a certain loss which in the vernacular is styled "soakage." The alcohol tax is levied on the total weight checked in, minus the recognized soakage. No other losses are allowed. If there were a theft, we would lose not only the cost of the alcohol at about 30 cents per gallon but also the Gov't tax at $3.00 per proof gallon ($5.70 per gallon of 231 cu.in.). When we placed the distillery in operation a few days before Thanksgiving Day in '24, we started at once to learn of the ingenious ways by which our poor benighted polanders tried to abstract alcohol. On Thanksgiving Day, WH (the Boss) and I were walking around to see what we had accomplished for our 1,500 thousand dollar expenditure. When we entered the fermenter room, we found nary a soul in attendance. I yoohoo'ed and presently Joe Nolan's helper staggered out from behind a tank.

His job was to watch the pumps to prevent overheating because of their newness. When he saw us, he grew very bold and told us that he was running the whole works and, if his wages were not immediately raised commensurate with his responsibility he would quit. Exit McNally! The interesting circumstance was his ingenuity. No tin cans or dippers were permitted in the pump room. However

in the sugar house a wiping rag in the hand of an oiler was standard accessory and excited no suspicion. McNally held his rag under a loose stuffing box and thereby soaked up the drippings and then squeezed the liquor into his mouth. Since the potency was 192 deg., the wonder is that it did not kill him.

It required a number of years and numerous discharges to learn all of the tricks that were worked out and to devise antidotes. The boldest plan was an attempt to steal a carload! The log records a suicide as the conclusion of this one. The last episode is dated about 10 years ago when the scalemaster, like all of his predecessors, thought he was smarter than the rest. The only fellow who ever "succeeded" in outwitting us was Joe ——. About 15 years ago he presented a sketch of a 10-in. copper pipe about 5 ft. long and requested approval for its fabrication by Coppersmith Sandy. I affixed my initials at the bottom, sent the charge to the accounting department, made a release through the shipping platform, and forgot it. Some years later, I happened to be in Sandy's office shuffling through a bunch of obsolete sketches and flipping them into the waste basket. Lo! here was Joe's pipe made into a 15-deck rectifying column and my initials were at the bottom! Sandy said he hesitated when the sketch came in but as he had only recently come into the organization, he feared to bring the matter up. However Joe's success ended when the Alcohol Unit caught up with him.

AT THE TIME the war broke out Doc [G. T. Reich, Pennsylvania Sugar's technical director] had three Frenchmen in the chemical plant to place in operation a new process that we acquired in France. These Frenchmen were thrifty to the point of penury. Each brought two shirts from home. Theoretically this was enough as a man wears only one shirt at a time. However on one occasion the practice didn't conform to the theory and the boys were soused with an overflow of stillage. The spare shirts were in the laundry. One of the three Frenchmen had acquired some slight knowledge of English at school and he explained to the landlady that the "shirt situation was very critical." Without shirts they could not come to dinner.

TODAY, the old fellows are being returned from the shelf and dusted off for re-use. A certain hoary, ill kempt ex-machinist who, during the jobless era, was subsisting on the proceeds from the sale of hokey pokey to the kids at a penny a slug, met Harry Kline at the bus stop in Camden. Harry registered surprise and told him he was cheating the grim reaper.

"What are you doing" inquired Harry.

"I'm a machinist again," replied the ghost.

"What on earth can you do?"

"I ain't doin' nothin', lad, but I'm tellin' 'em how to do it!"

NEW APPLICATIONS AND DEVELOPMENTS

LIGHTNIN AGITATORS

PLAY AN IMPORTANT PART IN THESE WAR INDUSTRI

Heat Treating (Shells and Armor Plate) | Gas Absorption and Dispersion | Alcohol Conversion
Synthetic Rubber | Detinning | Chemical Plant Expansion
Aviation Gasoline | Magnesium | Explosives
Moulding Plastic Impregnated Plywood Parts

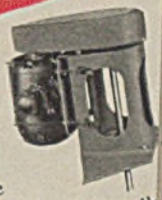
AIR DRIVEN MIXERS

"*LIGHTNIN*" line of Air Driven Portable Mixers now include Direct and Gear Drive as well as Laboratory models and Heavy Duty Mixers. These mixers are built to operate with air pressures from 60 to 120 lbs. and speed variation is obtained by throttling the air motor. Air driven mixers have a decided safety advantage in mixing paints, chemicals, high explosives and alcoholic compounds. Even when used in heavy liquids air motors will not stall. Models up to 1 H.P. are available.

TURBINE TYPE VERTICAL MIXERS

A new line of heavy-duty, slow speed Turbine Type Vertical Mixers permit the use of a longer shaft. Available in all speeds below 200 R.P.M. Installation is extremely simple. Ready to install on standard I.P.S. nozzles or special drilling. Furnished with many special types of impellers, laboratory and field-proven for superiority in liquid displacement, gas absorption and heat exchange and general agitation.

V-BELT DRIVE



V-Belt drive for top-entering propeller-type mixers for use over open tanks, closed tanks, pressure or vacuum vessels, or for attachment to standard size nozzles. Speed of a unit can be changed by changing the sheave and pulleys or a variable speed pulley can be provided on the motor. Drive can be furnished with electrically conducting belts to do away with danger from static, or oil resisting belts, where necessary. The drive can be standard, semi-enclosed drip-proof, or totally enclosed, air jacketed explosion proof. Available in sizes from 1/2 H.P. to 25 H.P.

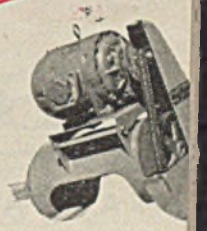
SPECIAL DRIVES

"*LIGHTNIN'S*" Right Angle Drive is designed to save critical materials, cut down manufacturing man-hours and speed up deliveries. It permits the mounting of motors at sufficient distances from the agitator when close proximity would create a hazard. Head room rquirements are reduced to a minimum. Complete range of sizes from 1 to 50 H.P. are available. Information on other special drives available on request.

MIXER DRIVE WITH FAN

"*LIGHTNIN'S*" New Mixer Drive with fan is especially designed for mixing hot gases or circulating air or gases over coils for increasing rate of heat exchange or for use in maintaining uniform temperature. This new Mixer Drive further increases the range of application of "*LIGHTNIN'S*" Equipment.

CHAIN DRIVE SIDE-ENTERING MIXERS



Here is another new "*LIGHTNIN*" Mixer design—the chain drive applied to side entering Construction permits use out-of-doo of the guard has been removed in tration to show the chain drive wh nates static hazards present in V Complete range of sizes from 1 are available.

"*LIGHTNIN*" Mixers are constantly being improved and redesigned to meet your specific requirements under present war production conditions. They proved in actual service that they cut power consumption, conserve vital materials, increase product uniformity and speed up production.

Each product here illustrated is a new development. You can rest assured that 1943 will reveal the same consistent effort to help you solve your mixing problems.

MIXING EQUIPMENT COMPANY, INC.
1028 Garson Ave., Rochester, N.Y.

Please send me:

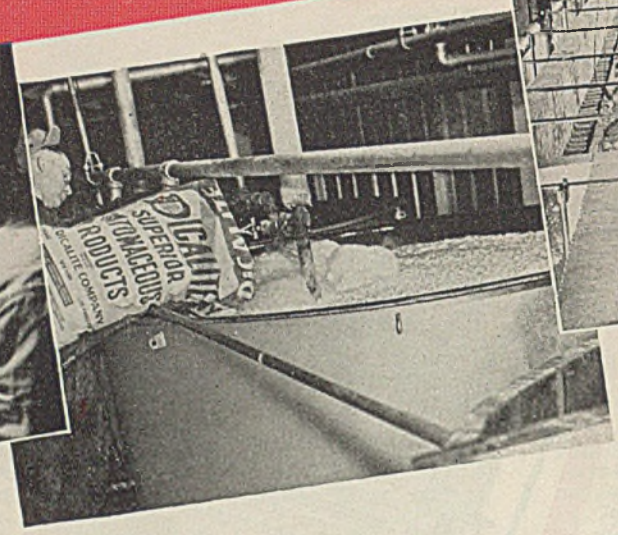
.....Catalog B-68—Top Entering M
.....Catalog B-69—Air Driven Mix
.....Catalog B-65—Portable (Clam
.....Catalog B-66—Side Entering M
.....Catalog B-67—Laboratory Mi
.....Mi-11—MIXING OPERATI SHEET: The basis for recommendation
.....Complete Catalog Binder for E Engineers in Authority

Name.....

Company.....

MIXING EQUIPMENT CO., Inc.

DIATOMS AT WAR WORK



DICALITE FOR

HEAT-SAVING INSULATION

CATALYTIC AND SORBENT PROCESSES, FILTRATION, ETC.

CAMOUFLAGE AND OTHER WAR FINISHES

• By far the greatest portion of Dicalite output is today being utilized by the process industries and others vitally important in "Production for Victory." For example:

DICALITE HIGH TEMPERATURE INSULATION is saving valuable coal, oil and gas in operation of boilers, furnaces, kilns and other heated equipment. In our warships on the high seas, in iron and steel plants, smelters, power plants and like industries working full speed on war production, time and fuel are being saved and efficiency increased by use of Dicalite insulated construction.

DICALITE CATALYST CARRIERS, ABSORBENTS: In many process plants, Dicalite materials are used as catalyst carriers, absorbents and fillers, to increase production, save needed time and help speed the war effort. Petroleum refining, manufacture of many chemicals, citric acid and explosives are examples in point. Likewise, DICALITE FILTERAIDS insure fast and efficient filtration in producing such wartime necessities as oils, chemicals, food products and varnish.

DICALITE EXTENDERS AND FLATTING AGENTS effectively produce required flatness in camouflage paints and similar war finishes, also giving other desired qualities and conserving essential pigments and resins. DICALITE MINERAL FILLERS also speed production and improve quality of paper, asphalt products, rubber, plastics, and others.

• A Dicalite Engineer will gladly be of service in problems involving insulation, absorbents, fillers, filtration and other applications where diatomaceous products may be employed.

THE DICALITE COMPANY

520 N. Michigan Ave., CHICAGO • 120 Wall St., NEW YORK • 756 So. Broadway, LOS ANGELES

PERSONALITIES

✦ A. M. CADIGAN is now chief chemist for the Pulp and Paper Products Division of the Cellulose Products Laboratory, Tacoma, Wash. Mr. Cadigan was formerly with St. Regis Kraft Co.

✦ D. B. KUHE is superintendent of the North Carolina Pulp Co., Plymouth, N. C. He was formerly with the Union Bag & Paper Mills.

✦ JOHN H. ROMANN, chief metallurgist of Tube Turns, Louisville, Ky., has been granted an indefinite leave of absence in order to direct a special nation-wide investigation in industrial plants concerning the low temperature properties of metals. This research is being carried on for the War Department by the War Metallurgy Committee of the National Research Council.

✦ G. P. KOCH, formerly educational instructor in the marketing department of Shell Oil Co., has joined the personnel department as supervisor of employee training. Dr. Koch, who received his B. S. degree at Washington State University, his M.S. at Minnesota and his Ph.D. at Rutgers, began his Shell career 20 years ago in the chemical laboratory at the Martinez, Calif., refinery.

✦ J. LAWRENCE HOWERTON is general superintendent of production at the Longhorn Ordnance Works of Monsanto Chemical Co. in Texas. Mr. Howerton graduated from Washington and Lee University in 1915 and for many years was with Swann Chemical Co. at Anniston, Ala. When that company was taken over by Monsanto some years ago, Mr. Howerton remained at the Anniston plant but was later transferred to the East St. Louis plant of Monsanto.

✦ WINFIELD B. HEINZ, Calco Chemical Division, American Cyanamid Co., resigned his position effective December 4, to enter the field of consulting engineering. His office is in Bound Brook, N. J. He will specialize in development engineering in several different industries. During the years he spent with Calco, Mr. Heinz supervised process and process equipment development required in that company's wide range of chemical manufacture. He organized and managed the section which is responsible for all their instrumentation and automatic control engineering.

✦ LAWRENCE C. BURMAN, former chief of the Rare Metals Unit, War Production Board, has been commissioned in the Corps of Engineers and is assigned to duty with the Manhattan Engineer District, New York, N. Y.

✦ J. F. M. TAYLOR has been appointed vice president of Shell Oil Co. east of the Rockies. Mr. Taylor succeeds E. D. Cumming as vice president in charge of manufacturing. Mr. Comming has been granted a leave of absence to serve as director of the refining division, Office of Petroleum Administrator for War, Washington, D. C.

✦ CLIFTON C. CANDEE has been appointed technical service director of the Lake and Pigments Department, Calco Chemical Division, American Cyanamid Co. Mr. Candee has been identified with the activities of this department since joining the firm in 1934.

✦ NORMAN G. FARQUHAR has joined the staff of *Chem. & Met.* as Assistant Editor. Since 1939 he has been employed as an engineer in National Aniline Division of Allied Chemical & Dye Corp. in the Buffalo plant and more recently in the New York office. Mr. Farquhar is a graduate in chemical engineering from the Massachusetts Institute of Technology and holds a mechanical engineering certificate from Lowell Institute.

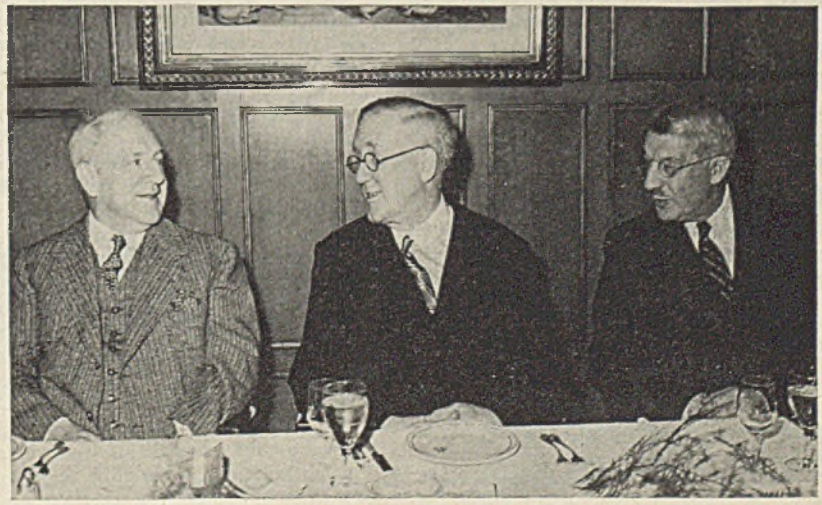
✦ WALTER R. MEYER joined the Enthone Co., New Haven, Conn., as technical director in November.

✦ B. DELORENZO has been appointed manager of the heat transfer department of the Brown Fintube Co., Elyria, Ohio. Mr. DeLorenzo graduated from the Massachusetts Institute of Technology in chemical engineering in 1930, and then spent an additional two years there in graduate study and research. He joined the Foster Wheeler Corp. as laboratory technician in 1932, working on solvent refining of petroleum products, and since 1936 had been design engineer for Foster Wheeler in the Oil Division, specializing on heat transfer and flows of fluids.

✦ WENTWORTH BROWN has been appointed manager of production of the Brown Co., Berlin, N. H., manufacturer of pulp, paper and other wood cellulose products, according to the announcement recently of H. P. Carruth, vice president in charge of operations.

✦ ALBERT E. MARSHALL announced recently his resignation as one of the five directors of General Aniline & Film Corp. Under the office of Leo T. Crowley, Alien Property Custodian, he has been elected chairman of the board of directors of E. Leitz, Inc., makers of the Leica camera and now wholly engaged in war production. Since January 1, Mr. Marshall has devoted more time to chemical and research activities at Rumford Chemical Works, where he is president and a substantial stockholder, and with the New England Industrial Research Foundation, of which he was an organizer in 1941. Appointed to General Aniline & Film Corp. last March, Mr. Marshall has served as executive vice president of that company and as executive head of its Agfa Ansco Division.

Dr. Lloyd F. Nickell (center), managing director of Monsanto Chemicals Ltd., Ruabon, North Wales, chats with Dr. L. McMaster, head of the department of chemistry, Washington University, and Dr. F. W. Russe, vice president, Mallinckrodt Chemical Works, at a dinner given in his honor by Edgar M. Queeny, president of Monsanto, December 8 at St. Louis



✦ THOMAS A. COLLINS has been elected vice president of Libbey Glass Co., Toledo, wholly owned subsidiary of Owens-Illinois Glass Co. He will serve under John H. Wright, president and general manager in connection with manufacturing, engineering and developing problems. Mr. Collins, who joined the organization several months ago, was formerly Western factories manager of Owens-Illinois Glass Co.

Allen Abrams

✦ ALLEN ABRAMS, vice president in charge of research and development for Marathon Paper Mills Co., Rothschild, Wis., on January 1 became deputy director of the research and development division of the Office of Strategic Services located in Temporary Q Building, Washington, D. C. Dr. Abrams is on leave of absence from Marathon.

✦ P. W. FOSTER, JR., has been elected vice president of the Foster Wheeler Corp. Mr. Foster is a graduate of Princeton University and served as an artillery officer abroad during the World War. In 1919, he joined the sales department of Power Specialty Co. and progressed consistently, having charge of the Boston office for some time. Later he moved to New York where he directed the industrial department, and more recently the Steam Generation Division. The Foster Wheeler Corp. was formed in 1927 through consolidation of Power Specialty Co. and Wheeler Condenser & Engineering Co.

✦ H. W. HEM has joined the Howe Scale Co. as research director. Warren Hem was born in Kansas City and acquired his technical training there at Findlay College of Engineering. He began his business career with the Strait Scale Co. of Kansas City in 1909 at the machinist's trade. Later he went to the Strait drafting room and eventually supervised pattern, foundry and machine work as well as scale design. After 11 years with Strait, Mr. Hem went to the Toledo Scale Co.'s engineering department. In 1929, he became chief engineer at Toledo, from which position he resigned to join the Howe Scale Co. at the factory in Rutland.

✦ HOWARD B. GRAVES has been appointed to the position of general manager of the D. W. Haering & Co., Inc., Chicago, Ill. Mr. Graves joined the company in 1934 as senior technologist and was formerly the St. Louis district manager. His wide background in the chemical engineering field thoroughly qualifies him for the general managership of the company.

✦ KARL KAMMERMEYER is now director of chemical and chemical engineering research for Publicker Commercial Alcohol Co., Philadelphia, Pa. Dr. Kammermeyer holds the following degrees from the University of Michigan: B.S. in chemical engineering, B.S. in mathematics, M.S.E. in chemical engineering, and D.Sc. in chemical engineering. He received the doctorate in 1932. Following graduation Dr. Kammermeyer was research associate in the department of engineering research at Michigan. From 1933 to 1939, he was employed for periods of three years each by two of the large oil companies in research and development. Until joining the staff of Publicker a short time ago, Dr. Kammermeyer has been assistant professor of chemical engineering at Drexel Institute of Technology, with which institute he had been associated since 1939.

✦ L. W. HUTCHINS, president of Sheldon, Morse, Hutchins & Easton, Inc., and director of Safety Research Institute, Inc., of New York City, has been appointed chief of the newly organized education unit in the Fire Defense Section of the U. S. Office of Civilian Defense.

✦ W. R. HUCKS, manager of the raw materials division of B. F. Goodrich Co., has been assigned to the operating division of the Rubber Reserve Co. He joined B. F. Goodrich in 1926 as a compounder in the tire division, went to the California plant in 1928 as chief chemist, later becoming technical manager of the Pacific Division. He returned to Akron in 1938 to take over his present work. He is a graduate of Georgia Tech.

✦ R. G. BOYD, now manager of planning and scheduling in the Tire Division of B. F. Goodrich Co., has been loaned to the United States Government. He has been assigned to the Allocation Division of the War Production Board. Mr. Boyd joined B. F. Goodrich in 1927 shortly after his graduation from the United States Naval Academy. After several years in the Technical Service Division he was assigned to foreign service by the company, returning to Akron from France in 1939.

✦ R. J. HULL, who is serving on the staff of the Rubber Administrator in Washington, is assistant manager of compounding in the B. F. Goodrich

Co.'s Tire Division. He came to the company in 1927 after graduating from Purdue University. After experience in the company's general chemical laboratories he was transferred to the Tire Division as a compounder.

✦ WILLIAM S. CAMPBELL, vice-president of plant operations, heads the new general staff of the Scott Paper Co., Chester, Pa. In the same organization, Charles M. Howell, who has been plant manager at Chester, will be director of staff engineering. He will be assisted by Robert C. Alexander, who has been superintendent of the finishing department. Harry M. Ostertag has been appointed to the new staff as director of mechanical development. His assistants will be Wesley S. Corbin, manager of the finishing development department, and Francis O. Boylan, paper mill development engineer. Harry Liebeck and P. D. Parsons, designers and engineers for the company will be senior consultants. Foster W. Brainard becomes staff technical director, assisted by K. W. Britt, head of the general research department. A new department, products standards, will be included in the general staff, with John B. Hay as director. Changes in the manufacturing organization include the promotion of Harrison F. Dunning to be assistant to the vice-president in charge of plant operations. He has been manager of the Glens Falls, N. Y., plant. Paul C. Baldwin has been promoted to head the Technical Division. He has been manager of pulp testing. Ralph Knoll has been promoted to assistant technical director in the Chester manufacturing organization.

Joseph C. Elgin

✦ JOSEPH C. ELGIN, chairman of the Department of Chemical Engineering at Princeton University, has received a leave of absence to enable him to join the staff of the Rubber Administrator in Washington. Professor Elgin's work will deal with chemical engineering equipment for the synthetic rubber manufacture.

✦ JOHN B. CALKIN, formerly of the Dennison Manufacturing Co., is now associated with the research depart-

ment of the Brown Co., Berlin, N. H.

✦ WALTER F. REYNOLDS, formerly of Hollingsworth and Whitney, Mobile, Ala., is now a chemist for the Dixie-Vortex Co., Easton, Pa.

✦ NEIL F. ROBERTSON, formerly of the Scott Paper Co., Chester, Pa., is now a research chemist for the Crossett Lumber Co., Crossett, Ark.

✦ IRVING A. OEHLER has been appointed chief metallurgist of the American Welding and Manufacturing Co. Mr. Oehler has been with Republic Steel Corp. in its Buffalo District, since completing his education at Rensselaer Polytechnic Institute several years ago.

✦ R. E. ZIMMERMAN, vice-president of the U. S. Steel Corp. was reelected president of the American Standards Association at that organization's annual meeting, which was held on December 11, in New York.

Lewis S. Coonley

✦ LEWIS S. COONLEY has been promoted from associate professor to the head of the Department of Chemical Engineering and acting head of the Department of Chemistry at Rensselaer Polytechnic Institute. He succeeded Dr. Albert Watson Davison, who left the Institute January 1 to direct research for the Owens-Corning Fibreglas Corp. Dr. Coonley, 39 years old, was born in Delmar and was educated at the public school in Slingerlands, Albany High School, Rensselaer Polytechnic Institute, and Massachusetts Institute of Technology. He was graduated as a chemical engineer at RPI in 1924, earned a master's degree at MIT in 1928, and a doctor's degree at RPI in 1938. He joined RPI's faculty in 1924, immediately after graduating, and has been at the Institute since, except for his year of graduate study at MIT. In addition to his teaching, Dr. Coonley has been continuously engaged in research.

✦ HERALD R. COX, formerly principal bacteriologist of the U. S. Public Health Service, Rocky Mountain Laboratory, has joined the staff of Lederle Labora-

tories, Pearl River, N. Y., as associate director of research in charge of virus and rickettsial diseases. Dr. Cox received the Doctor of Science degree from the School of Hygiene, Johns Hopkins University, in 1931. The next year he spent there as an instructor. From 1932 to 1936 he was an assistant to Dr. Peter K. Olitsky at the Rockefeller Institute of Medical Research, New York. Since 1936 he has been a member of the staff of the Rocky Mountain Laboratory.

Albert W. Davison

✦ ALBERT W. DAVISON, professor of chemical engineering at Rensselaer Polytechnic Institute and head of the department, has joined Owens-Corning Fiberglas Corp. as scientific director of its research laboratories at Newark, Ohio.

✦ WILLIAM C. CARTER has been elected president of the Link-Belt Co. For 14 years he was vice-president and for the past year executive vice-president. He succeeds Mr. Alfred Kauffmann who has resigned because of ill health.

✦ R. W. MCFARLANE, who was in the Tar & Chemical Division of Koppers Co. in Birmingham, Ala., is now in the supervisory and operation division of the Synthetic Rubber Program at the B. F. Goodrich Co. in Akron, Ohio. Mr. McFarlane is a graduate of the Chemical Department of the University of Wisconsin. He completed his work at the University in 1929.

✦ LESTER O. WIEGERT is an assistant sanitary engineer at Camp Van Dorn in Mississippi.

✦ LEW F. PORTER is chief chemist with the American Steel Foundries at East Chicago, Ind. Mr. Porter graduated from the University of Wisconsin in 1940.

✦ A. H. B. JEFFORDS, management engineer with the Trundle Engineering Co. for the past several years, has been made a vice-president. He will take over various administrative duties in the Cleveland office, specializing on war

production rules, regulations and requirements.

✦ MILTON J. DRAKE has been appointed to manage the resin department and to supervise technical sales to the paint and varnish industry by the Velsicol Corp., Chicago, Ill. Mr. Drake will establish a separate laboratory at the company's Chicago headquarters and will work largely on problems of the paint, varnish and lacquer field. He received his schooling at Lake View High School in Chicago, Culver Military Academy, Lewis Institute of Technology and the University of Illinois. Prior to joining Velsicol, Mr. Drake was employed as chief chemist with the M. & H. Laboratories, Chicago.

Robert E. Wilson

✦ ROBERT E. WILSON, president of Pan American Petroleum & Transport Co., was awarded the Perkin Medal given annually by the American Section of the Society of Chemical Industry for outstanding work in applied chemistry. The medal was awarded to Dr. Wilson in recognition of his research studies on such varied subjects as flow of fluids, oiliness, corrosion, motor fuel volatility, clay and glue plasticity, and humidity, and in recognition of his industrial contributions in the use of tetraethyl lead, petroleum hydrocarbon cracking, and adoption of chemical engineering principles by the oil industry. The award was made January 8.

✦ ADIAN G. ALLISON, former ceramic engineer of the Electro Refractories & Alloys Corp., of Buffalo, N. Y., has been appointed to the research staff of Battelle Memorial Institute, Columbus, Ohio, and assigned to its Division of Ceramic Research. Mr. Allison who holds Bachelor of Ceramic Engineering and Master of Science degrees from Ohio State University, will be engaged in a program of research in the development of new manufacturing methods for the ceramic industry.

✦ J. J. RAYTKWICH is no longer associated with the Midland Ordnance Foundation, Inc., as director of fire prevention and protection. He is now director of safety with the U. S. Rubber Co., Scioto Ordnance Plant in Ohio.

He is rejoining the U. S. Rubber Co. after an eight-months absence.

✦ JAMES A. MERRILL of Goodyear Tire & Rubber Co., Akron, Ohio, was one of ten American Production Soldiers who were honored by President Roosevelt on December 10 at the White House for their outstanding contributions to the war effort.

✦ THOMAS MIDGLEY, JR., has been chosen president-elect of the American Chemical Society. Dr. Midgley has served as chairman of the board of directors of the Society since 1934.

✦ CARSTEN STEFFENS of the technical staff of General Printing Ink Corp., New York, N. Y. has resigned to accept a position with the Solvay Process Division of Allied Chemical & Die Corp. Dr. Steffens will be located in the Laboratory at Syracuse, N. Y.

✦ DONALD M. UTESCH is now in the Chemical Department of the International Minerals & Chemical Corp., Chicago, Ill. He was formerly with Speare Supply Co., Chicago, and Armour & Co. of the same city.

✦ OGDEN FITZSIMMONS has joined the General Engineering Department of Monsanto Chemical Co. and will be located in St. Louis, Mo. Mr. Fitz-Simons was formerly with the Barrett Division, Allied Chemical and Dye Corp.

✦ W. I. GALLIHER has been appointed as executive sales manager of the Columbia Chemical Division, Pittsburgh Plate Glass Co. He formerly was director of sales.

OBITUARIES

✦ EMERY L. FORD, head of Michigan Alkali Co., died Dec. 20 after a brief illness which followed a heart attack. His age was 66. He served the firm successively as chemist, purchasing agent, secretary-treasurer, and vice president before becoming president in 1939. At his death he also was president of the J. B. Ford Co., a subsidiary of the alkali firm and the Huron Portland Cement Co.

✦ CHARLES A. KROPP, chairman of the board of the Kropp Forge Co. and the Kropp Forge Aviation Co., Chicago, passed away Dec. 17 at his winter home at Miami Beach, Fla. He was 77 years old.

✦ ALBERT KAHN passed away at his home in Detroit on December 8. Mr. Kahn will be remembered as the designer of many of our modern industrial plants.

✦ DAVID S. YOUNGHOLM, vice president of the Westinghouse Electric & Mfg. Co., in charge of the company's Lamp Division, Bloomfield, N. J., died recently from a heart attack. He was 53.

MEETINGS AND CONVENTIONS

T. A. P. P. I. and A. I. M. E. Hold Conventions During February

STANDARDS ASSOCIATION ELECTS OFFICERS

At its annual meeting, December 11, at the Hotel Astor, New York, N. Y., the American Standards Association elected R. E. Zimmerman, vice-president, U. S. Steel Corp., to serve a third time as president. George S. Case, chairman of the board, Lamson & Sessions Co., was elected vice-president, while H. S. Osborne, American Telephone & Telegraph Co., was re-elected chairman of the Standards Council. E. C. Crittenden, of the National Bureau of Standards, was elected vice-chairman. The following five organizations were elected to fill vacancies occurring on the Board of Directors: American Petroleum Institute, American Gas Association, Fire Protection Group, Association of American Railroads, and American Institute of Electrical Engineers.

BRITISH FORM JOINT COUNCIL OF PROFESSIONAL SCIENTISTS

A Joint Council of Professional Scientists, representing over 10,000 qualified scientists, has been set up under the chairmanship of Sir Robert Pickard, F.R.S., by the Institutes of Chemistry and Physics in association with representatives of British professional botanists, geologists, mathematicians and zoologists. The Council has been established to voice the collective opinion of qualified scientists on matters of public interest, to provide a liaison between professional organizations of scientists for coordinated action in matters of common interest, and in particular to concern itself with:

(a) utilization of scientists to the best advantage in service of the community;
(b) education, training, supply and employment of scientists;
(c) the better understanding of the place of scientists in the community;
(d) maintenance of adequate qualifications and ethical standards among professional scientists;
(e) supply of information and advice to the public and other bodies.

Members of the Council representing the Institute of Chemistry are as follows: Dr. J. J. Fox, president, Institute of Chemistry, Prof. Alexander Findlay, Dr. G. Roche Lynch, Sir Robert Pickard, Dr. H. A. Tempany, and R. B. Pilcher, Registrar and Secretary, Institute of Chemistry.

Representing the Institute of Physics are: Prof. Sir Lawrence Bragg, President, Institute of Physics, Prof. J. A. Crowther, E. R. Davies, Dr. B. A. Keen, Dr. H. Lowery, and Dr. H. R. Lang.

Prof. W. Brown represents the botanists; Prof. D. Keilin, the zoologists; Prof. S. Chapman, the mathematicians; and Prof. H. H. Read, the geologists.

The Joint Council has been established for the period of the National Emergency, but it may form the nucleus of some more permanent organization to facilitate the close collaboration between professional men and women practising in all branches of science.

Communications to the Council should be addressed to Dr. H. H. Lang, Honorary Secretary, Joint Council of Professional Scientists, c/o The Institute of Physics, The University, Reading, Berks.

MIDGLEY PRESIDENT-ELECT OF AMERICAN CHEMICAL SOCIETY

Dr. Thomas Midgley, Jr., vice-president of The Ethyl Corp. and internationally known for his discovery of tetraethyl lead, has been elected president of the American Chemical Society for 1944. Dr. Midgley, who is active in furthering wartime research projects, took office as president-elect on Jan. 1, 1943, while Dr. Per K. Frolich, director of the Chemical Division, Esso Laboratories of the Standard Oil Development Co., Elizabeth, N. J., becomes president, succeeding Dr. Harry N. Holmes, head of the department of chemistry at Oberlin College.

The new president-elect was chosen by the Society's Council from four nominees receiving the largest number of votes in a national mail ballot of the Society's approximately 32,000 members. Dr. Walter A. Schmidt, president of the Western Precipitation Co., Los Angeles, Calif., was elected a director-at-large to succeed Dr. Midgley. Dr. Leason H. Adams, the Geophysical Laboratory, Carnegie Institute of Washington, and Prof. Robert E. Swain, Stamford University, were re-elected regional directors.

New coucilors-at-large are: Dr. M. L. Crossley, director of research, Calco Chemical Division, American Cyanamid Co., Bound Brook, N. J.; Prof. Vincent du Vigneaud, head of the department of chemistry, Cornell Medical College, New York; Dr. W. Albert Noyes, Jr., professor of physical chemistry, University of Rochester; Prof. R. L. Shriner, chairman of the department of chemistry, Indiana University, Bloomington, Ind.

Dr. Midgley has won recognition for discoveries which are outstanding both from the standpoint of pioneering in new fields and from the standpoint of commercial importance. His discovery in 1922 of tetraethyl lead as an antiknock agent was made after he and his collaborators in the General Motors Research Laboratories had tried more than 33,000 different chemical compounds without success. He has also contributed largely to the knowledge of the chemistry of rubber and the methods of synthesizing rubber. With Dr. Albert L. Henne, Ohio State University, he developed the organic chlorofluorides which have become widely used as non-flammable, non-toxic refrigerants. He has been associated with developments connected with the recovery of bromine from sea water.

Dr. Midgley has also been awarded the Priestley Medal of the American Chemical Society, the William H. Nichols Medal of the Society's New York Section, the Perkin Medal of the Society of Chemical Industry, and the

CALENDAR

JAN. 25-26	Compressed Gas Manufacturers Association, 30th annual meeting, Waldorf Astoria, New York, N. Y.
JAN. 25-29	American Institute of Electrical Engineers, Winter Convention, New York, N. Y.
FEB. 14-18	American Institute of Mining and Metallurgical Engineers, 157th annual meeting, New York, N. Y.
FEB. 15-18	Technical Association of the Pulp and Paper Industry, Commodore Hotel, New York, N. Y.
APRIL 7-10	The Electrochemical Society, 83rd meeting, Hotel Roosevelt, Pittsburgh, Penna.

Longstreth Medal. Wooster College conferred the honorary degree of doctor of science upon him in 1933. Dr. Midgley is vice-president of Kinetic Chemicals, Inc., chairman of the Board of Directors of the American Chemical Society, and vice-president of Ohio State University Research Foundation.

MIDWEST POWER CONFERENCE BEING PLANNED

STANTON E. WINSTON, director of the Midwest Power Conference, has revealed that plans are now being made to hold a 1943 conference, as usual. C. W. Kellogg, president of Edison Electric Institute, New York, will be the keynote speaker, while Col. J. L. Walsh, war chairman of the American Society of Mechanical Engineers, will be the speaker at the "All-Engineers' Dinner." His topic will be "Logistics, the Science of Survival."

Dates for the 1943 Conference will be April 9-10, and the place, as usual, will be the Palmer House, Chicago, Ill. All discussions and talks will be centered around wartime power problems. Complete announcement of the program will be made at a later date.

WILSON RECEIVES PERKIN MEDAL

THE PERKIN Medal for 1943 was presented January 8 to Dr. Robert E. Wilson, president of Pan American Petroleum and Transport Company, at a joint meeting of the American Section of the Society of Chemical Industry, the American Institute of Chemical Engineers, the American Chemical Society, the Electrochemical Society and the Societe de Chimie Industrielle. Dr. Foster Dee Snell presided. Dr. Thomas Midgley, chairman of the Board of the American Chemical Society, a lifelong friend of the medallist, revealed interesting anecdotes of his personal life, and Dr. Walter G. Whitman of the Chemical Branch of the War Production Board, spoke on the medallist's technical accomplishments. The medal is awarded annually by the American Section of the Society of Chemical Industry for outstanding work in applied chemistry.

In Dr. Wilson's speech, which followed his acceptance of the medal, he discussed current misunderstandings and misrepresentations with regard to our patent system. He considered in detail various criticisms of and changes proposed in our patent system, and analyzed the probable effect on various types of industrial research of possible drastic changes in patent policy. He urged that our scientists take more part in educating the public as to the nature and value of our patent system.

Dr. Wilson's experience eminently qualifies him to speak with authority on this subject. He is the inventor or co-inventor of ninety patents in a variety of fields, having successively been Director of Research at M.I.T. for four years, a research director in the Chemical Warfare service for two years, Research Director and later in charge of development and patents for the Standard Oil Company of Indiana, and for the past six years the President of Pan American Petroleum and Transport Company which is on the royalty-paying side of the fence. In his recent part-time position as director of General Aniline and Film Corp., since its seizure by the Alien Property Custodian, he has become familiar with foreign patents.

SELECTIONS FROM CONVENTION PAPERS

CHEMICAL INDUSTRY AND THE SALVAGE CAMPAIGN

TOO MANY executives in chemical plants simply assign a foreman to the job of collecting pieces of pipe and waste paper lying around the premises. Instead, they should give the job its due importance by assigning someone with authority as salvage supervisor. This person should have the authority to put into the scrap heap standby equipment that is no longer needed or used, instead of relying upon stray pieces of pipe and other metal.

An interesting story has been told about the old Brandywine powder mill, the ancestor of all the duPont's powder mills. The official in charge of the salvage campaign for the company looked around this old mill and found among other obsolete machinery 28 enormous iron wheels which weighed 7.5 tons each. These had been used to grind ingredients of the powder on a cast iron plate weighing 10 tons. They first made powder for the American troops in the War of 1812. Now the 350 tons of iron are serving again, this time as much-needed scrap.

Iron and steel consuming industries must keep in mind that the salvage campaign is not for the sole purpose of assuring a supply of metal for the manufacture of airplanes, tanks and ships. It also serves to keep *them* supplied with equipment required for the operation of *their* plants. It would probably be wise if more chemical concerns looked at the salvage campaign with this personal, semi-selfish attitude.

Management should also be reminded that today scrap is a commodity, a by-product that we cannot afford to throw away. In one medium-size chemical plant in New Jersey the company found that its salvage furnished benefits over and above putting the waste material to work against the Axis. In a report recently sent to the vice president of the company, the engineer in charge of the program was able to show that the program had saved the company over $9,000 a year.

In a rubber mill in the same state, scrap in the first six months of the drive reached a million pounds. It included cast iron and steel, lead, cop-

per, brass, aluminum, burlap and rags.

A summary of scrap sales of the Pittsburgh plant of a certain company showed sales for 1941 amounted to $1,500,000. In the company as a whole scrap sales amounted to $2,500,000. This is all in addition to the materials for which uses were found within the company's own plants.

Solvents such as acetone, toluol, ethyl acetate, alcohol, carbon tetrachloride are used in processing smokeless powder, synthetic resins, rubber products, oils, etc. These solvents are generally vaporized into the air during processing. In some cases they are used for washing and are discarded when too dirty. Hence there are two problems of salvaging solvents: in one case the solvent vapors must be collected and processed, and in the other the dirty solvent must be cleaned and re-used.

Over one billion pounds of vaporized solvents will be recovered annually in equipment now in operation or to be placed in operation within six months. Another billion pounds are now going to waste that might be recovered.

In the fabrication of plastics there is a large percentage of waste material. Nothing can be done to salvage the thermosetting resins. In the case of thermoplastics, which amount to about half of all plastics produced, measures have been taken to recover the scrap. The thermoplastics can be remelted and reworked with little loss in quality.

Glycerine has long been a by-product of the soap industry. However, normally a small percentage of glycerine is left in soap due to the fact that it is not economically feasible to remove it. With the war demanding ever-increasing amounts of glycerine, it has now become essential to recover the last drop of this chemical from soap.

Another example of waste utilization is the sewage treating plants which are salvaging large volumes of fertilizer materials and gas for driving engines.

James A. Lee, Managing Editor, *Chem. and Met. Eng.*, New York, before the National Conference of Business Papers Editors, New York, Dec. 11, 1942.

LAMINAR FLOW OF OIL-COAL SUSPENSIONS

SUSPENSIONS, such as pulverized coal in fuel oil, may exhibit either viscous or plastic flow properties depending upon the concentration of suspended material. If the concentration is below a certain definite value, viscous flow will be encountered.

Methods are presented for predicting the critical concentration which demarcates the viscous suspension from the plastic type. This critical concentration is practically identical with the concentration at which zero-fluidity occurs on a fluidity-concentration chart.

The following modification of the Hagen-Poiseuille Law has been formulated:

$$\frac{H}{L} = \frac{V\mu_o}{D^2\rho_o}\,\frac{K_o}{K_o - C_o}$$

Where K_o is an empirical constant corresponding to concentration at zero-

fluidity, and C_v is percentage suspended material by volume.

The equation has been corroborated for suspensions of coal-in-oil up to 40 percent by weight of coal concentration, and enables one to predict friction losses in pipe in laminar flow of suspensions from such data as concentration and characteristics of components making up a suspension, velocity of flow, and pipe dimensions.

F. J. Gradishar, Westvaco Chlorine Products Co., South Charleston, W. Va., W. L. Faith and J. E. Hedrick, Shell Oil Co., Martinez, Calif., before the American Institute of Chemical Engineers, Cincinnati, Ohio, Nov. 16–18, 1942.

ION-EXCHANGE RESINS

It was first in 1935 that two English chemists, Adams and Holmes, announced that synthetic resins could be utilized in an application based primarily upon their *chemical* instead of their physical properties. They discovered that certain polyhydric phenol-formaldehyde resins, when polymerized to the insoluble "C" stage, would exhibit the phenomenon known as base-exchange. Use of these ion-exchange resins has presented a significant advance in the field of water purification. For the first time it is possible to remove all dissolved salts from water by chemical reaction alone to give a product comparable in quality with laboratory distilled water.

During the early stages of development, many persons familiar with exchange materials suggested that although the resinous compounds did exhibit extremely high initial capacity, they might behave as do the gel zeolites to give a gradual decrease in capacity as the number of cycles increased. Experimental work has proved conclusively that the high original capacity is constant despite the number of cycles. Further experiments in which exchangers which had undergone 150 cycles were operated under varying salt values prove that the chemical reactivity and efficiency are unimpaired.

The following is an example of a boiler feed water supply system that has been operating on a commercial unit. A 12 cu.ft. IR-4 unit operating in conjunction with a hydrogen exchanger has been in constant operation for almost a year, and is giving excellent results as shown by the following comparison:

	Raw Water Grains per	Treated Water U. S. gal.
Calcium Bicarbonate...	19.0	0.0
Magnesium Bicarbonate	0.2	0.0
Sodium Bicarbonate....	0.0	trace
Magnesium Sulphate...	7.4	0.0
Sodium Sulphate.....	8.8	0.0
Sodium Chloride.....	1.6	0.0
Total	37.0	0.5

In these operations, 25 lb. Na_2CO_3 (as 4 percent solution) is used per cu.ft. of anion exchanger and 3 lb. 66 Be H_2SO_4 (as 5 percent solution) is used per cu.ft. for regeneration of the cation exchanger. The unit operates at a rate of 5 gal. per sq.ft. per min., and the average T.D.S. of the water throughout the entire run is 6 p.p.m.

The product is at least equal in quality to the condensate used previously. Figuring H_2SO_4 at two cents per lb., and Na_2CO_3 at one cent per lb., the chemical operating cost is approximately 27 cents per 1,000 gal. water.

It should be pointed out that low capacities were obtained for the IR-4 unit at first. A consideration of the various factors showed that the rate of regeneration was too high, and when this was corrected, capacities ranging from 45,000-60,000 grains (as $CaCO_3$) per cu.ft. were obtained. The importance of controlling flow rate during regeneration cannot be overemphasized.

The case of a certain boiler feed supply is very interesting. This unit has been in operation for over nine months. Identical 32 cu.ft. (4 ft. dia.) units were obtained and one filled with Amberlite IR-1, the other with a carbonaceous exchanger. Identical conditions were maintained by strict control. It was planned to obtain a comparative evaluation of these two products under usual industrial operating conditions. The following table shows the summarized operating data over the nine month period.

Carbonaceous Exchanger

Runs	Salt Value	Capacity	Average Capacity
1–25	0.55–1.04	3,090–5,570	4,600
26–53	0.41–0.67	5,450–8,400	7,200
54–106	0.53–1.10	3,980–7,050	6,500

Amberlite IR-1

Runs	Salt Value	Capacity	Average Capacity
1–25	0.38–0.74	4,460– 9,500	7,500
26–45	0.36–0.60	7,260–13,400	10,100
46–83	0.45–1.20	5,900–13,600	9,500

It might be assumed from these figures that constant variation in capacity occurred and that the operation of both exchangers were decidedly erratic. Such was not the case, and the complete data show that there were periods of very constant operation for both products. However, during these periods in which constant salt values were maintained, the capacity of IR-1 was always approximately double that of the carbonaceous exchanger operating under identical conditions.

This case is cited because it proves a very important point with respect to Amberlite IR-1. Due to a breakdown in the prefiltration equipment, large quantities of mud and alum floc passed into the beds. Inspection of the units showed that a layer of sediment 3-6 in. deep had been deposited on the surface, and that the beds were contaminated throughout. Because of insufficient headroom, the beds could not be cleaned by backwash and the capacity (at the same salt value) dropped 50 percent. The beds were therefore partially emptied, the exchangers washed by decantation, and normal operating technique resumed. The capacities returned to their previous values, proving conclusively that the very unsuitable operating conditions had not caused any permanent injury.

When it is realized that passage of an aqueous solution through beds of IR-1 (hydrogen cycle) and IR-4 results in *complete* removal of soluble salts,

the possible fields of application become apparent. Judging from response to this new development, there is scarcely a major industry in which there are not applications for the Amberlites. Unfortunately, however, this work is still in the development stage, and any specific information released at this time would undoubtedly be premature.

Much testing is being undertaken and some of the developments have already reached the semi-plant scale. Typical of these applications is the "desalting" of aqueous solutions of carbohydrates, formaldehyde, gelatin, etc. In these cases, dialysis is often the only alternative. The low cost and high efficiency and throughout of ion exchange processes employing synthetic resins have made them of real interest.

R. J. Myers, Resinous Products & Chemical Co., Philadelphia, Pa., before the Buffalo Section of the American Chemical Society, Nov. 17, 1942.

SUPPLY AND DISTRIBUTION OF SYNTHETIC RESINS

CELLULOSE ACETATE plastics are now controlled by mandatory order No. M-154, which has been satisfactory. It has been reported that this material is in relatively free supply, and that Class III uses can be supplied in full. Production of cellulose acetate butyrate has increased during the last few months. It is estimated that supplies are sufficient to meet all military and civilian uses now alloted under the existing order.

However, the shortage of ammonia for nitric acid, the allocation of nitrocellulose (because of the acute short supply situation) and the increasingly large demands for solvents and plasticizers will tend to decrease the production of less essential items in cellulose nitrate plastics.

Methacrylate Resins—The monomer is currently produced by two chemical companies and the bulk of the production is used for military aircraft in bomber noses, turret tops, domes, and other special equipment. A limited amount is being used for molding powder, water-proofing of certain military jackets, and special chemical warfare items. Plans are going forward for an expansion of monomer capacity to about 141 percent of present production and for cast sheet capacity to 180 percent of present production.

Limitations on expansion of methyl methacrylate resins are mainly in the equipment field, since large amounts of stainless steel are required. Supply of this resin for all civilian uses, with the possible exception of dentures, has disappeared entirely. Expansions now under way will not be in production before September, 1943. Therefore no relief is expected during the next year.

Vinyl Polymers—Polyvinyl chloride and vinyl chloride co-polymers are the most important of the vinyl group in the war effort. Large quantities of these resins are used to replace rubber and even in many products where rubber is not satisfactory. Approximately 12,000,000 lb. of these resins were used

as rubber substitutes during the first six months of this year, and the resulting saving in rubber might be conservatively estimated at 18,000,000 lb. Production of these resins in the United States can be divided into those containing 92 percent and more vinyl chloride, and those with less than 92 percent vinyl chloride. Production capacity of those over 92 percent vinyl chloride will soon reach an annual rate in excess of 25,000,000 lb. per year. Principal direct war uses for this grade of resin are for wire in cable insulation for shipboard use, special sheetings for aircraft accessories, and certain tank linings where the lower molecular weight resin material is not satisfactory.

Principal uses of the low molecular weight resins are for the conventional rigid sheetings for aircraft windshield and cockpit covers, plotters and computers; proofed goods, including Army raincoats, special plane paulins, engine covers, field bags, etc. The material is also being used in certain chemical tank linings, special protective paints and paper coatings. Only the most essential civilian products are being allowed, and it is the opinion that war products will require increasing amounts in the next several months.

There are definite limitations on the expansion that can be made in manufacturing capacity for vinyl resins, as large amounts of acetylene and chlorine are required as raw materials and the reactions must be handled in stainless steel equipment. Likewise, an increased tonnage of resin will require a corresponding increase of plasticizer in order to make the resin useful as a rubber substitute.

Vinyl Acetate—These materials are used not only in an intermediate stage for manufacture of polyvinyl alcohol, polyvinyl acetals, and vinyl chloride copolymers, but has recently become a commercial resin, where it is generally used in the form of polyvinyl acetate water emulsions or alcohol solutions.

Current production will not begin to take care of the important war uses, which include the production of sulfa drugs, as well as the polymers already mentioned. It is estimated that approximately 7 percent of the current production must be diverted to manufacture of sulfa drugs.

There are four major producers of polyvinyl acetate, whether in emulsion or alcohol solution. These are being used for adhesives in the bonding of textiles, paper, cork, leather, etc., usually by heat sealing; they are also used in the manufacture of printing inks, textile sizing adhesives, and special coatings. Recent large demands have come in for use of these resins for sealing compounds, food packages, shoe cement and impregnating compounds, and ammunition boxes. There is not enough raw material for the producers to run to capacity, thus only direct war products can be supplied.

Polyvinyl alcohol, a large consumer of vinyl acetate, enters into production of direct war products, such as special

linings, solvent-resisting tubing, textile finish, paper specialties, and film. There are several potential war items which may require a large volume of this resin. There is no indication that the material can be made available for civilian items in the immediate future.

Vinyl acetate is a principal raw material used for the manufacture of acetal resins such as "Formvar," "Butvar," "Butacite," and "Vinylite X." The bulk of vinyl butyral was formerly used as a plastic in safety glass manufacture. Even though this use has been greatly reduced because of the decline in civilian automotive production, there is now a large demand for this resin for the manufacture of several war products.

The two most widely produced resins are polyvinyl formal and polyvinyl butyral. The latter resin is plasticized and compounded on conventional rubber equipment for fabrication of raincoats and similar products. Some of the other major uses for the acetals are special wood impregnators, wire insulation, fuel tank liners, army fabrics of all types, gas masks, shatterproof glass, protective cover, and laminating cement for sealing special envelopes and packages. Approximately 43 percent of the present vinyl acetate production is being diverted to production of acetal resins.

Main restriction on larger production is the supply of acetate monomer. Present requirements for this monomer are about 131 percent of the production capacity, and this will rise to 200 percent by March, 1943, because of direct war requirements. As already indicated, an expansion in monomer capacity is under way. It appears that we will have facilities available by the middle of 1943 in an amount equal to 180 percent of the present production.

Polystyrene—The synthetic rubber program calls for considerable expansion in the styrene production facilities for the manufacture of Buna S. It has been announced that approximately 200,000 tons of monomer styrene will be produced in seven plants. The only future uses of polystyrene that can be allowed will be similar essential items, including electrical insulation, special coating requirements, and instances where the material is a substitute for rubber.

Urea Formaldehyde—Distribution of urea formaldehyde and melamine formaldehyde materials is controlled by G. P. Order M-25. Both are adequate in supply to take care of military and essential civilian needs. However, growing demands of ammonia for other military products might cause a further reduction in availability of urea for less essential civilian applications. There is a growing demand for the melamine resins which indicates this grade might possibly be restricted to necessary military items.

Frank Carmen, Chief, Plastics & Synthetic Rubber Section, War Production Board, before the Society of The Plastics Industries, fall meeting, Rye, N. Y., Oct. 13, 1942.

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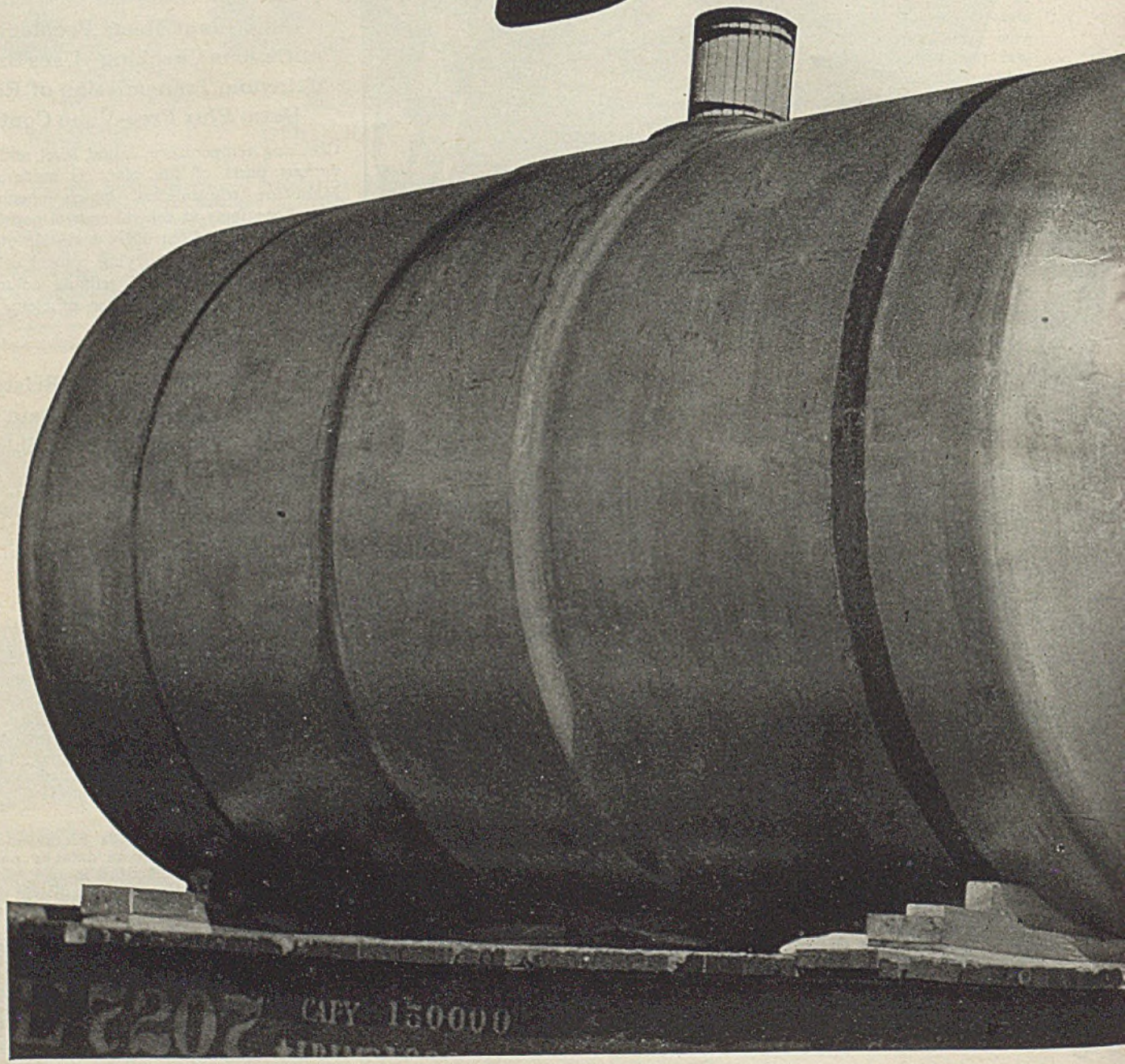

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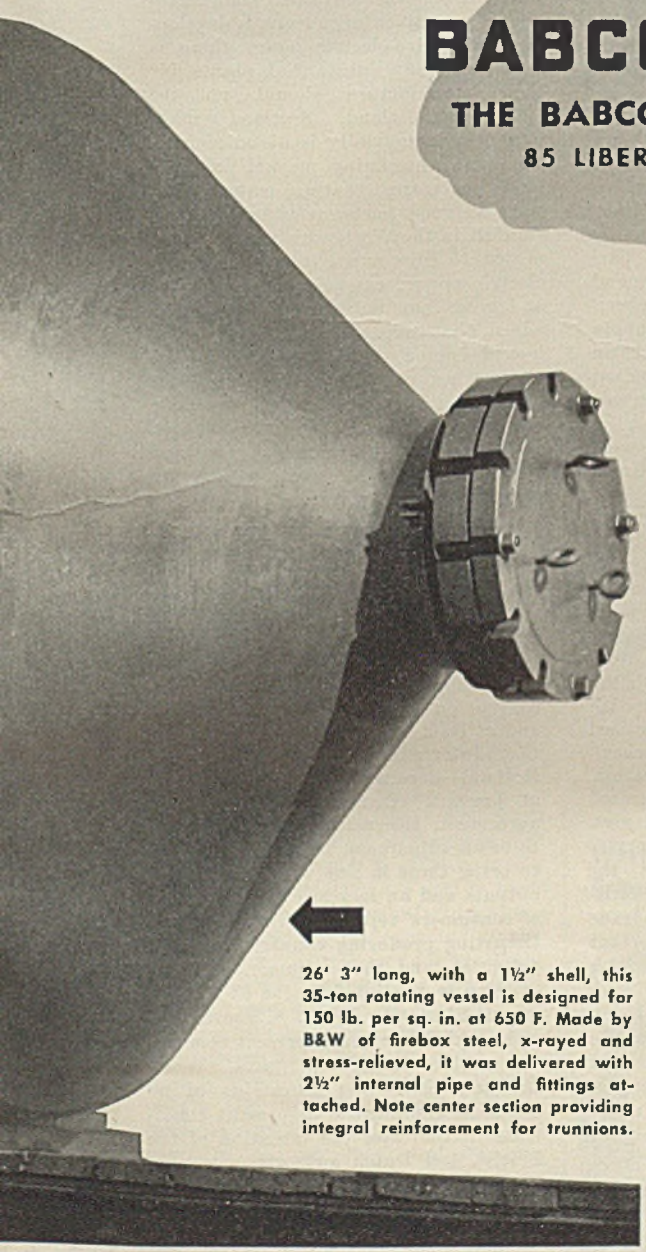
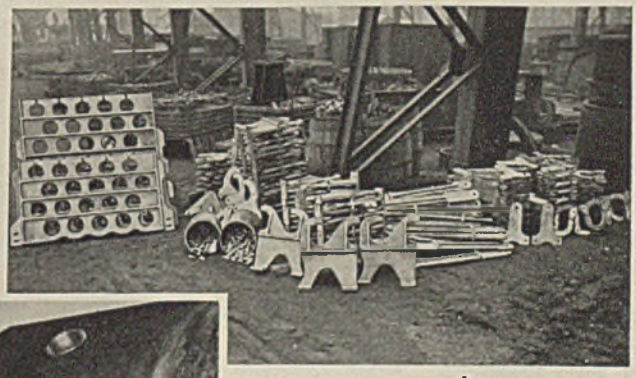
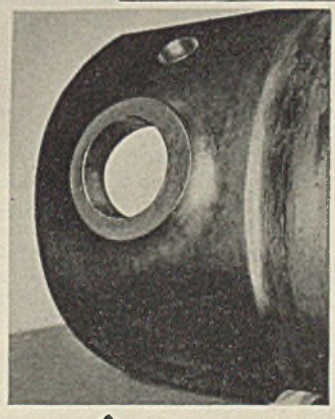


26' 3" long, with a 1½" shell, this 35-ton rotating vessel is designed for 150 lb. per sq. in. at 650 F. Made by B&W of firebox steel, x-rayed and stress-relieved, it was delivered with 2½" internal pipe and fittings attached. Note center section providing integral reinforcement for trunnions.



These B&W Tube Support Castings for an oil heater furnace are part of an eleven-thousand-pound order, all of 25% chrome, 12% nickel alloy. More than two million pounds of tube support castings have been furnished by B&W for service at temperatures as high as 2000 F. No service failures have been reported. B&W also furnished all related links, bolts, nuts, etc.



This 17"-diameter Streamlined Opening, made by the B&W Pushout Method from 6¾" plate, is welded into a 66"-diameter shell, designed for a working pressure of 1475 lb. per sq. in. B&W Streamlined Openings reduce stress concentrations, permit lighter weight with safety.

S-34-T

NEWS FROM ABROAD

WARTIME CHANGES IN BRITISH CHEMICAL TRADE OPEN NEW PROSPECTS FOR THE FUTURE

Special Correspondence

AFTER more than three years of war the situation of the British chemical industry has, of course, altered greatly in comparison with pre-war conditions. The recent report of the Association of British Chemical Manufacturers deals only with a few of the major problems created by these changes. The labor question has assumed a different aspect since the chemical industry was scheduled as a vital munitions industry in December, 1941, a measure which places restrictions on the employers' and employees' right to end their employment. With the growing labor shortage, special attention has been directed to the part-time employment of women as the main remaining source of labor. Members of the A.B.C.M. have been encouraged to keep their association informed of their development plans in order to avoid duplication of production effort, particularly in the heavy and fine chemical sections of the industry. The fine chemical industry has been able to supply the needs of the country to such an extent that very few products indeed have been referred to the scheme for production in university laboratories, etc., on the grounds that they were essential and yet not made in Great Britain.

The organization of the tar industry in respect of its ability efficiently to meet post-war problems is receiving special consideration, and a survey is being made with a view to co-ordinating policy throughout the industry. This survey, though at present limited to the tar industry, is in line with the general trend of thought in the British chemical industries. It is being realized that the whole structure of the chemical industry needs reconsideration. The question is whether it is organized to operate on a basis which will give, after the war, the most efficient service to the community at home and, the Association report continues, a satisfactory contribution to the export trade of the country. Other important changes in the status of the British chemical industry result from geographical changes. The policy of dispersal of production and the preference given to some previously neglected areas has generally resulted in a lengthening of transport routes and other problems, especially in the supply of labor, but it has also helped to open up certain new sources of power and raw materials. Lord McGowan, chairman of Imperial Chemical Industries, Ltd., recently outlined the consequences of these changes for Scotland.

Hydro-Electric Chemicals

Cheap carbide, produced with hydro-electric power,—which is one of the outstanding wartime developments of British chemical industry—will in Lord McGowan's view almost automatically open up a widened field of plastics and solvents in Scotland. Other possibilities are pharmaceuticals and ferro-alloys, and given an adequate development of hydro-electric power there is no reason why substantial plants for their manufacture should not be located in Scotland. Scotland's main weakness industrially is distance from the main consuming market in England; but against that are many assets, such as good ports, reasonable heavy rainfall in the West, which can be harnessed to give much increased hydro-electric power, extensive coal supplies and good communications. It may be added that Great Britain has so far lagged behind other countries in the electro-chemical industries because hydro-electric power is not available near the principal industrial centres. It is the great advantage of Scotland that it can rely on a cheap production of hydro-electric energy.

Of potential rather than actual interest is the announcement that a new International Tin Agreement has been signed by the British, Dutch, Belgian and Bolivian Governments. Of the signatories of the old agreement, France and Siam are missing. but this is of little importance as there is no intention to enforce restriction at present and at least one of the members of the new International Tin Committee—Holland—does not dispose of an output at present. Compared with the old agreement, the main difference seems to be an adjustment in standard quotas to bring these in line with recent peak outputs and an increase in the number of consumers' representative. The participating producing countries send 17 delegates, and the consumers 3. One of them is appointed by the U. S. Government, another by U. S. consumers, and a third one will represent consumers outside the United States. While the new restriction scheme is of no practical significance in present conditions, it indicates the intention of the British and Dutch authorities to continue with this form of commodity control, and if the U. S. Government sends a delegate to sit on the new com-

mittee, it would seem that Washington does not disapprove of restriction in principle.

Oils and Fats Purchases

Another development in the field of chemical raw materials which has aroused some interest in Great Britain is the arrangement under which Great Britain and the United States have become exclusive buyers of all oils and fats available to the United Nations. The British authorities will be the only buyers of animal fats in Argentina and Uruguay, of oilseeds, oils and fats in countries belonging to the British Commonwealth, and in Fighting French Africa and the Belgian Congo. Normally Great Britain depends upon imports for about 95 percent of the oils and fats supply. Another field of cooperation between Great Britain and the United States is provided by Lease-Lend shipments of pharmaceutical products. The British Chemical and Dyestuffs Traders' Association which was appointed as agent for the Ministry of Supply for the distribution of American Lease-Lend pharmaceuticals will shortly distribute the following products at the mentioned prices: Amidopyrine at 25-29 s., barbitone at 40-46 s., benzocaine at 32 s. 6 d.-37 s. 3 d., pancreatin at 25-29 s., peptone (U.S.P. IX) at 12 s.-14 s. 6 d., phenazone at 14 s.-17 s. 3 d., phenobarbitone at 44 s.-50 s. 6 d., pot. guaiacol sulphonate at 11 s.-13 s. 6 d., theophyline at 50-57 s., urethane at 5 s. 6 d.-7 s. 3 d., carbromal at 45-51 s., and pepsin (1/10,000) at 48-54 s., all in imported containers for 28 lb.-7 lb. parcels.

The supporters of a synthetic rubber industry in Great Britain continue their campaign, but the Government has not altered its negative attitude with regard to synthetic rubbers of the Buna, Butyl and Neoprene types which, it was stated, are to be left to the United States for production there. From the questions in the House of Commons it would, however, appear that there is one type of synthetic rubber which is to be made in Great Britain, possibly a product resembling Thiokol, and the authorities have also encouraged experiments with rubber-yielding plants like the Russian Koksagyz seeds of which have been planted in various parts of England and Scotland and sent to Empire countries. As far as synthetic substitutes for quinine in the treatment of malaria are concerned, active steps are said to have been taken for their manufacture. Actually the productive capacity of the British chemical industry for synthetic anti-malarials has increased immensely in the years leading up to 1942, but an even greater effort is required. Another substitute product which has grown greatly in importance is saccharin. Its production now is 25 times what it was before the war, and yet there is still an unsatisfied demand, but the Government has been unable to hold out any prospect of a further increase because the raw materials are required for more essential purposes.

Production of Barytes

The production of barytes in Great Britain has greatly increased as a result of the interruption of foreign imports, but in the view of the British Barytes Producers' Association there seems to be little prospect of still further increase in the output of barytes or of opening-up new mines. It is intended to ask the Government to make a survey of the national barytes resources and to adopt reasonable measures which will ensure that they can be developed without excessive risk of loss of capital. More contact between members of the Association is also considered desirable, and considerable progress in this direction has been made during the past year. A desire for a greater measure of cooperation between producers of the same material is expressed in various sectors of the British chemical industry. Comparison of methods, conditions and costs and collaboration and division of labor in the field of research are regarded as necessary, and good results have been obtained where cooperative measures have been taken in recent years.

A chemical raw material which, though not found in the British Isles, has made great progress during wartime is asbestos. The short fibers are incorporated in plastics and asphalt, and asbestos millboard is finding an important outlet in shipbuilding and for other construction work. As a sound absorber asbestos was used in the subway before the war, and while this work has not been proceeded with since, there has been progress in asbestos-rubber combinations and asbestos wrappings for goods to meet special climatic conditions. Asbestos-lined funnel vats have been developed for reclaiming waste oil; for sewage new asbestos products have been used, and asbestos linen and asbestos felt are believed to permit improved storage of fruit and other products. Linings of axle-bearings can be made of asbestos-cotton cloth, possibly with an addition of metal fibers to give increased tensile strength.

An interesting new development is the addition of a trace of chlorine gas to the circulating water of steam condensers in power stations. An experiment of this kind was carried out with success in order to prevent organic growths in the tubes. It is stated that this treatment is now in use in various power stations, and the coal saving resulting from it every year is estimated at 250,000 tons. This is just one of many new measures taken with a view to economies in the consumption of coal. There is no doubt that chemical engineers can make a very useful contribution to this vital question, and efforts are being made to save fuel in many chemical and other industrial plants by use of suitable chemical products such as water softeners, food preservatives (to shorten drying time), etc. These efforts, though directly attributable to wartime needs, are bound to have a very important bearing on post-war development.

GERMANY SEEKS DUTCH CAPITAL FOR DEVELOPMENT OF INDUSTRIES IN EASTERN EUROPE

Special Correspondence

EDITOR'S NOTE: *Cut off from direct correspondence with all except a few foreign sources in neutral countries, these notes interpret recent developments in continental Europe as reported in publications and official documents received in the United States. These monthly letters, prepared in this country, will be continued only so long as pertinent material of interest to American chemical industry is available for our comment and interpretation.*

SINCE the Netherlands are cut off from overseas possessions and sources of raw materials, Germany has been trying to enlist Dutch interest and capital in the development of Eastern Europe. The Germans have been advertising the newly formed Nederlandsche Oost Compagnie, capitalized at 2.5 million Gulden, and subscribed partly by the Nederlandsche Bank and guaranteed by the provisional government, as similar to the historical Dutch East and West Indies Companies. Last summer the heads of the new company —its president is also president of the Nederlandsche Bank—were invited by Eastern Commissar Alfred Rosenberg to make a study trip to eastern occupied areas to see where idle Dutch capital might be invested to develop resources of that part of Europe.

In peacetime many Netherlands industries were entirely dependent on raw materials imported from colonial areas and processed in the motherland. Quinine, former Dutch monopoly, was a striking example, with most of the cinchona bark coming from the Dutch East Indies being processed into finished quinine products in a few factories in the Netherlands and western Europe. Other branches of the Dutch pharmaceutical industry were likewise dependent on West and East Indies raw materials and drugs. For the past two years they have been attempting, not too satisfactorily, to shift over to substitutes and raw materials available in Europe. N. V. Koninklijke Pharmaceutische Fabrieken v.h. Brocades-Stheeman & Pharmacia reports that although its factory at Meppel is operating fairly normally, its plant at Nimwegen has been experiencing considerable difficulties with raw material supplies and substitutes.

Belgian industries, especially copper refineries, now cut off from raw materials from the Belgian Congo and overseas, are suffering similar difficulties. A different problem is presented in some cases where subsidiaries in occupied territories have been seized or purchased from western European parent companies. Thus, Schneider-Creusot, French armament combine, which lost its holdings in eastern Europe and the Balkans, has invested idle funds in domestic French industry. Recently it obtained control of the 10 million franc Etablissements Barbet, which makes chemical apparatus and operates several distillation plants.

France's raw material position in oil is similar to that of Belgium and Holland in other materials. Easy access to petroleum imports and large domestic refining capacity put France in a better oil position than most European countries before the outbreak of war. To be sure, plans for making synthetic oil from lignite, shale, and oil residues, had been made, but the motivation for putting them into effect was lacking. Now that most of the French oil refineries are either closed down or working only part-time on domestic substitutes, synthetic oil plans are being carried out. A new 25,000 ton synthetic gasoline plant, using a French modification of the Fischer-Tropsch process and treating lignite, is being built near the Mediterranean. This location should make utilization of mineral oil residues and distilling of imported natural oils possible after the war.

Raw Materials in France

German occupation of the whole of France will probably result in further efforts to develop projects for utilizing domestic raw materials, especially since France is now cut off from its North African sources of phosphate rock, vegetable oils, leathers, etc. Expansion of the French electrochemical industry, based on hydroelectric power, was one of the main points of the French 10-Year Plan started a year ago. Synthetic fiber production is being pushed by the new Franco-German syndicate, and even fully synthetic nylon is now being manufactured on a small scale by the Soviete des Usines Chimiques Rhone-Poulenc in a plant near Lyons.

On the other hand, the possibility of Allied invasion of France from Africa may discourage further plans to develop French industries. Recently some small and medium-sized French plants were reported to have been dismantled and set up in eastern Germany. The current position of different branches of the French chemical industry varies considerably in accordance with easy availability of raw materials and the correlation of a given plant's production program with German military needs. Where French chemical plants have been shut down, Germany has attempted to transfer skilled French workers en masse to German plants. I. G. Farben, for instance, reports that it plans to employ 7,000 skilled French workmen in its plants.

Lorraine cokeries and three other French coking plants under the administration of the German Commissar are marketing their output of ammonium sulphate through the German ammonia sales syndicate. Since allocations of sulphuric acid have been limited, they

are trying to produce as much ammonium sulphate in the cokeries as possible with a minimum of sulphuric acid.

Cartels and Syndicates

In connection with sales syndicates and cartel arrangements, which are very numerous within the Reich chemical industry, the decree of the German Price Commissar of July 27, 1942, is now being put into effect. It required that all cartelized prices be examined for reduction, the extent of which would be determined by the Government. Difficulties in setting prices in the chemical industry arise from the fact that some item may be the chief product in one plant and only a by-product in another and would be assessed a different production cost. Some ready examples are soda ash, hydrochloric acid, sodium sulphate, ammonium sulphate, etc. In general, a committee representing cartel members and the price commissioner is determining costs of the most efficient plants, giving some consideration to the domestic raw material situation in the case of synthetics or recovered waste products, or new processes, and also to the relative importance of other products produced by the same company.

Within the limits of possible complaint in the Reich, spokesmen for the chemical industry are warning in technical journals against the danger of too arbitrary price setting. The government's answer is the same as it was a few years ago when it cut fertilizer prices to stimulate agricultural production. At that time it stated that the increased turnover—which, as a matter of fact, actually did result—would offset the effect of lowering prices. Judging from the reported earnings, with allowance being made for complex bookkeeping transactions to cover taxes, unprofitable new products, new uncertain investments in occupied territory, etc., at least the larger chemical concerns seem better off than many other German industries.

In the past year numerous smaller chemical plants have been shut down in the course of rationalizing and concentrating production for lack of transportation, labor, raw materials, or indirectness of war contribution. Cosmetics producers, for example, have gone out of business in large numbers. Whereas 1,600 firms were engaged in the manufacture of cosmetics in the Reich before the war, the number of firms now officially entrusted by the Reich Office for Chemistry to manufacture toilet preparations is less than 100. Similarly, there are now 300 German factories producing lacquers as against 900 at the beginning of the war. Many of the smaller plants now being shut down may never reopen because in some cases whole plants have been scrapped for iron and metals under the intensive drive carried out last summer and autumn under the direction of the new Reichs Munitions Minister Speer.

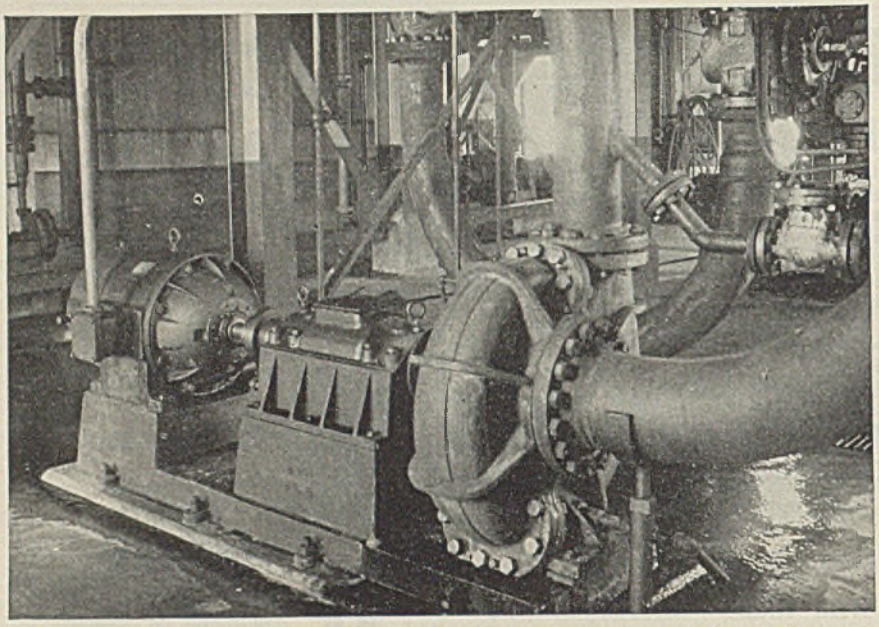
Such ruthless elimination of small,

and sometimes marginally efficient, plants may have a twofold effect. While it obviously puts many smaller firms out of business, it sometimes strengthens the remaining plants. This was to some extent the case in the last war, when, after two preliminary looser agreements, the modern I.G. Farbenindustrie emerged through the fusion of the remaining large German chemical concerns with the Badische Anilin-und Soda-Fabrik of Ludwigshafen. I.G. policy in post-war years also aimed by careful study of costs to concentrate production of any given product in the most efficient of the I.G. plants, and either to convert the remaining plants to turning out other products in which they had an advantage or if they were too inefficient to shut them down completely. Incidentally, a number of smaller competitors were bought up only to shut down their production.

In the case of the chief I.G. electrochemical unit, Griesheim Elektron, the major part of the plant's production was shifted as early as 1926 from Frankfurt-Griesheim to central German Bitterfeld, strategically better located and nearer to cheap power from abundant lignite deposits. The same was true of dye production, with each of the larger I.G. plants specializing in some dye branch. Such specialization and efficiencies, augmented by patent and cartel monopolies, gave I.G. a competitive advantage in world trade. How the German chemical industry will fare after this war will depend a great deal on the nature of post war settlements.

Long Range Studies

That I.G. Farben and its economists —who were in no small part responsible for developing the trade of the concern—are at this time secretly making long range studies anticipating the effects even of a breakdown of the Reich's political and economic program in Eastern Europe seems quite possible. Dr. Anton Reithinger, chief I.G. economist, in a recent article sounds a slightly pessimistic note in discussing the inevitability of a decline of the standard of living in Europe. He points out that of the 300 million people in continental Europe, 140 million depend for a livelihood on agriculture, 50 million on mining and industry, 40 million on handicrafts, and 40 million on trade and transport. This was unbalanced, he says, in the light of post World War I developments. Three new industrial areas, the United States, Japan, and Russia had wrested industrial leadership from older European countries like England, Germany, Switzerland, and Belgium. While the latter countries' share of world industrial production declined, overseas agricultural and raw material countries gained. Europe thus dropped relatively behind overseas nations and Soviet Russia, whose industrial production increased by 400 to 500 percent, and this development, according to Reithinger, made a decline of the European standard of living inevitable.



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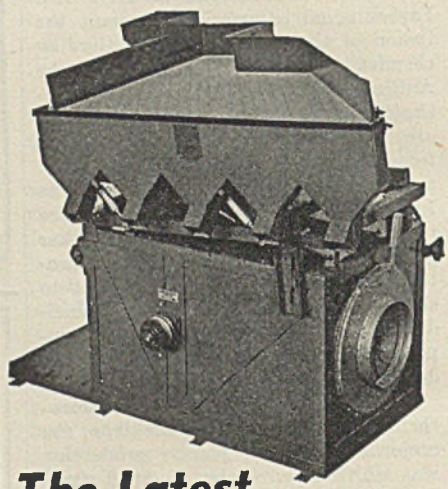

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SELECTIONS FROM FOREIGN LITERATURE

PLASTICS AS SUBSTITUTES

SYNTHETIC products replace metals in many uses, but for systematic adaptation of plastics to specific requirements the service conditions must be defined as accurately as possible. For example, thermal expansion is fully reversible in metals whereas heating and cooling of plastics cause some shrinkage. With proper attention to the required properties there are many opportunities through which metals could be released for other uses. Some properties of metals and plastics are compared in the table.

Digest from "Plastics as Substitutes," by R. Vieweg, *Schweizer Archiv für angewandte Wissenschaft und Technik* 8, 291–8, 1942. (Published in Switzerland.)

INCOMPLETE AND IMPERFECT COMBUSTION

INCOMPLETE combustion, commonly employed when a reducing atmosphere is wanted, is very different from imperfect combustion which is never desirable because it permits oxygen as well as unburned gas to pass into the flue gas. Designating the sensible heat in the combustion gas as I and temperature as T, the I-T diagram for a given flue gas can be used to good advantage in adjusting combustion conditions. Whether the desire is to achieve a specified degree of incomplete combustion or merely to prevent imperfect combustion the relation of sensible heat to temperature in the flue gas is significant. Calculations are presented, based on standard values for complete combustion of solid, liquid and gaseous fuels, to show how I-T diagrams can be used. The error involved in simplifying the calculations by treating hydrogen as so much carbon monoxide is discussed. As an example the conditions of coal firing and gas firing are compared for a porcelain furnace.

Digest from "IT-Diagram for Incomplete and Imperfect Combustion," by P. O. Rosin and H. R. Fehling, *Journal of the Institute of Fuel* 16, No. 86, 20–5, 1942. (Published in England.)

HOT WIRE ANEMOMETER

HOT WIRE anemometers for measuring turbulence in gas streams have hitherto been calibrated by a tedious method requiring enough measurements to plot sensitivity curves over a wide velocity range for various voltages. But sensitivity is subject to several variables, and the thermal influence of the nearby wall in testing phase boundary layers is uncertain. In a new calibration method the customary approach is reversed; the current is calibrated against a constant (not necessarily known) gas velocity instead of calibrating velocities against a constant current. The wire is better than four times more sensitive to current changes than to velocity changes. The calibration is therefore more accurate in addition to being much quicker and easier. Secondary effects do not interfere and no special calibration setup is required.

As an additional improvement in measuring turbulence in gas conduits a setup has been devised which eliminates errors due to pulsations which resemble turbulence in their effects on the instrument. This is accomplished by using two platinum wires instead of one. They are spaced apart by a distance several times larger than the turbulence unit. The two wires are connected so that their signal voltages oppose each other and only the difference is actually measured. Pulsation effects are thus eliminated.

Digest from "Two Contributions to Hot Wire Anemometer Technique," by G. Datwyler, *Helvetica Physica Acta* 15, 266-72, 1942. (Published in Switzerland.)

DEW POINT OF FLUE GASES

THE DIFFERENCES between observed and calculated dew points of flue gases is commonly attributed to sulphur dioxide in the gas. Actually, however, sulphur trioxide (sulphuric acid) is the only readily condensable gas present (other than water vapor) and its influence on dew point is large even though its concentration is low. Thus, in wet flue gas (5.1 percent water vapor by volume) the dew point rises from 92 deg. F. to 324 deg. F. when the sulphuric acid content of the flue gas rises from 0 to 0.007 volume percent. Again, with 25.2 percent water vapor the dew point is 150 deg. F. in absence of sulphuric acid, 221 deg. F. with 0.001 percent sulphuric acid and 371 deg. F. with 0.02 percent sulphuric acid. With such high dew points as may be reached in flue gases from coals which yield traces of sulphuric acid on burning, it becomes impracticable to keep the metal surfaces of the boiler hot enough to prevent condensation. The condensate which settles on the metals at high dew points is strongly acid and highly cor-

Comparison of Some Properties of Metals and Plastics

Property	Metals	Plastics	Ratio
Electrical conductivity, ohm^{-1}cm.$^{-1}$	Very high	Very low	10^{14}: 1 to 10^{20}: 1
Thermal conductivity, kcal. m.$^{-1}$ hr.$^{-1}$ deg.$^{-1}$	High 30 to 300	Low 0.1 to 0.7	100: 1 to 1000: 1
Linear thermal expansion	9 to 30	10 to 100	
Texture	Crystal lattice Mixed crystals Compounds	Chain molecules Vitreous amorphous resins	
Appearance	Metallic color and luster	All colors; sometimes transparent	
Workability	Can be cast, rolled, drawn, stamped, extruded, wrought, welded	Can be extruded, cast, molded, drawn, welded, precipitated, extracted	

rosive. It also attracts flue dust, forming hygroscopic substances and intensifying corrosion while the products accumulate and clog gas passages. The relations between dew point and sulphuric acid concentration, established by this investigation, should be helpful in research on prevention of such corrosion.

Digest from "Relation Between Dew Point and the Concentration of Sulphuric Acid in Flue Gases," by A. Alan Taylor, *Journal of the Institute of Fuel* 16, No. 86, 25–8, 1942. (Published in England.)

SYNERESIS IN SILICA GELS

TIME of set has been measured in silica gels to which an organic agent had been added. Alcohols were used as the organic agents, namely methanol, ethanol, ethylene glycol, glycerol and erythritol. In alkaline gels the effects of these adjuvants varied widely but in acidic gels they all retarded gelation. When the medium was neutral the adjuvants had approximately the same retarding effect throughout the series. This eliminates the dielectric constant as a factor in gelation velocity. When the medium passed from neutrality to alkalinity glycerol and erythritol lost their power to retard gelation. Comparative tests with all the alcohols did not show any clear relation between the composition of the syneretic liquid and the syneresis behavior of the gel after setting. There was no selective adsorption of the alcohols. Gels on the alkaline side were tested at pH 9.7 and a temperature of 25 deg. C. The amount of adjuvant was about 6 g. of the selected alcohol to 100 cc. of the syneretic liquid.

Digest from "Syneresis of Silica Gels Containing Addition Agents," by L. A. Munro and G. E. Monteith, *Canadian Journal of Research* 20B, 212–20, 1942. (Published in Canada.)

BENZOLE SCRUBBERS

EMULSIFICATION troubles in gas scrubbers and debenzolizing plants are probably due mainly to resinification of unsaturates in the scrubbing oil. Water and the resin particles form stubborn emulsions. Resin components which are not fully oil-soluble also form sludges or slimes in preheater and cooler tubes. To avoid emulsions the scrubbing oils should be renewed at intervals, water or sludge should be drained off from rotary scrubbers and oil entering the scrubber should be slightly warmer than the incoming gas so that water vapor will not condense in the oil. Aqueous sludge accumulating in the oil flow system of a benzole plant is slightly acidic, hence corrosive. Steel tubes are more corrodible than wrought iron. Plant experience indicates that preheating the benzolized oil at least to 130 deg. C. makes it possible to debenzolize it thoroughly with 0.52 lb. of live steam per gal. of oil. Thermostatic control improves the uniformity of the product but is not necessarily an economy. For example, automatic control saves labor, but the installation cost may use up several

years of the saving. Again, consumption of steam and cooling water tends to increase rather than decrease on changing to automatic control.

Digest from "Benzole Recovery by Gas Oil," by B. Richardson, *Gas Journal* 240, 248–9, 1942. (Published in England.)

FLUORESCENT LAMPS

DEVELOPMENT of fluorescent lamps required patient study of cathode design, character of electric discharges in mercury vapor and compositions of stable powders with high fluorescence intensity. These lamps achieved success through versatility of color effects and through high efficiency in converting power to light energy. A 200-250-v., 80-watt lamp and its auxiliaries were developed in England in 1940 to light factories under blackout conditions. This unit is 60 in. long, with 57 in. of fluorescent coating. The lamp voltage is 115 from a 200-250-v. a.c. supply. The lamp uses 80 watts, operating at 0.8 amp. Its nominal luminous efficiency is 35 lumens/watt. Incandescent lamps radiate more than half of their heat, fluorescent lamps less than half. Since the total heat generated by fluorescent lamps is much smaller than in incandescent lamps the radiant heat from fluorescent lamps is relatively very small.

Digest from "Fluorescent Lamps," by L. J. Davis, H. R. Ruff and W. J. Scott. *Journal of the Institution of Electrical Engineers* 89, II, 447–72, 1942. (Published in England.)

ELECTRICAL CONDUCTIVITY OF VARNISHES

THROUGH recent advances in the theory of intrinsic electric strength this property of solids has acquired added significance for insulating varnishes. Baking varnishes have therefore been tested, by specially designed methods, in films from 20 to 100 microns thick at temperatures from —196 to 90 deg. C. Three baking finishes (clear, black and Bakelite) were tested in comparison with a shellac varnish. Their intrinsic electric strength at —196 deg. C. was between 8,000,000 and 9,000,000 v. per cm. As the temperature rises to 0 deg. C. the intrinsic electric strength decreases along a curve which is somewhat concave with respect to the origin for the clear varnish but is linear for the other varnishes. From 0 to 60 deg. the strength loss is slower and from 60 to 90 deg. it changes to a slight increase, excepting that there is a still sharper drop in the case of shellac. At 60 deg. C. the maximum intrinsic electric strengths are:

Varnish	Volts per Cm.
Bakelite baking	4,900,000
Black baking	2,600,000
Clear baking	2,200,000
Shellac	3,300,000

Digest from "Intrinsic Electric Strength and Conductivity of Varnish Films and Their Variation With Temperature," by A. Morris Thomas and Miss M. V. Griffith. *Journal of the Institution of Electrical Engineers* 89, I, 487–98, 1942. Published in England.)

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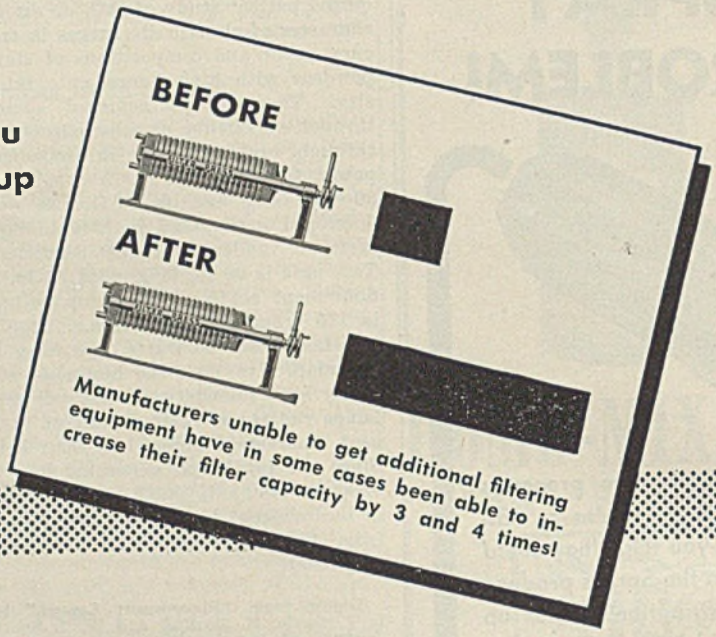

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CHEMICAL ENGINEER'S BOOKSHELF

COMPOUNDS OF CARBON

FUNDAMENTAL ORGANIC CHEMISTRY. By *Ed. F. Degering* and Collaborators. Published by John S. Swift Co., Cincinnati, Ohio. 485 pages. Price $3 (cloth), $2 (paper).

SOMEWHAT different from the ordinary line of textbooks, this volume aims to stress both theoretical and practical aspects of the field in a concise, dynamic, interesting and systematic style. Some 90 pages are devoted to a kaleidoscopic survey of organic chemistry which deals principally with the concept of relative electronegativity in homologous series. The theoretical approach in this section is, as the author states, "an attempt to systematize organic chemistry, and is offered as a theoretical postulate that may or may not be vindicated by experimental data."

The book, a companion to the Quadri-Service Manual and the Work Book of Fundamental Organic Chemistry, is illustrated with cartoons to make clear the principle of relative electronegativity, drawings of molecular models, graphs, and photographic reproductions of the Fisher-Hershfelder molecular models. Degering has done a thorough job of organizing and condensing much information into a systematic outline form. The order of discussing the various classes of organic chemicals usually follows a definite scheme: formulas, occurrence and general importance, nomenclature, methods of commercial preparation, laboratory and special syntheses, physical properties (tabulated), general chemical reactions, and specific or special chemical reactions.

Instead of being set in type, this textbook has been reproduced by photo-offset and planographed. Possibly as a result, some of the footnotes and tables of physical properties are not as readable as would be desired. However, as a rule, both text material and illustrations have been reproduced satisfactorily.

A MODERN SON OF MARTHA

WITHOUT FAME. By *Otto Eisenschiml*. Published by Alliance Book Corp., Chicago, Ill. 368 pages. Price $3.50.

Reviewed by *S. D. Kirkpatrick*

AS A boy in Illinois I worshipped at the feet of many of Chicago's chemical celebrities. Men like Uncle Billy Hoskins, the philanthropic dean of all mid-western chemists, Professors Julius Stieglitz and Lee Lewis, "Alphabet" Morey, Donald Nelson, Dudley French, Paul Van Cleef—yes, and even Fred Lodge who once offered me a fine job in the Armour Fertilizer Works at $65 per (month)—these were my heroes of thirty years ago. Since then I must admit that I have come to suspect that some of these boyhood idols may have had feet of clay. But others have remained to teach and to inspire in me a better understanding of life and the ways of the world—chemical and otherwise.

One of the latter is wise old Otto Eisenschiml—the first man to impress upon me that chemists were more important than chemistry, and that "our beloved science" (to quote a favorite expression of the late Professor W. A. Noyes) had little or no value in the marketplace unless someone had applied it successfully to the problems of a work-a-day world. But Uncle Otto went a step farther: the value of that contribution in the eyes of the public also depended to a considerable extent on the price the chemist put on his services. We could continue to be "servants of mankind" and live by the charity and sufferance of an unappreciative public; or we could become masters of destiny for business and industry, health and security—once we put our talents to proper use.

Two years ago at an A.C.S. banquet I sat beside Past-Chairman Eisenschiml of the Chicago Section. We talked a bit about books for his great historical mystery "Why Was Lincoln Murdered" was then a best seller and his publishers were clamoring for the companion volume "In the Shadow of Lincoln's Death." He spoke of the flood of professional autobiographies that had followed Victor Heiser's "Doctor's Odyssey," Bellamy Partridge's "Country Lawyer," and Hartzell Spence's "One Foot in Heaven." Did I think anyone would be similarly interested in the life of a chemist and the varied experiences of a consultant? Frankly, I must confess that I was a bit skeptical. The current popularity of such books was probably just a passing fad. Besides, chemists were proverbially poor buyers of non-technical books and who else could possibly be interested in their humdrum existence? How wrong I was! How shortsighted in passing this tip along to my book publishing colleagues with only a luke-warm recommendation.

Here is a book by a chemist that is and truly deserves to be a best seller. It packs within its covers more of gripping human interest than I've found in any single book in many years. Here are all the amusing and inspiring experiences of a poor boy born and raised in Old Vienna who came to this country at the age of 21 to take for his own the allegiance which his American father had won as a United States Army Officer in the Indian-fighting days of the West. What he learned as a bench chemist in the steel mills of Pittsburgh was more than the technique of applying his skill and science to inanimate materials and problems. He became a student of people and this stood him in good stead when he moved to Chicago, although there he almost starved before he finally found out how to find a job. What he learned from his boarding-house buddies, particularly from an itinerant book agent, taught him the elements of salesmanship that must so often be combined with the chemical elements if even the best of chemists is to get along in the world.

His first "steady" job as a trouble-shooter for a linseed oil mill helped to develop another equally profitable talent—that of scientific curiosity combined with remarkable resourcefulness in solving difficult technical problems. Eisenschiml, the chemical detective, had so many thrilling experiences that his autobiography rivals that of Sherlock Holmes or Ellery Queen.

After his work had brought him a fair fortune and a considerable measure of the fame he now tries to disclaim, Eisenschiml, the philanthropist and philosopher, decided to desert the chemical profession. The chapter he titled "A Servant Leaves the Kitchen" is in many ways the most interesting and challenging part of the whole book. In it the author attempts to prove—at least to his own satisfaction—that "chemistry was a good profession to get out of." His arguments are persuasive but I think he has failed to make his point. He is too much of a Son of Martha to become a Son of Mary by merely shutting up his laboratory and saying goodbye to his old clients. I know this to be true because the Coordinator of Civilian Defense has just selected Dr. Otto Eisenschiml to talk to the public on protection against gas and incendiaries. Read this book and you will understand why.

NEW INORGANIC TEXTBOOK

GENERAL INORGANIC CHEMISTRY. By *M. C. Sneed* and *J. L. Maynard*. Published by D. Van Nostrand Co., New York, N. Y. 1,166 pages. Price $4.50.

ONE of the most complete inorganic textbooks to come to our attention in the past few years is this volume by two University of Minnesota professors. Order of presentation of the subject matter in its 1,166 pages follows the usual standard for the elements and their compounds. The treatment, however, is a little more extended than in the average elementary text. Physical chemistry is stressed throughout and organic chemistry receives considerable attention.

The book will probably become required reading for many prospective chemical engineers in their first year at college.

MERCERISING. By *J. T. Marsh.* Published by D. Van Nostrand Co., New York, N. Y. 458 pages. Price $9.

HISTORICAL, theoretical and industrial aspects of the treatment of cotton with caustic soda are extensively covered in this British book on mercerizing. The volume, with 29 chapters divided among seven subheads, discusses cotton, the mercerizing process, cellulose and cellulose hydrate, theoretical aspect of the action of alkali, absorptive capacity, and efficiency of the process. Discussions of equipment and procedures relate mainly to British practice. Since this is the only recent book written in English on the subject of mercerizing, it will be welcomed in many quarters.

ELECTROPHORESIS OF PROTEINS AND THE CHEMISTRY OF CELL SURFACES. By *H. A. Abramson, L. S. Moyer,* and *M. Gorin.* Published by Reinhold Publishing Corp., New York, N. Y. 341 pages. Price $6.

PHYSICAL chemistry has become more and more important to biological science in the past few years. Many new instrumental tools have found application and one of the most interesting approaches toward the solution of biological problems is made through the study of electrokinetic phenomena. Most of the work on electrophoresis has been published in individual papers in the scientific journals and annals, and no specific summary of this field is available. Thus the authors must be commended for their conscientious compilation and co-ordination of a vast amount of information. The text makes interesting reading.

THE QUADRI-SERVICE MANUAL OF ORGANIC CHEMISTRY. By *Edward F. Degering.* Published by Houghton Mifflin Co., Boston, Mass. 220 pages. Price $2.50.

FOUR distinct features are offered the student in this laboratory manual, hence the title. These are a set of experiments, a duplicate notebook system, self-measuring objective tests, and a theoretical approach to laboratory organic chemistry. Semi-micro procedures are used throughout wherever possible. There are 76 experiments included—a rather large number which will allow instructors some latitude in assigning work.

A TEXTBOOK OF BIOCHEMISTRY. Second edition. By *Roger J. Williams.* Published by D. Van Nostrand Co., New York, N. Y. 533 pages. Price $4.

THE AUTHOR'S "Introduction to Biochemistry" of the year 1938 has been brought up-to-date and appears under another title. This is indeed a very fine text for a reader who is not too familiar with biochemistry, because Dr. Williams presents in simple lan-

guage all pertinent facts. Five major parts form the contents: biochemical materials, tissue composition, food composition, bodily mechanisms for promoting and regulating chemical change, and metabolism. A glossary of physiological and medical terms is appended which should win the book a large group of readers and friends.

VOLUMETRIC ANALYSIS. Vol. I. By *I. M. Kolthoff* and *V. A. Stenger*. Published by Interscience Publishers, New York, N. Y. 309 pages. Price $4.50.

REVISED and enlarged from the first English edition and the second German edition, this volume covers the theoretical fundamentals of an important part of quantitative analysis. Neutralization, ion combination and oxidation-reduction reactions receive extensive consideration. Conductometric, potentiometric and polarimetric titrations and some less common methods are also included. Indicators, titration curves, titration errors, reaction velocity adsorption and coprecipitation phenomena, and volumetric methods of organic analysis are among the other chapters of the text. The authors promise a second volume which will be "a critical review of existing methods."

ELEMENTARY PHYSICAL CHEMISTRY. Third edition. By *Hugh S. Taylor* and *H. Austin Taylor*. Published by D. Van Nostrand Co., New York, N. Y. 551 pages. Price $3.75.

THE BROTHERS TAYLOR have reorganized the second edition of their physical chemistry textbook and have added discussions of newer aspects to supplement the classical material. Phase equilibria, the solid state and ionic equilibria are among the chapters which have undergone reorganization, while much of the new material will be found in the enlarged chapter on the atomic concept of matter. The book is an accepted standard text for a groundwork course in the chemical engineering curriculum.

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.

Bidder's Reference Book. Standard Instructions to Bidders and Contractual Provisions for Use With Quartermaster Corps Negotiated Contracts. War Department, Office of the Quartermaster General. Q. M. C. Form No. 304. Price 15 cents.

Production of Industrial Explosives in the United States During the Calendar Year 1941, by W. W. Adams and V. E. Wrenn. Bureau of Mines, Technical Paper 647. Price 10 cents.

Hydrogenation and Liquefaction of Coal, Part 2.—Effect of Petrographic Composition and Rank of Coal, by C. H. Fisher, G. C. Sprunk, A. Eisner, H. J. O'Donnell, L. Clarke, and H. H. Storch. Bureau of Mines, Technical Paper 642. Price 25 cents.

Geology and Ore Deposits of the Chicagof Mining District, Alaska, by J. C. Reed, and R. R. Coats. U. S. Geological Survey, Bulletin 929. Price $3.25.

Chromite Deposits of Red Bluff Bay and Vicinity, Baranof Island, Alaska, by P. W. Guild and J. R. Balsley, Jr. U. S. Geological Survey, Bulletin 936-G. Price 20 cents.

Quicksilver Deposits Near the Little Missouri River, Pike County, Ark., by D. Gallagher. U. S. Geological Survey, Bulletin 936-H. Price 55 cents.

Structural Insulating Board (vegetable fiber). National Bureau of Standards, Simplified Practice Recommendation R179-42. Price 5 cents.

Directory of the Bureau of Animal Industry, Animal Industry Bureau. Unnumbered. Price 10 cents.

Collection and Shipment of Specimens to Laboratories. Medical Dept., War Department, Army regulations 40-310. Price 5 cents.

Water Supply and Water Purification. War Department. Technical Manual 5-295. Price 55 cents.

Incentive-Wage Plans and Collective Bargaining. Labor Statistics Bureau, Bulletin 717. Price 5 cents.

Copyright Law of the United States of America Being the Act of March 4, 1909, as amended together with rules of practice and procedure. Library of Congress. Unnumbered. Price 15 cents.

Reciprocal Trade-Agreement Between the United States of America and the Republic of Cuba. State Department. Unnumbered. Price 10 cents.

Chemical and Physical Properties of Some of the Important Alluvial Soils of the Mississippi Drainage Basin. Department of Agriculture, Technical Bulletin 833. Price 20 cents.

Cooperative Tests of Sweetpotato Varieties, Introductions, and Seedlings for Starch Production and Market Purposes. Department of Agriculture, Circular 653. Price 10 cents.

Methods for Manufacturing Acid-Precipitated Casein from Skim Milk. Revised by E. O. Whittier. Department of Agriculture, Circular 279. Price 10 cents.

Industrial Fumigation Against Insects, by E. A. Back and R. T. Cotton. Bureau of Entomology and Plant Quarantine, Circular 369C, revised. Price 10 cents.

Soybean Protein, by A. K. Smith. Bureau of Agricultural Chemistry and Engineering. Unnumbered. Mimeographed.

"Priorities." This is a monthly periodical issued by the War Production Board published the first of each month to show in tabular form priorities in force and reporting forms required. Single copies are for sale at 20 cents each, with quantity discount when 100 or more are purchased at one time. Annual subscription (12 issues) is $2.00. All orders and subscriptions should be addressed to the Government Printing Office.

Annual Reports. Various departments, bureaus, and independent establishments are releasing their reports for the past fiscal year which ended June 30, 1942. Those interested in such reports should address each of the bureaus or departments of interest, and request either a copy of the report or instructions as to the means for purchasing such documents.

Women's War Jobs. The Department of Labor is issuing a series of documents intended to assist industrial executives in enlisting and directing women engaged in war jobs that are not of the customary type. Personnel officers interested should address the Department for samples of the documents and instructions for purchasing either single copies or quantities for distribution to employees.

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.

Alloys. The International Nickel Co. Inc., Development and Research Division, 67 Wall St., New York, N. Y.—Bulletin T-9—16-page technical information booklet giving engineering properties of "K" Monel alloy. Gives composition, physical constants, properties, working instructions, thermal treatment, corrosion resistance, and applications. Contains extensive engineering data in chart, graph, table, and drawing forms.

Alloy Steels. Climax Molybdenum Co., 500 Fifth Ave., New York, N. Y.—Section 2—33 pages of notebook sheets dealing with chromium-molybdenum steels. Represents a revised version of Section 2 of the "Molybdenum in Steel" series issued by this concern. Contains extensive engineering information in the form of tables, charts and graphs, and in text form. Well organized.

Chemical Porcelain. Illinois Electric Porcelain Corp., Macomb, Ill.—Catalog C-1—15-page catalog illustrating and describing very briefly this concern's line of chemical porcelain. Includes data on pipes, fittings, valves, flanges and spacers. Contains cross-sectional drawings and tables of specifications.

Clamp Ring Joints. American Locomotive Co., Alco Products Div., 30 Church St., New York, N. Y.—Bulletin 1032—6-page form dealing with this concern's line of clamp ring joints, with cross-sectional drawings and photographic reproductions. Discusses principles of the clamp ring joints, advantages, details of construction, and uses in industry.

Compressors. Bury Compressor Co., Erie, Pa.—Bulletin E—4-page form which describes very briefly and illustrates the line of compressors put out by this concern. Lists briefly advantages of the various types.

Conveyors. The Lamson Corp., Syracuse, N. Y.—14-page catalog dealing with the line of roller gravity conveyors put out by this concern. Contains data on specifications, accessories, and application in industry. Extensively illustrated by photographic reproductions.

Equipment. Haveg Corp., Newark, Del.—Bulletin F-3—36-page catalog dealing with this concern's corrosion-resistant equipment such as agitators, condensers, filter plates and frames, hoods, pumps, tanks, etc. Each piece of equipment made from Haveg is described and illustrated. Includes extensive data on specifications and sizes, as well as diagrammatic drawings. Well illustrated. Contains extensive engineering information.

Feed Water Treatment. Cochrane Corp., 17th and Allegheny Ave., Philadelphia, Pa.—Catalog 23—8-page reprint entitled "Conditioning Feed Water for High-Pressure Boilers," which gives requirements for high-pressure boilers and modern feed water conditioning equipment. Discusses hot process softener, Zeolite, and other methods of conditioning. Illustrated by drawings and charts.

Foundry Refractories. The Ironton Fire Brick Co., Ironton, Ohio—4-page form illustrating and describing briefly the line of foundry refractories, cupola blocks, ladle pouring brick and ladle bottom tile put out by this concern. Includes data on dimensions.

Gas Engines. Worthington Pump & Machinery Corp., Harrison, N. J.—Bulletin F550B21—Eight-page bulletin describing and illustrating the line of vertical four-cycle, totally enclosed gas engines put out by this concern. Includes data on specifications, principal dimensions, etc. Illustrated.

Graphite Lubrication. Nassau Laboratories, Inc., Hackensack, N. J.—28-page, second edition of this concern's "Graphite Lubrication Handbook." Explains the work which graphite performs in lubrication and lists the various products supplied. Also includes an indexed list of applications, brief descriptions of stock items of standard Cograph concentrates, and a price list of Cograph products made with natural colloidal graphite.

Heat-Treating. Despatch Oven Co., Minneapolis, Minn.—Bulletin 81—16-page bulletin dealing with this concern's recirculating furnaces for heat-treating ferrous and non-ferrous metals. Contains information on suggested uses, complete range of sizes, construction specifications, material-handling systems, etc. Extensively illustrated by photographic reproductions.

Heavy Equipment. Whiting Corp., Harvey, Ill.—Booklet 236—20-page booklet dealing with this concern's equipment and products for industry. Includes traveling cranes, mechanical chargers, foundry equipment, evaporators, rotary drum vacuum filters, crystallizers, clarifiers, etc. Each unit is briefly described. Extensively illustrated with installation photographic reproductions.

Humidifiers. Armstrong Machine Works, Three Rivers, Mich.—Eight-page form dealing with the use of this concern's humidifiers in industry. Each use is discussed briefly. Illustrated by photographic reproductions.

Hydraulic Presses. The Hydraulic Press Mfg. Co., Mt. Gilead, Ohio—Bulletin 34—29 pages dealing with the hydraulic presses of this concern. Extensively illustrated with diagrammatic drawings, photographic reproductions, and charts. Includes data on specifications.

Laboratory Equipment. U. S. Stoneware Co., 60 E. 42nd Street, New York, N. Y.—Bulletin 498—12-page form, illustrating and describing briefly the line of laboratory sinks, pipes, and other equipment put out by this concern. Includes tables on dimensions, cross-sectional drawings, and other technical data.

Metallizing. Metallizing Co. of America, 1330 W. Congress St., Chicago, Ill.—20-page catalog dealing with the "Mogul" metallizing process and equipment. Discusses principles of metallizing, use in airplane construction, for buses and trucks, in foundries, mine maintenance, etc. Extensively illustrated.

Mixing Tanks. Graver Tank & Mfg. Co., Inc., East Chicago, Ill.—Bulletin 312—four-page bulletin dealing with the vertical and horizontal chemical mixing tanks and proportioning equipment put out by this concern. Each unit is illustrated and described briefly. Contains tables of dimensions and specifications.

Panel Instruments. Roller-Smith Co., Bethlehem, Pa.—Catalog 4120—12-page publication describing this concern's line of 3-in. and 4-in. panel instruments, with a complete listing and prices together with dimensions, illustrations of various types of cases, etc. Contains a number of dimensions drawings.

Petroleum Testing. Precision Scientific Co., 1750 N. Springfield Ave., Chicago, Ill.—Catalog 700—96-page catalog dealing with this concern's apparatus and equipment for testing petroleum products. Gives detailed information on apparatus for standard methods of testing asphalt, bituminous material, various types of fuels and lubricants, according to the specifications of A.S.T.M., Federal Specification Board and others. Also includes data on laboratory utilities, plus a recent compilation of data on thermometers used for petroleum inspection. Illustrated. Includes price schedules.

Pipe Fittings. Bonney Forge & Tool Works, Allentown, Pa.—Bulletin WT31—16-page bulletin describing how to make branch pipe outlets with this concern's "WeldOlets", "ThredOlets" and "Socket End WeldOlets", including right-angle welded branch pipe outlets. Contains data on dimensions, sizes, weights and prices. Extensively illustrated.

Plastics. The Catalin Corporation, 1 Park Ave., New York, N. Y.—6-page booklet giving the properties and specifications of Catalin, this concern's line of cast phenolics. Properties are contained in table form, while other tables give complete specifications.

Reduction Drives—The American Pulley Co., Philadelphia, Pa.—Catalog R-42—16-page, revised catalog featuring this concern's line of compact speed reduction units in various sizes. Contains photographs of typical installations, schematic drawings, and data on how to select reduction drives. Also includes dimension tables and list prices.

Refractories—Basic Refactories, Inc., Cleveland, Ohio—Bulletin 210R—4-page form dealing with the "All-Ramix" bottom for basic open-hearth furnaces. Illustrates and describes briefly how "Ramix" saves construction time, labor, and money. Includes condensed directions for installation for new hearth construction or major bottom repairs.

Rectifiers—General Electric Co., Schenectady, N. Y.—Bulletin GEA-3827—24-page booklet dealing with this concern's ignitron mercury-arc rectifiers in the steel industry. Outlines various conversion-equipment problems in this industry, discusses characteristics and applications of ignition mercury-arc rectifiers, discusses types of conversion units commercially available to supply power to large d-c systems, etc. Diagrams show cross sections of the rectifier, comparative efficiencies of the three types of power-conversion units, effect of phase control on output-voltage, and a floor plan illustrating a typical installation. Contains extensive engineering data.

Resistance Thermometers—Leeds & Northrup Co., 4907 Stenton Ave., Philadelphia, Pa.—Catalog N33C—45-page catalog dealing with this concern's "Micromax" resistance thermometers for measurement and control of air-conditioning systems, chemical processes, refrigerating systems, oil refineries, etc. Extensively illustrated.

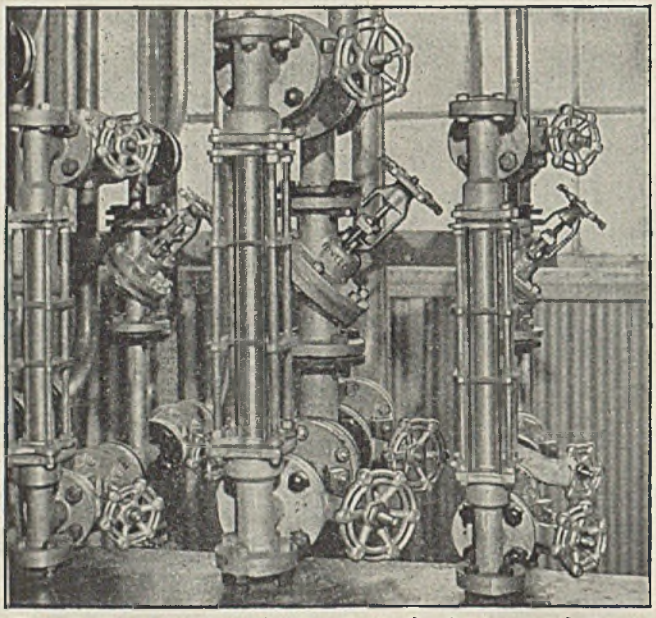
Solenoids—Dean W. Davis & Co., Inc., 549 W. Fulton St., Chicago, Ill.—2-page form illustrating and describing briefly this concern's new type of laminated solenoids designed for hydraulic valves and general industrial purposes. Units of both the pull type and the push-pull type are illustrated. Contains diagrammatic drawings.

Truck Lubricants. Standard Oil Co., Sales Technical Service Department, 910 S. Michigan Ave., Chicago, Ill.—Form TB92—112-page engineering bulletin for instruction of industrial salesmen on fuels and lubricants for trucks and buses. Contains data on truck and bus engines, power drives and axle suspension, brake and braking systems, motor fuels, chassis and gear lubricants, preventive maintenance, etc. Extensively illustrated by photographic reproductions, cross-sectional drawings, and charts and graphs. Contains extensive and excellent engineering data.

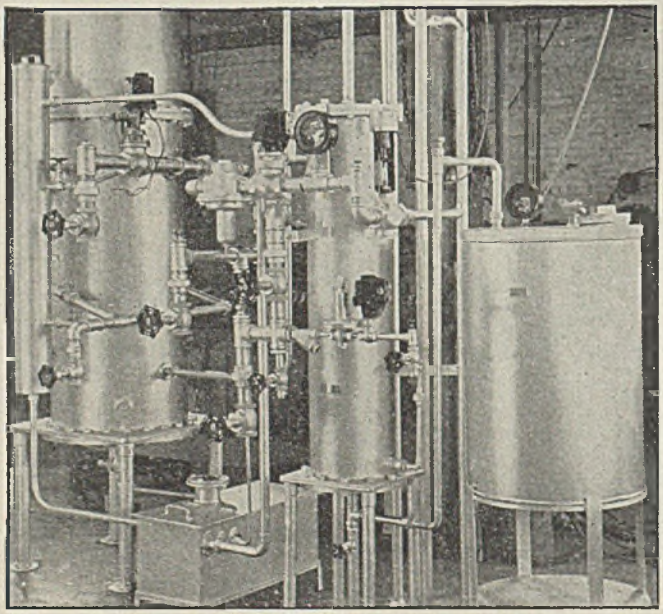
Valves—The Fairbanks Co., 393 Lafayette St., New York, N. Y.—Catalog 42—176-page bound catalog dealing with this company's bronze and iron valves and dart unions. Contains over 250 illustrations. Shows sectional views of valves, illustrations of various parts with prices. Contains extensive tables of dimensions and other data. Also contains tables on chemical analysis, physical properties of metals, and dimensions of various type threads and flanges.

Water Analysis—W. H. & L. D. Betz, Frankford, Philadelphia, Pa.—Technical paper 81—4-page reprint entitled "Determination of Calcium in the Presence of Magnesium by Standard Soap Solution—A Rapid Titration Method." Contains tables of analytical results using the new rapid method developed by this concern.

POWELL CORROSION



This distillation system, in the plant of a large manufacturer, is equipped with Powell Flanged End "Y" Valves.



Powell Valves on this distillation apparatus assure dependable flow control in a nationally-known process plant.

For nearly a century Powell has been making valves to satisfy every need of American Industry. Thus through the years, as each new process requiring valve control has been introduced, the Powell Engineering staff has been ready with valves designed to satisfy all demands of the job to be done.

In 1925, anticipating the requirements of the rapidly expanding Chemical and Process Industries, Powell pioneered in the manufacture of an entirely new type of valve—the Corrosion-Resistant Valve.

Today Powell has the most complete line of valves designed to give long, unfailing service in the exacting control of the innumerable corrosive media.

Naturally the Powell Line has been simplified and standardized as much as possible but a considerable diversity of design is necessitated by the limitations of the materials from which the various valves can be produced. However, each valve is designed to meet the requirements of a number of different services.

Shown here are a few examples of the Powell Corrosion-Resistant Line.

The Wm. Powell Co.

Dependable Valves Since 1846

CINCINNATI, OHIO

POWELL

BECKMAN supplies three important instruments that control key operations in the production of Synthetic Rubber, Toluene, and Aviation Gasoline. And because these Beckman instruments incorporate unique operating features that make them the most advanced equipment available, they are being specified for practically all Synthetic Rubber plants . . . for most of the Toluene plants . . . and as rapidly as equipment is available, are taking over critical control operations in Aviation Gasoline plants throughout the world.

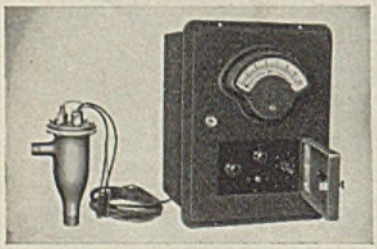
IN ALL THREE Beckman Supplies the Key Control Instruments!

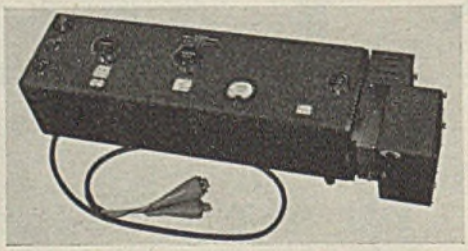
SYNTHETIC RUBBER: Three important phases of the synthetic rubber process are controlled by Beckman instruments . . . (1) determining the butadiene and styrene content of the gases . . . (2) controlling the refinery processes for maximum recovery of these products . . . and (3) controlling pH during polymerization, coagulation, and stabilization operations prior to the final washing and drying of the rubber. For this last-mentioned critical control operation, Beckman Automatic pH instruments have been specified for maintaining continuous pH measurement and accurate pH control in every one of the synthetic rubber plants thus far contracted for under the government rubber programs—*high testimony to the outstanding superiority and all-around dependability of Beckman equipment!*

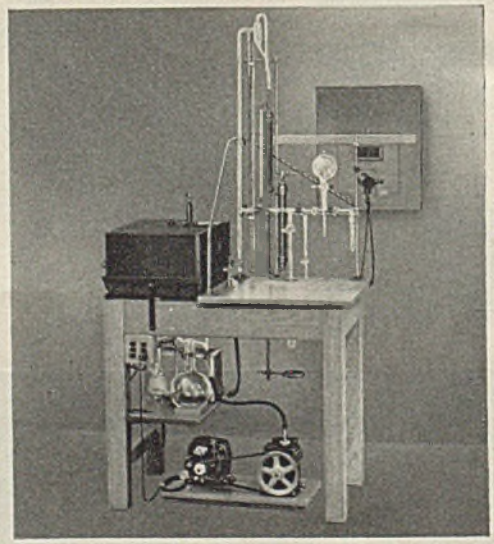
TOLUENE: For efficient production of toluene from petroleum, it is essential that toluene determinations be made quickly and accurately. With the Beckman Quartz Spectrophotometer operators can determine toluene content with an accuracy within 1% of the toluene present over a concentration range of 0.01 to 100%. The total determination takes only a few minutes in contrast to the several hours required by other methods. In addition to toluene determinations, this instrument is also being used extensively on butadiene, styrene, benzene, and similar products. Here again, time for analysis is cut from hours to minutes, permitting precise control heretofore unobtainable in refinery operations.

AVIATION GASOLINES: For controlling refinery operations in the production of aviation gasoline as well as butadiene, modern refineries are installing the Beckman Infrared Spectrophotometer. This instrument, built by Beckman, is based upon an original design developed by one of the leading petroleum research laboratories. It is particularly adapted for routine analysis of hydrocarbon gases and embodies many unique time-saving advantages.

GET FULL DETAILS ON THESE BECKMAN INSTRUMENTS







Our trained engineering staff will be glad to work with you in adapting Beckman control instruments to your particular operations . . . and will gladly supply further details on the construction and operation of these outstanding instruments.

(Left) The Beckman Automatic pH Indicator is the most advanced pH instrument available today. It operates directly from 115 V. mains and incorporates important advancements available in no other make or type of pH equipment. (For full details, ask for Bulletin 161). (Center) The Beckman Quartz Spectrophotometer speeds all types of research and control work. Covers the full Spectral range of interest in spectrophotometry—220 mmu in the ultraviolet to 1000 mmu in the infrared. Simple to operate, extremely accurate, and ruggedly built for long life, sustained performance. (Right) The Beckman Infrared Spectrophotometer was specially developed for controlling refinery operations by a leading petroleum research laboratory. Simplifies process control and insures maximum recovery in the production of modern aviation gasolines.

NATIONAL TECHNICAL LABORATORIES ★ SOUTH PASADENA, CALIFORNIA

ECONOMICS AND MARKETS

INDUSTRIAL CONSUMPTION OF CHEMICALS TURNED UPWARD IN FINAL QUARTER OF YEAR

CONSUMPTION of chemicals in the final quarter of last year was on an upward plane based on a review of operations within the principal consuming lines. The movement, however, was by no means general as different influences are affecting the individual industries. Fertilizer plants are somewhat curtailed by insufficient supplies of some of the nitrogen-bearing materials but outputs of superphosphate have been increased. Pulp and paper mills will observe regulatory measures which will hold production below the totals reached last year. Activities at glass plants are favorable from an over-all viewpoint but not so favorable in some of the flat glass divisions and the outlook for the present year is for a continuance of that condition which means a larger production of containers and a smaller output of window and plate. In the last three months of the year the influence of enlarged activities in the fertilizer, pulp and paper, petroleum refining, and iron and steel lines more than made up for some recessions in activities at paint and varnish, textile, and leather plants. Definite data for operations at soap plants are lacking but indications are that outputs were reduced in the latter part of the year due to the limitations imposed by the raw material supply. Incidentally large amounts of soap will be needed in the present year in the manufacture of synthetic rubber.

The Chem. & Met. index for consumption of chemicals for November is 169.69 compared with a revised index of 174.08 for October. In 1941 the numbers were 162.83 and 171.48 for November and October respectively. For the twelve-month period, the increase in consumption over 1941 was approximately 5 percent. This is the smallest rate of annual increase in recent years but in some industries actual reductions were reported and it is probable that some further reductions in demand for raw materials will be met in the present year. Based on the index of the Federal Reserve Board, production of chemicals last year was about 23 percent larger than in 1941 with direct war requirements pushing the output to record heights. The Board's index for all industry shows a gain of only about 18 percent for the year, both these comparisons being on a basis of unadjusted indexes.

What may be expected in the movement of materials in the first quarter of this year may be surmised from reports made by the thirteen Shipper's Advisory Boards who have estimated that freight car loadings in that period will run about 3.4 percent above the actual loadings in the comparable 1942 period.

According to the survey freight car loadings of twenty-eight principal commodities will be 7,712,290 cars in the quarter, comparing with 7,461,503 actual loadings in the 1942 period. All sections except the Pacific Northwest, the Trans-Missouri-Kansas, the Southeast, the Atlantic States and the New England area expect increases with the latter area most affected.

The Midwest expects an increase of 14.7 percent, from 1,060,834 cars to 1,216,754 cars, and the Allegheny board expects a gain of 0.3 percent, from 1,119,799 cars to 1,123,004 cars. The Ohio Valley, in third place, expects a 3.4 percent gain from 889,199 cars to 919,859 cars.

The Atlantic States predict a decline of 4.1 percent, from 871,034 cars to 835,489 cars, and the Southeast a drop of 0.3 percent from 877,854 cars to 875,602 cars. New England's decline is estimated at 14.3 percent, from 199,418 cars to 170,937 cars.

Chem. & Met. Index for Industrial Consumption of Chemicals

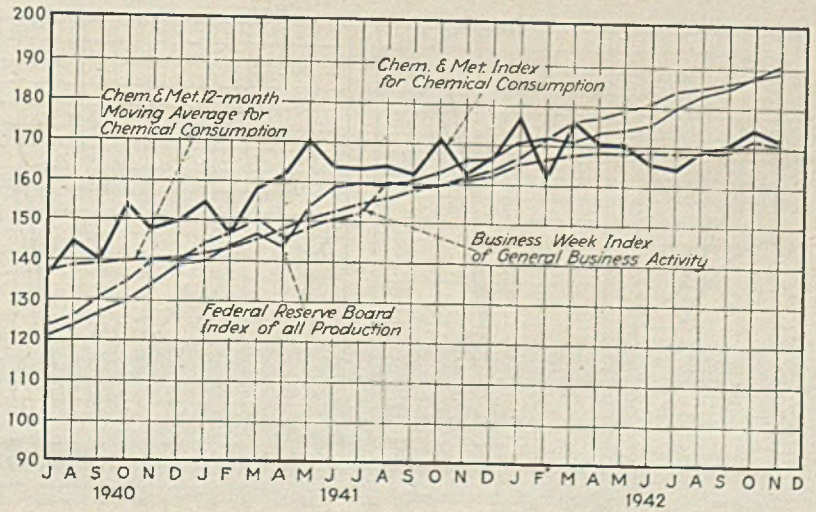
1935=100

	October revised	November
Fertilizers	38.50	41.11
Pulp and paper	20.55	20.01
Petroleum refining	15.21	14.61
Glass	15.90	15.20
Paint and varnish	14.32	12.38
Iron and steel	13.81	13.28
Rayon	15.20	14.91
Textiles	12.32	11.61
Coal products	9.68	9.38
Leather	4.95	4.75
Industrial explosives	6.04	6.05
Rubber	3.00	3.00
Plastics	4.60	4.40
	174.08	169.69

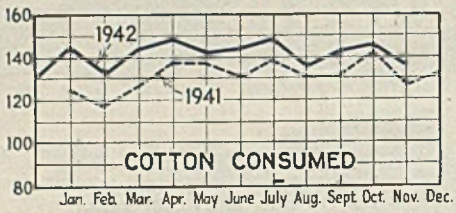
On an over-all basis, an increase is predicted in shipping of ten commodities, with a decrease in eighteen. Cottonseed and products, except oil, are expected to increase 22.2 per cent, manufactures and miscellaneous 18.4 percent, livestock 14.6 percent, grain 10.9 percent, fertilizers 8.3 percent and coal and coke 5.7 percent.

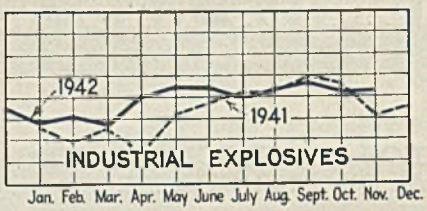
Farm implements and vehicles other than automobiles are expected to decline 45.4 percent, syrup and molasses 18.4 percent, paper, paperboard and prepared roofing 10.7 per cent, lime and plaster 10.4 percent, cement 8.8 percent, poultry and dairy products 7.9 percent, citrus fruits 7.6 percent, lumber and forest products 6.5 percent, sand and stone 5.7 percent, brick and clay products 5.5 percent, petroleum and petroleum products 4.8 percent, and iron and steel 4.6 percent. No estimate was given regarding shipments of chemicals and explosives.

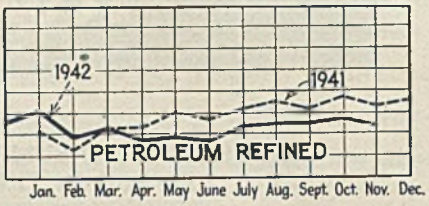
Byproduct coke plants worked at record levels last year. Actual figures are available for some of the products for the first eleven months. They show production of 703,008 tons of sulphate of ammonia as against 679,595 tons for like period of 1941. For the same periods other outputs were: ammonia liquor, 62,153,059 lb. and 57,209,000 lb.; coal-tar, 675,602,429 gal. and 639,229,596 gal.; creosote oil, 37,523,317 gal. and 33,689,128 gal. respectively. Pyroxylin spread, on the other hand was one of the commodities which was adversely affected by control over raw material allocations. The output for the first eleven months of 1942 was 54,384,713 lb. compared with 75,693,303 lb. for the comparable months of 1941.

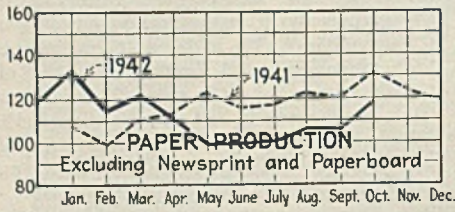


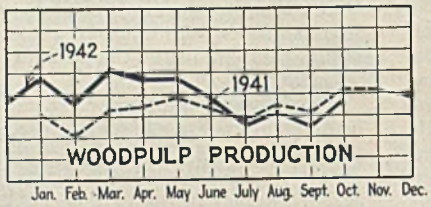
Production and Consumption Trends

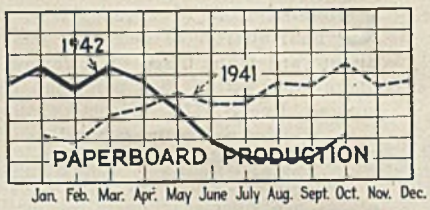


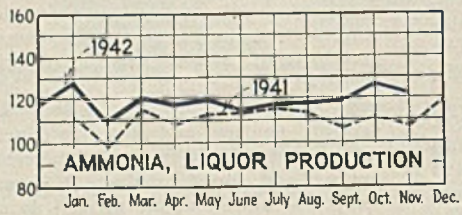


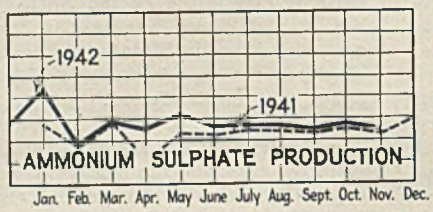


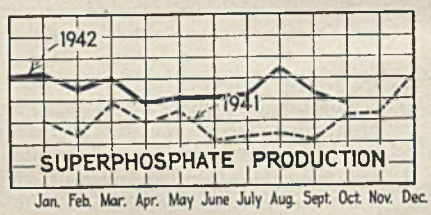


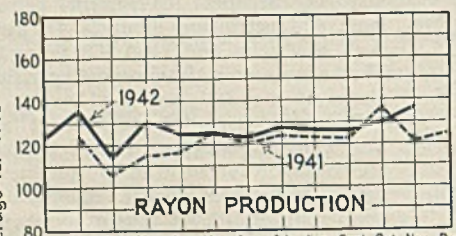


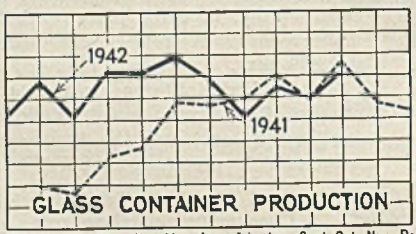


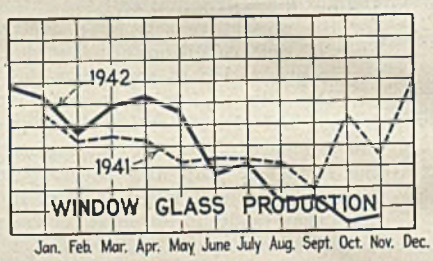




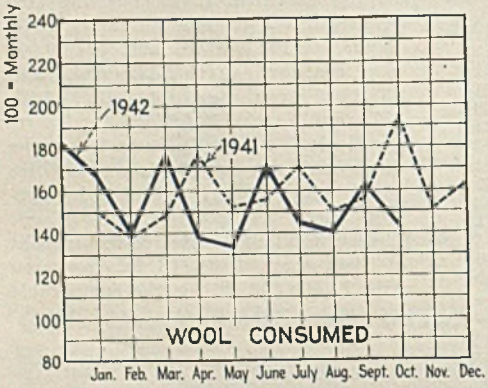


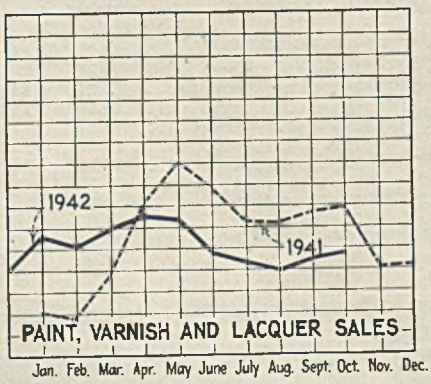


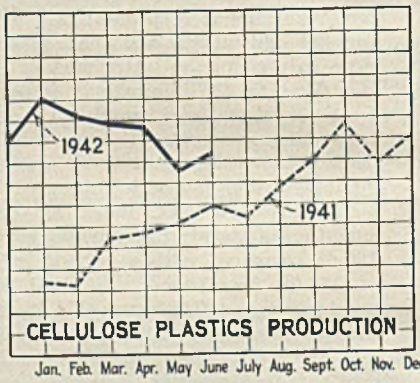


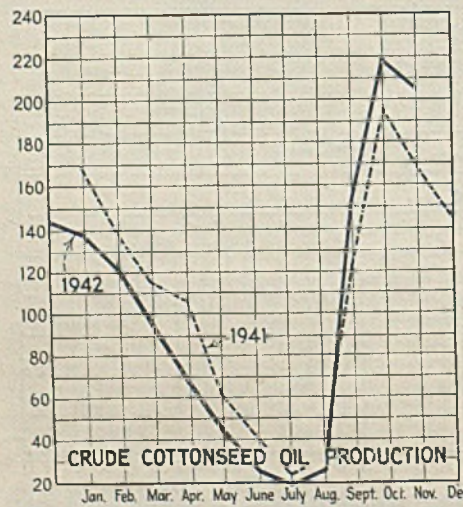


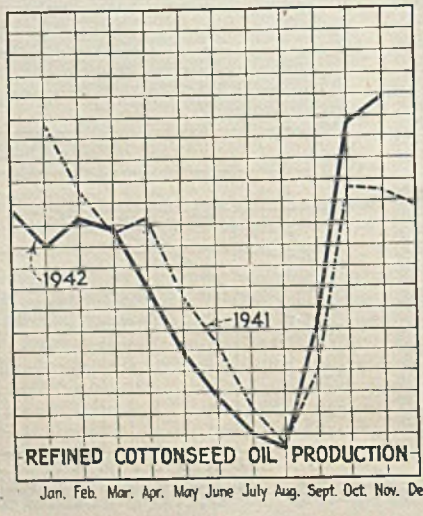
100 = Monthly Average for 1940

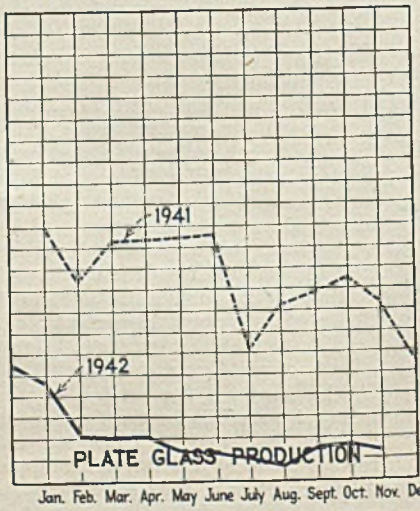


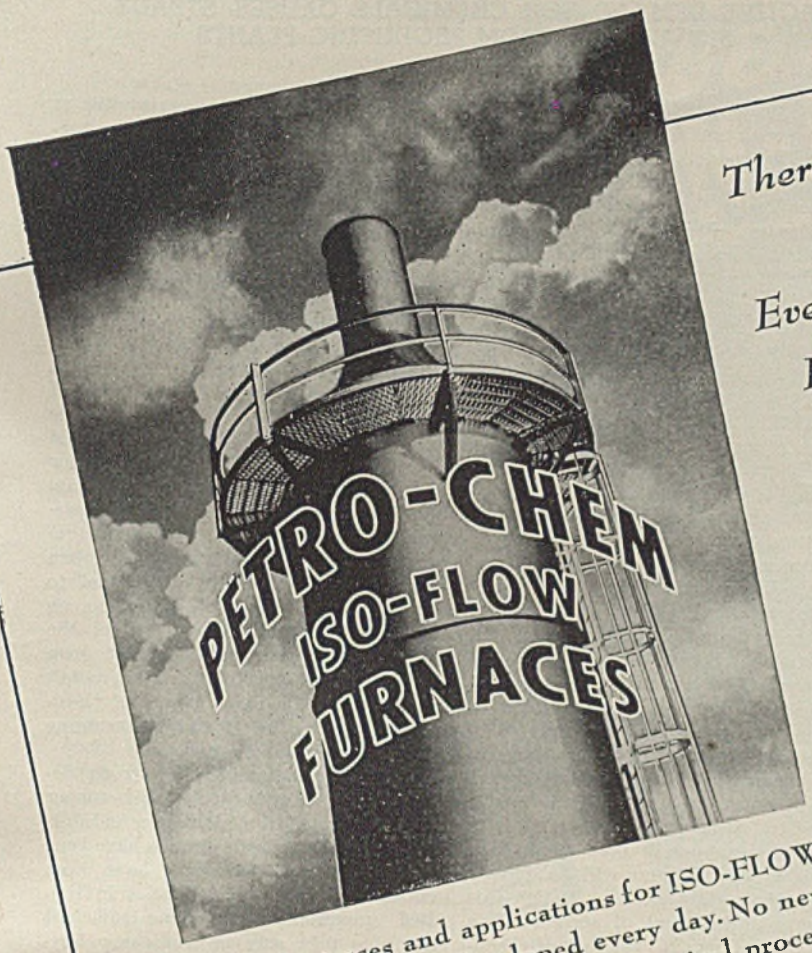












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Distillation
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for Heat Treatment
and any other heating service required by the Chemical Industry.

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ACTIVE DEMAND FOR CHEMICALS CAUSES STEADY MOVEMENTS FROM PRODUCING PLANTS

THE CHEMICAL industry entered the year with an active call for practically all products and with a steady movement from production points which indicates the close connection between rates of production and consumption. Here and there a few chemicals are found to be in ample supply but this is the exception and for the most part offerings are limited and frequently are insufficient to meet all demands. More and more finished products are coming constantly under distribution control due to the fact that raw materials are not available in sufficient volume to admit of unrestricted trading and essential needs must be given preference.

With a large part of chemical output under allocation and with price ceilings in effect for many of the important commodities, the market is practically devoid of the features which are found when trading is unrestricted and when competitive influences are important. The main developments of market significance still are centered in the action which is taken by government authorities and this in turn means that as war needs develop, action is taken to safeguard such needs. It has been announced that production of war goods this year will be sharply higher than they were in 1942. This means a curtailment of some civilian lines and means that the flow of chemicals may be altered considerably from the pattern followed last year. The net result, however, will be a larger consumption of chemicals which will be met partly by increased production facilities and partly by limiting the use of chemicals in some fields.

The situation in oils and fats is similar from a supply standpoint. We have raised larger crops of oil-bearing materials but the call for industrial, government, and Lend-Lease use is so large that an estimated shortage of close to 1,000,000,000, lb. of oils and fats is indicated for the year. The margarine trade has been given permission to increase its consumption of oils and fats by about 230,000,000 lb. and soap makers have to take a further cut in their allotments so that they are now permitted only 84 percent of the average amount used in the base period. Up to the end of the year it had been 88 percent, but they still may use foots up to 150 percent of the base period amounts.

Advisory committees representing different branches of the industry have held meetings in Washington in which the raw material situation was discussed. For instance, producers of vinyl resin coated papers and fabrics were informed that because of military requirements, a critical shortage exists in raw materials used in the production of vinyl resin and pyroxylin coated fabrics and their use in civilian production must be curtailed.

There are reports that some branches of the chemical industry are finding it difficult to determine costs of production and set individual price ceilings. Cost studies are said to be underway on sulphuric acid, acetic anhydride, and ammonia with the possibility that they may be extended to chlorine, caustic soda, soda ash, and sodium bicarbonate.

In the field of pigments, producers have been studying with a view to determining the final end use of pigments so as to line them up on a basis of essentiality which in turn would be a basis of the types of pigments and colors which might be scheduled for production. In the case of titanium dioxide, the restrictions which previously were in effect have been removed. This action was taken when the supply of ilmenite was found to be ample with considerable stocks on hand and domestic production of the ore reaching a point where it soon would amount to 26,000 tons a month which would insure a supply of titanium dioxide equal to any consuming demand which might arise.

In the insecticide field, strong demand has been reported for copper sulphate both from domestic and foreign buyers. Arsenicals also have been of interest and producers have been encouraged to make deliveries in limited amounts but retaining sufficient stock to take care of emergency buying should it later develop. Arsenic for insecticides is made available so that production will be better than the average amount consumed in 1941-42. Nicotine sulphate is scarce and the active call for nicotine from different quarters has started a search for a substitute material.

The order placing zinc dust under complete allocation has a direct significance on production of chemicals because it is probable that less zinc dust will be available for the manufacture of sodium hydrosulphite for textile dyes. Likewise, certain protective coatings and paints where zinc dust serves as a pigment are likely to be affected by the allocation order. Zinc dust is made from the dross accumulated in the galvanizing process. Because of shortage of zinc, the

CHEM. & MET. Weight Index of CHEMICAL PRICES

Base=100 for 1937

This month	108.92
Last month	108.92
January 1942	109.01
January 1941	100.00

Both contract and spot quotations are holding at established levels and a stabilized price position may be expected for the immediate future. Occasional fluctuations are found for items which are not under ceilings.

amount of galvanizing is only about 40 percent of a year ago. This naturally cuts down the supply of dross and cuts production of zinc dust.

Gum rosin and turpentine are included among the materials which are not controlled in price and while fluctuations are reported almost daily, the net change over the last few weeks has been small. The big development in the market is found in the announcement of the loan plan for the present year. Loans will be made available through the American Turpentine Farmers Association Cooperative to producers who comply with the conservation program.

Naval stores put under loan may be redeemed up to April 1, 1944, by payment of the loan value plus accrued charges and interest at 3 percent, but naval stores so redeemed may not subsequently be offered for purchase by CCC. Naval stores which are purchased become the property of CCC.

Loans will be made at rates equal to 90 percent of the November 15 parity price. For turpentine this is 64c. per gallon bulk, and for rosin the loan rates will range from $3.70 per 100 pounds net for X grade down to $3.25 for G grade, with an average of $3.50. The purchase rates, at 95 percent of parity prices, are 68c. per gallon of turpentine and $3.90 to $3.45 per 100 pounds of rosin, with an average of $3.70.

The loan and purchase program will be available from January 1, 1943, through December 31, 1943. Turpentine in barrels is not eligible for loan or purchase, nor is rosin which grades below G. All naval stores accepted under the program must be stored by approved warehousemen at designated interior and port points. The turpentine and rosin content of eligible oleorosin (crude gum) stored at approved central distillation plants also may be offered for loan or purchase.

Loans on naval stores have been available each season since 1938. The naval stores purchase program first became effective in June, 1942. Loan and owned stocks now total 815,662 barrels and drums of rosin and 140,320 barrels of turpentine as compared with 800,295 barrels and drums of rosin and no turpentine on January 1, 1942.

CHEM. & MET.
Weighted Index of Prices for
OILS & FATS

Base=100 for 1937

This month	142.32
Last month	140.89
January 1942	135.69
January 1941	75.28

In addition to the controls in effect, limited stocks of some oils are creating a strong price outlook. Industrial uses are curtailed by greater demand for edible products. Advance in flax market brought upward revision for linseed oil.

CHEMICALS DIVISION OF WPB REPORTS ON DECEMBER ALLOCATIONS OF CHEMICALS FOR CIVILIAN USE

IN THE third of its series of monthly reports on allocations of individual chemicals, the Chemicals Division of the War Production Board has given the most comprehensive picture of scarce chemicals yet released. The report covers allocations for December and is valuable inasmuch as it enables users of critical chemicals for all types of products to determine approximately the amount of each chemical they may expect to be allocated.

The report refers only to the chemicals allocated to civilian industry and does not include those which go for direct military needs. The purpose of allocations is to insure that essential needs are met. Requests are granted in full, granted in part, or denied completely. Where reduction was made the percentage figure shows the relationship between the amount granted and the amount requested. Wherever limitation orders govern consumption, allocations are granted in accordance with the percentage of each chemical permitted to be used by such order. Allocations were as follows:

Acetic Anhydride—Granted in part for cellulose acetate yarn for civilian requirements (80 percent), plastics and films for civilian requirements (90 percent); granted in full for other uses.

Acid, Naphthenic and Naphthenates—Granted in full for use in rubber plasticizers and softeners, rotogravure printing, metal cleaning compounds, lubricating greases and oils, non-substitutable paint driers, pigment manufacture processing.

Granted in part for use in semi-important paint driers (50 percent or less), textile finishing (50 percent or less), rust inhibiting compounds (50 percent or less). Denied for all non-essential protective coatings.

Acrylonitrile—Allocated almost entirely for use in synthetic rubber.

Alcohol, Capryl—Granted in full for manufacture of dicapryl phthalate, and for oil additives. Granted in small quantities for research and experimentation. Denied for all other uses.

Alcohol, Isobutyl and Isopropyl—All requests filled in full.

Alcohol, Normal Butyl—Civilian requests were all granted in part as follows: dibutyl phthalate (35 percent), butyl acetate (42 percent), hydraulic brake fluids (37 percent), other butyl derivatives (54 percent), cellulose aceto butyrate (25 percent), photographic and reproduction (82 percent), industrial coatings (50 percent), medicinal and pharmaceutical (80 percent), resins and plastics (28 percent), textiles and coated fabrics (80 percent), research (50 percent), resale (88 percent).

Alcohol, Secondary Butyl—Granted in part for lacquers and thinners (92 percent); for resin molding compounds (74 percent). Granted in full for other uses.

Alcohol, Tertiary Butyl—All requests granted in full.

Ammonia, Anhydrous—Granted in full for activated carbon, amines, ammonium sulphate, ceramics, corrosion control, detinning, dry cell batteries, dye intermediates and dyestuffs and pigments, fermentation, films and photo chemicals, fire retarding salts, flour manufacture and baking, flux, magnesium castings, food processing, glass, heat treating salts, hexamethylenetetramine, inorganic nitrates, insecticides, laundries, meat curing, metal treating nitriding, molybdenum, nitrocellulose, nitro-organics, nitrous oxide, paper, petroleum refining, pharmaceutical, photo engraving, plastics, rayon manufacture, refrigeration, rubber, soda ash, tanners bate and tanning, textiles, water treatment, welding.

Granted in part for nitrocellulose, sulphuric acid, adjusted to effect a gradual shift to sodium nitrate in specific types of operation where equipment permits.

Denied for use in fertilizer, caramel coloring, household ammonia and other cleaning purposes.

Ammonia, Aqua—Granted in full for ammonium picrate, ammonium sulphide, aniline, caustic soda, corrosion control, copper extraction, detinning, dye intermediates, electrolytic manganese, industrial explosives, fermentation, frosting bulbs, hexamethylenetetramine, insulation, laboratory reagents, and pharmaceuticals, metal refining, mildew proofing, molybdenum, paper, petroleum refining, plastics and resins, pyridine recovery, rayon manufacture, slime control, soda potash, potash salts, textile treatment, tungsten wire, water purification, and refrigeration.

Denied for use in fertilizer, caramel coloring, household ammonia, other cleaning purposes, Chamber process sulphuric acid.

Ammonium Compounds—Granted in full for use in chemical manufacture. Granted in part for fertilizer—on basis of overall nitrogen quota as established by the Department of Agriculture.

Aniline—All requests granted in full.

Aromatic Petroleum Solvents—Granted in full for use in reagents, hospital, and industrial laboratory work, dyestuffs, essential medicinal preparations, rubber preservative compound, engine and fuel testing, wool scouring, rotogravure printing, sanitary lacquers, tub oil processing.

Granted in part for use in textile finishing (50 percent or less according to type of use), defense housing paints (50 percent on overall basis), soap (50 percent on overall basis).

Denied for use in furniture and cabinet finishing, industrial lacquers, industrial synthetic uses, non-essential paints, civilian degreasing.

Benzene—Granted in full for use in the manufacture of phenol, cumene, rubber adhesives and rubber solvents. Granted in part for use in manufacture of aniline (75 percent), lacquer thinners and wood stains (30 percent), and for insulator and cold molded compounds (50 percent). Denied for use in paint and varnish remover, in printing and type wash. Inventory reduction of all aniline producers resulted from 25 percent in benzene allocated for aniline.

Butadiene—Almost entirely for use in synthetic rubber.

Caffeine—Granted in full for use in medicinals. Granted in part for use in beverages (30 percent).

Calcium Hypochlorite (high test)—Granted in full for use in sugar refining, and in potable water treatment. Other essential civilian uses filled in small quantities.

Carbon Black, Furnace Type—Requests for material for rubber compounding were granted in full. For use in inks and paints, minor quantities were allocated to specific users to give them a chance to make necessary adjustments to another type of black in their operations.

Castor Oil—Granted in full for use in protective coatings for insulation finish and food containers, adhesive tapes, binding compounds, hydraulic fluid, lubricants and metal working, dielectrics, boiler feed water, petroleum treating, concrete curing, fly paper, pyrotechnics, capryl alcohol.

Granted in part for adhesives, pyroxylin and vegetable (55 percent), coated fabrics—wearing apparel—(50 percent), coated fabrics—health supplies—(54 percent), cosmetics (25 percent), medicinal (80 percent), plasticizers—miscellaneous purposes—(40 percent), printing inks and papers (92 percent), leather and textiles—non-sulphonated (54 percent), dairy products (50 percent), antifreeze (72 percent), foods (50 percent), resins and opal wax (90 percent). Sulphonators were granted 50 percent of the amounts requested.

Denied for use in all other protective coatings, coated fabrics for household books and upholstery, core oils, belt dressing, soaps.

Chemical Cotton Pulp—All requests


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CHEMICAL STONEWARE
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Knight-Ware acid proof chemical pipe is being effectively used in a great variety of places where resistance to acids, alkalies, gases and fumes is vital.
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granted in full with the exception of certain cases where inventory reductions were effected.

Chlorate Chemicals—Granted in full for use in flares, torpedoes, pharmaceuticals, textiles, dry colors, weed killing, metal treating. Granted in part for use in matches (90 percent), fur dyeing (50 percent).

Chloride of Lime—Granted in part for civilian purposes (73 percent).

Chlorinated Paraffin—Granted in full.

Chlorine—Granted in full for use in chemical manufacture, water purification, dry cleaning. Granted in part for use in pulp and paper (80 percent) and in bleach (78 percent). Order L-11 governs the size of the requests for pulp and paper.

Dichlorethyl Ether—Granted in full for use in synthetic rubber. Denied for use in insecticides and cleaning compounds.

Diphenylamine—All requests filled in full.

Ethyl Cellulose—Granted in full for photo-engraving stripping compound, food label adhesive—special type. Granted in part for printing ink—temporary (30 percent), food package heat seal—special type (75 percent).

Furfural—Granted in part for use in resins (62 percent), abrasive wheel binder (44 percent), petroleum refining (77 percent), gas purification (90 percent), hydrogenation (29 percent), and other uses (80 percent).

Glycerine—Granted in full for the following uses on orders carrying ratings of AA-4 and higher, and A-1-a through A-1-k: drugs and pharmaceuticals, explosives, alkyd resins, ester gums, rubber products, varnish, plastics, transparent wrappings, greaseproof and glassine, wrappings other than transparent, printing, textiles, leather products, adhesives including bookbinding, paper, gaskets, edible products, other than beverages, flavoring extracts, candy and gum, chemical manufacture, other products, cork products. Granted in part under the same ratings for beverages, flavoring extracts, candy and gum (70 percent).

Granted in part for A-2 through A-10 ratings for drugs and pharmaceuticals (80 percent), alkyd resins (40 percent), ester gums (40 percent), rubber products (70 percent), varnish (40 percent), plastics (40 percent), transparent wrappings (90 percent), greaseproof and glassine (90 percent), wrappings other than transparent (50 percent), printing (90 percent), textiles (50 percent), leather products (50 percent), adhesives including bookbinding (60 percent), paper (60 percent), gaskets (80 percent), beverages, flavoring extracts, candy and gum (40 percent), other edible products (60 percent), chemical manufacture (60 percent), other products (40 percent), cork products (70 percent).

Granted in part for other ratings, on the basis of average monthly consumption in 1940 for: drugs and pharmaceuticals (60 percent), alkyd resins (25 percent), ester gums (25 percent), rubber products (60 percent), varnish (25 percent), plastics (25 percent), transparent wrappings (80 percent), greaseproof and glassine (80 percent), wrappings other than transparent (40 percent), printing (70 percent), textiles (40 percent), leather products (40 percent), adhesives including bookbinding (50 percent), paper (50 percent), gaskets (70 percent), beverages, flavoring extracts, candy and gum (40 percent), other edible products (50 percent), tobacco (45 percent), cosmetics and toilet preparations (35 percent), chemical manufacture (50 percent), other products (40 percent), cork products (50 percent. Granted in full for explosives.

Glycol Diethylene—Granted in full for use in molding sand, gas dehydration and cutting oils. Granted in part for use in general plasticizers (81 percent), tobacco (42 percent), general textile (80 percent), rayon yarn (81 percent), chemical manufacture (81 percent).

Glycol Ethylene—Granted in full for use in cellophane—except for L-20 limitations—hydraulic brake fluid, general textiles, cutting and drugs. Granted in part for use in civilian anti-freeze (69 percent), dynamite (56 percent), chemical manufacture (81 percent), general plasticizer (69 percent).

Glycol, Mixed—Granted in full for

molding sand, gas dehydration, chemical manufacture, general textile, general plasticizers and cutting oil. Denied for brake fluid.

Glycol, Propylene—Granted in full for tobacco, chemical manufacture, brake and hydraulic fluid, foods and flavors, drugs, general plasticizer. Granted in part for cosmetics (99 percent), and miscellaneous uses (89 percent).

Glycol, Triethylene—Granted in part for chemical manufacture (81 percent), for general plasticizers (11 percent). Granted in full for other uses.

Lithium Compounds—Granted in part for use in air conditioning (5 percent), storage batteries (35 percent), glass and enamel (70 percent), medicinals (3 percent), welding fluxes (84 percent), other uses (13 percent).

Methyl Ethyl Ketone—Granted in part for use in lacquers, thinners, toluol substitutes (65 percent), cleaners and removers (78 percent), printing inks (50 percent), resale in small quantities (41 percent). Denied for soaps and cosmetics. Granted in full for other uses.

Naphthalene—Granted in part for use in moth prevention and insecticides (60 percent). Other uses filled in full.

Nitrate of Soda—Granted in full for industrial requirements. Granted in part for agriculture, the allocations being in accordance with overall nitrogen quotas established by the Department of Agriculture. Denied for the use in manufacture of glass containers.

Nitrocellulose—Both scrap and prime granted in full for raincoats, metal button lacquer, moistureproof coatings for foods, bottle closure linings, food labels, sausage casings, medical equipment, collodion, hospital equipment, instrument cases, auto refinishing, upholstery, radio, telephone, machines and machine tools, power belting, electrical equipment, and supplies, tape, casting sealer, rotogravure inks, tracing cloths, stencils, drawing instruments, maritime, model airplanes, oil containers.

Prime grade granted in full for use in plastics (class 1), cellophane coating and photographic film, both of the latter subject to L orders. Granted in part for use in shoe cement (75 percent), heel lacquers (75 percent), shoe lining (50 percent), waterproof sheeting (50 percent), baby pants (50 percent), dress shields (50 percent), book cloth (50 percent), fountain pens (50 percent).

Scrap grade granted in full for shoe cement, heel lacquers, shoe lining, waterproof sheeting, baby pants, dress shields, book cloth. Granted in part for use in furniture (50 percent), upholstery, except transportation, (50 percent), window shades (50 percent), floor covering (50 percent).

Both prime and scrap grades denied for use in handbags, belts, and luggage, hats, fingernail polish, decorative lacquer for food, oilcloth, transcription except central station, recreating and amusement purposes, and casket liquor.

Oiticica Oil—Granted in full for use in food containers, chemical resistant finishes, insulation, special printing inks. Denied for use in industrial equipment, wrinkle finish, furniture, wood products, window envelopes and miscellaneous uses.

Phthalic Anhydride—Granted in part for use in resins (65 percent), esters (79 percent), dyes and intermediates (45 percent), drugs and food (84 percent), miscellaneous—rubber oil demulsifying agents and miscellaneous chemicals.

Phthalic Plasticizers—Diamyl phthalate—all civilian uses denied. Dibutyl phthalate—granted in full for heat-sealing lacquers for food containers, casket lacquers, shoe adhesives, hospital sheeting, cellophane. Granted in full for Class I and II plastics. Denied for use in Class III plastics and all others.

Granted in full for use in Class I and II plastics and denied for Class III and all others were dimethyl phthalate, diethyl phthalate, dimethyl cellosolve phthalate, butyl phthalyl butyl glycollate, ethyl phthalyl ethyl glycollate, and methyl phthalyl ethyl glycollate.

Use was denied in the case of dicapryl phthalate, dioctyl phthalate, diethyl cellosolve phthalate, and castor oil phthalate.

Dibutyl Cellosolve Phthalate was granted in full for rubber substitutes for can and bottle linings and denied for all other use. Hydrogenated castor oil phthalate was granted in full for cellophane.

Phenol—Phenol and cresol for tri-

cresyl phosphate were allowed to cover allocations of these commodities. Phenol was granted in part for medicinals (70 percent of 1941 monthly average), disinfectants and preservatives (60 percent —although no domestic cresols or cresylic acid were allocated for this purpose —imported cresylic acid was substituted where possible), dyes, pigments and inks (50 percent), chemical manufacturing (80 percent). Chlorinated phenols were granted for 40 percent of essential civilian requirements. Ore flotation minimum operating requirements were filled in full and miscellaneous uses for phenol were filled 50 percent.

Phenolic Resins — Specialties — Requests for the following uses were filled in full: bonding and impregnation, resin for use with rubber, synthetic rubber, pitch or asphalt in molded articles, and thread sealing compounds. The following uses were granted in part: abrasive (80 percent), friction material (84 percent), lamp and tube basing (57 percent), paint and lacquer bristle setting (99 percent), inpregnation of solenoids and other electrical windings (70 percent), casting impregnation (95 percent), binding of composition cork (71 percent).

Molding compounds—Following uses granted in full: food closures and printing plates. Granted in part: industrial power and light (84 percent), medical equipment and supplies, scientific instrument parts (69 percent), civilian electrical apparatus, closures other than food, wine and liquor (85 percent), industrial equipment (70 percent), agricultural equipment (61 percent), health and sanitation (29 percent), replacement for civilian appliances (72 percent), textiles, rayon equipment and parts (68 percent), replacement parts for automotive use (89 percent). Denied were requests for material for amusement articles, ashtrays, and for wine and liquor closures. Phenolic resin already had been removed from civilian buttons and none was granted for that purpose.

Laminates—Requests for material for safety helmets were granted in full. Use for electrical insulating parts were granted up to 98 percent. Other uses filled in part were: mechanical and structural uses (57 percent), phenolic gears, gear blanks, sheet material for use in gears (55 percent), corrosion resistant parts (49 percent), and heat insulation (53 percent). Requests for decorative purposes had already been denied and no such requests were made for the month.

Protective coatings—Use of phenolic resins granted in part for food and beverage containers and closures, paper liners for food and beverage, medicinal and chemical containers (45 percent), hospitals, ambulances and fire trucks (50 percent), heat, light, gas and power plants, bridges, water systems and railroads, electrical equipment, insulation instruments, surveying, flashlights (25 percent), bus lines, street cars, trucks, other municipal and inter and intra community freight or passenger transportation system (35 percent), printing and publishing inks, lithography, lacquers, etc. (52 percent), general industrial uses (43 percent). Denied for use in agriculture and construction equipment, public buildings and maintenance and other civilian uses.

Plywood adhesives—All civilian requests were denied.

Para Phenyl Phenol Resins—Following civilian requests were filled in part: electrical equipment, switch boards, circuit breakers (40 percent), containers paper liners for bottle caps (1 percent), and coated abrasives (10 percent). Denied were: road building equipment, refrigerators, inks, communications, laboratory equipment and experimental work.

Phosphate Plasticizers — Triphenyl granted in full for use in films and denied for other uses. Tricresyl denied for all civilian use.

Phosphorus—Granted in full for phosphate plasticizers, mining flotation, bearing metals, rustproofing, petroleum, drugs and vitamins, pharmaceuticals, matches, dyestuffs, fire retardents, activated carbon, dentrifice, fertilizer, glass, coumarin, gelatin, salt conditioner.

Granted in part for power plant chemicals (70 percent), acid leavening (85 percent), sugar refining (92 percent), yeast (85 percent), cheese and butter (34 percent), industrial detergents (95 percent), industrial soaps (95 percent),

household detergents (35 percent), household soaps (35 percent), beverages (60 percent).

Polyvinyl—All civilian requests denied.

Polyvinyl Alcohol—Granted for use in erasers using offgrade material.

Polyvinyl Butyral—All civilian requests denied.

Polyvinyl Formal—All civilian requests denied.

Pyrethrum—Granted in part for civilian requests (25 percent).

Pyridine—Granted in full for all uses.

Shellac—Granted in full for ink, medical and dental supplies, laboratory cements, rubber products, latex products, industrial brushes, concrete, industrial explosives, precision optics, fire hydrant valves, snap flasks, base cement for light tubes, tracing cloth, photo-engraving, brewer's varnish, fiber luggage, electrical equipment, Tympan paper for printing presses, shellac coating photo sensitized, sealer for tar paper, surface coat paper, cigarette boxes and covers, pipe organ repairs.

Granted in part for boots and shoes (70 percent), refrigerators and washing machines (45 percent), cement and Pittman cement (99 percent), leather finishes and shoes (62 percent), hats (40 percent).

Denied for mirror backing, phonograph records, picture frames, furniture, woodwork, office equipment, general maintenance, floor finishing, linoleum and aniline.

Silica Gel—Granted for all civilian requests in full.

Sperm Oil—Granted in full for use in cutting oil, drawing compounds, duplicating carbon, lubricants and additives, quenching oil, emulsion breakers. Denied for use in leather, and for use in textile oil, although one company is being permitted to use small stocks on hand at the rate of 1,000 pounds a month.

Styrene—Allocated almost entirely for use in synthetic rubber.

Toluene—Granted in full for laboratory and research uses. Granted in part for dyes and intermediates (38 percent), solvents (1 percent), food preservatives (1 percent), medicinals (97 percent), miscellaneous chemicals (39 percent), other uses (53 percent). Toluol, 1 deg. granted in part for dyes and intermediates (26 percent), medicinals (24 percent), miscellaneous chemicals (26 percent).

Toluol, LG-2—Granted in part for use in solvents (50 percent), rubber accelerators (43 percent). Toluol denied for use in protective coatings, cleaning, adhesives. Toluol, long range, denied for use in solvents.

Tung Oil—Granted in full for use in binder and molding compound, insulation, food container coating, coated fabrics, water resistant coatings, chemical resistant coatings, pipe coatings, industrial tape. Granted in part for use in industrial coatings (55 percent), house finish (3 percent), brake linings (92 percent), printing inks and mats (60 percent). Denied for use in wrinkle finish.

Vinyl Acetate Monomer—Granted in full for use in essential medicinals and denied for other civilian uses.

Vinyl Chloride Polymers and Copolymers—Vynw and Koroseal were granted in full for experimentation and research, for essential industrial electric wire insulation, for chemically resistant gaskets in rayon spinners, and for catheters. Quantities requested were small.

Vyns and Vyhh were granted in full for experimental and development work, for hospital sheeting, for acid proof paint, for talking books for the blind, for self-adhering surgical bandages, and for glass container closures for food and drugs. Requests for food packaging were granted in part (50 percent). Requests for beverage use were denied. Quantities requested were small.

Vinylite Scrap—Granted in full for experimental work, protective clothing, baby pants, mending tape, nursery sheeting, hospital sheeting. Denied for specialties and novelties.

Saran—All requests granted.

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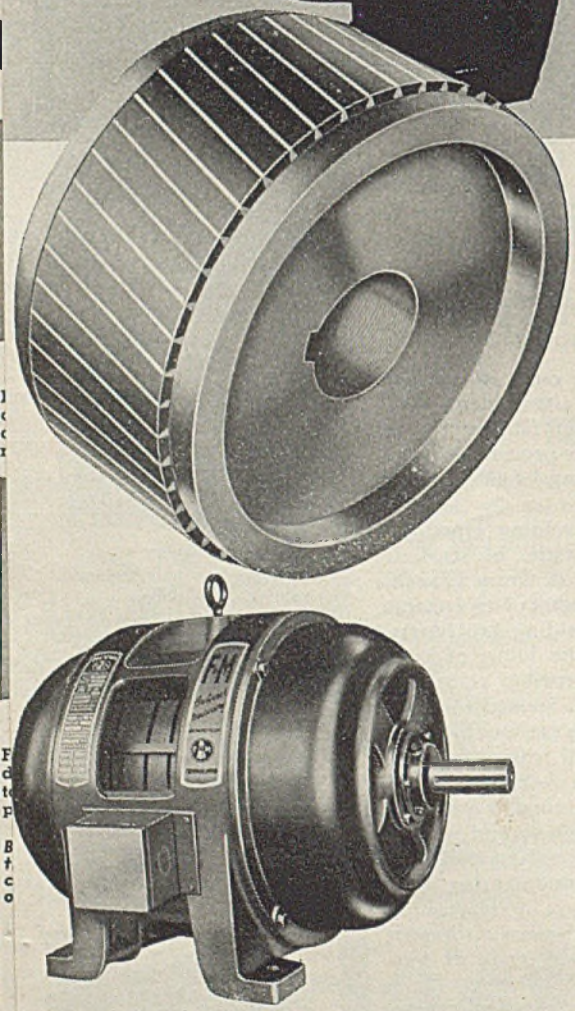

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AIR CONDITIONERS

Motors

CURRENT PRICES

INDUSTRIAL CHEMICALS

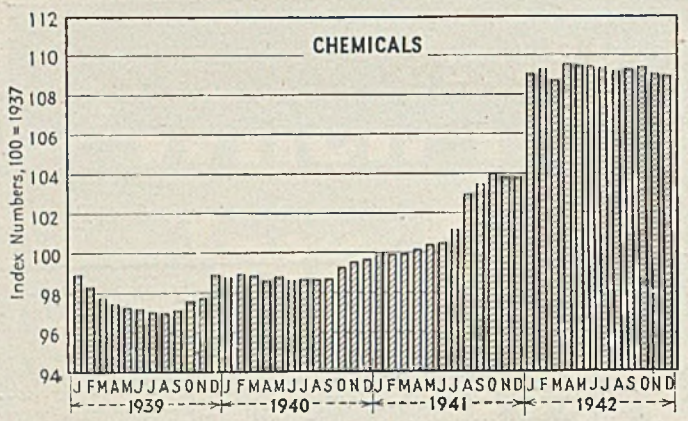
	Current Price	Last Month	Last Year
Acetone, drums, lb.	$0.085–$0.109	$0.085–$0.109	$0.168–$0.173
Acid, acetic, 28%, bbl., cwt.	3.38 – 3.63	3.38 – 3.63	3.38 – 3.63
Glacial 99.5%, drums	9.15 – 9.40	9.15 – 9.40	9.15 – 9.40
U. S. P. X 1, 99.5%, dr.	10.95 –11.20	10.95 –11.20	10.95 –11.20
Boric, bbl., ton	109.00–113.00	109.00–113.00	106.00–111.00
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	.7½– .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.	.12½– .14½	.12½– .14½	.158–.....
Alcohol, Ethyl, 190 p'f., bbl., gal.	$.19 – $.25	$.19 – $.25	$.19 – $.25
Denatured, 190 proof	.....	.....	.....
No. 1 special, dr., gal. wks.	.60 –.....	.60 –.....	.60 –.....
Alum, ammonia, lump, bbl., lb.	.03½– .04	.03½– .04	.03½– .04
Potash, lump, bbl., lb.	.04 – .04½	.04 – .04½	.04 – .04½
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.	.02½– .03	.02½– .03	.02½– .03
tanks, lb.	.02 – .02⅝	.02 – .02½	.02 – .02½
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	.11 – .12
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	.06½– .07
Carbide drums, lb	.04½– .05	.04½– .05	.04½– .05
Chloride, fused, dr., del., ton.	18.00 –24.00	18.00 –24.00	18.00 –24.00
flake, bags., del., ton.	18.50 –25.00	18.50 –25.00	18.50 –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	.05½– .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.	5.15 – 5.40	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– .06½	.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.	.18½–.....	.18½–.....	.18½–.....
Lead:			
White, basic carbonate, dry casks, lb.	.08½–.....	.08½–.....	.07½–.....
White, basic sulphate, sck., lb.	.07½–.....	.07½–.....	.06½–.....
Red, dry, sck., lb.	.09½– .09½	.09½–.....	.08½–.....
Lead acetate, white crys., bbl., lb.	.12½– .13	.12½– .13	.12 – .13
Lead arsenate, powd., bag, lb.	.11 – .12	.11 – .12	.09½– .11
Lime, chem., bulk, ton	8.50 –.....	8.50 –.....	8.50 –.....
Litharge, powd., csk., lb.	.08½–.....	.08½–.....	.0735–.....
Lithopone, bags, lb.	.04½– .04½	.04½– .04½	.04½– .04½
Magnesium carb., tech., bags, lb.	.06½– .06½	.06½– .06½	.06½– .06½
Methanol, 95%, tanks, gal.	.60 –.....	.60 –.....	.55½–.....
97%, tanks, gal	.60 –.....	.60 –.....	.55½–.....
Synthetic, tanks, gal.	.28 –.....	.28 –.....	.28 –.....
Nickel salt, double, bbl., lb.	.13½– .13½	.13½– .13½	.13½– .13½
Orange mineral, csk., lb.	.12½–.....	.12½–.....	.11½–.....
Phosphorous, red, cases, lb.	.40 – .42	.40 – .42	.40 – .42
Yellow, cases, lb.	.18 – .25	.18 – .25	.18 – .25
Potassium bichromate, casks, lb.	.09½– .10	.09½– .10	.09½– .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	.07½– .08	.07½– .08
Bisulphite, 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– .06½	.06½– .06½	.06½– .06½
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.	.02½– .02½	.02½– .02½	.02½– .02½
Sulphur, crude at mine, bulk, 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	.05 – .06	.05 – .06
Carbonate, bbl., lb.	.14 – .15	.14 – .15	.14 – .15
Cyanide, dr., lb.	.33 – .35	.33 – .35	.33 – .35
Dust, bbl., lb.	.10½–.....	.10½–.....	.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

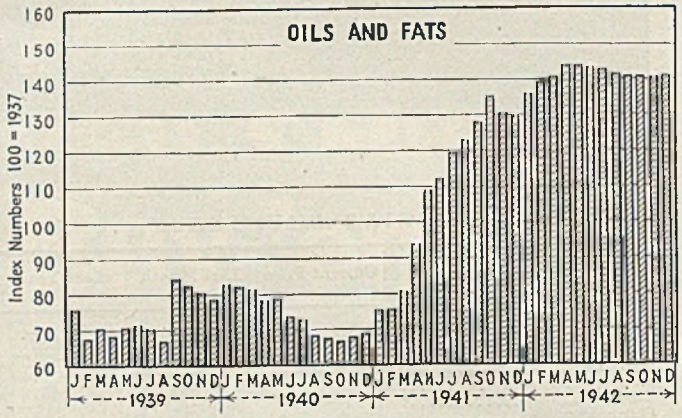
OILS AND FATS

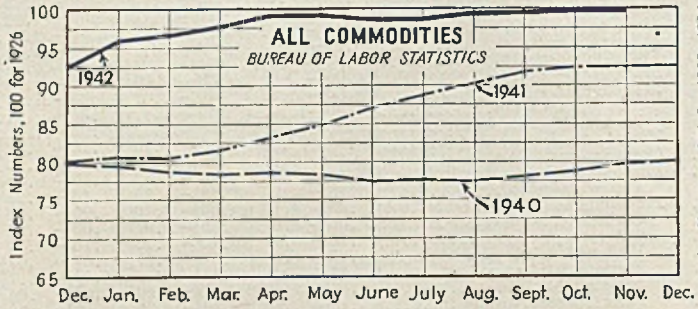
	Current Price	Last Month	Last Year
Castor oil, No. 3 bbl., lb.	$0.13½–$0.14½	$0.13½–$0.14½	$0.12½–$0.13
Chinawood oil, bbl., lb.	.38 –.....	.38 –.....	.35 –.....
Coconut oil, Ceylon, tank, N. Y., lb.	nom	nom	nom .....
Corn oil crude, tanks (f.o.b. mill), lb.	.12¼–.....	.12¼–.....	.12½–.....
Cottonseed oil, crude (f.o.b. mill), tanks, lb.	.12½–.....	.12¾–.....	.12½–.....
Linseed oil, raw car lots, bbl., lb.	.134–.....	.128–.....	.111–.....
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.	.11½–.....	.11½–.....	.11½–.....
Sulphur (olive foots), bbl., lb.	nom	nom	.19 –.....
Cod, Newfoundland, bbl., gal.	nom	nom	nom .....
Menhaden, light pressed, bbl., lb.	.117–.....	.117–.....	.112–.....
Crude, tanks (f.o.b. factory) lb.	.088–.....	.088–.....	.08 –.....
Grease, yellow, loose, lb.	.08½–.....	.08½–.....	.09½–.....
Oleo stearine, lb.	.09½–.....	.09½–.....	.09½–.....
Oleo oil, No. 1.	.11½–.....	.11½–.....	.11½–.....
Red oil, distilled, d.p.p. bbl., lb.	.11½–.....	.11½–.....	.12 –.....
Tallow extra, loose, lb.	.08⅝–.....	.08⅝–.....	.09½–.....

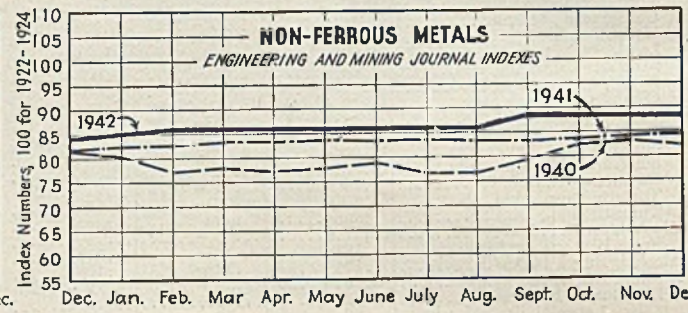
The accompanying prices refer to round lots in the New York market. Where it is the trade custom to sell f.o.b. works, quotations are given on that basis and are so designated. Prices are corrected to January 14

Chem. & Met.'s Weighted Price Indexes









Coal-Tar Products

	Current Price	Last Month	Last Year
Alpha-napthol, 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.	.13 –.....	.13 –.....	.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.	.19 – .20	.19 – .20	.29½– .30
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	3.20 – 3.25
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 –.....	65.00 –.....
Pumice stone, lump, bbl., lb.	.05 – .07	.05 – .08	.05 – .07
Imported, casks, lb.	nom	nom	nom .....
Rosin, H., 100 lb.	4.10 –.....	3.97 –.....	3.75 –.....
Turpentine, gal.	.70 –.....	.69½–.....	.79½–.....
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

WHEELCO INSTRUMENTS CO., Chicago, has appointed Roger W. Allen southeastern district manager with headquarters at 305 Techwood Drive, Atlanta, Ga.

BLACKMER PUMP CO., Grand Rapids, Mich., is now represented in Oklahoma and western Arkansas by the Power Machinery Corp., 215 North Detroit St., Tulsa, Okla.

REYNOLDS METALS CO., aircraft parts division, Louisville, has named Harry G. Smith operations manager. Mr. Smith will superintend the operation of five additional plant buildings which have just been leased by the company.

CROCKER-WHEELER ELECTRIC MFG. CO., Ampere, N. J., has appointed W. L. Buchanan field manager of renewal parts sales with headquarters in the Chicago office of the company.

THE B. F. GOODRICH CO., Akron, has made M. G. Huntington manager of its national sales and service division in the Washington office. He succeeds K. D. Smith who has been transferred to Detroit.

LUKENS STEEL CO., Coatesville, Pa., has announced the appointment of Charles L. Huston, Jr., as assistant to the president.

PHILLIPS PETROLEUM CO., Bartlesville, Okla., has moved the general offices of the Philgas division from Detroit to the main offices of the company.

E. LEITZ, INC., New York, has appointed Charles E. Kidner general manager. Mr. Kidner will continue as vice-president of the Kalart Co., Stamford, Conn.

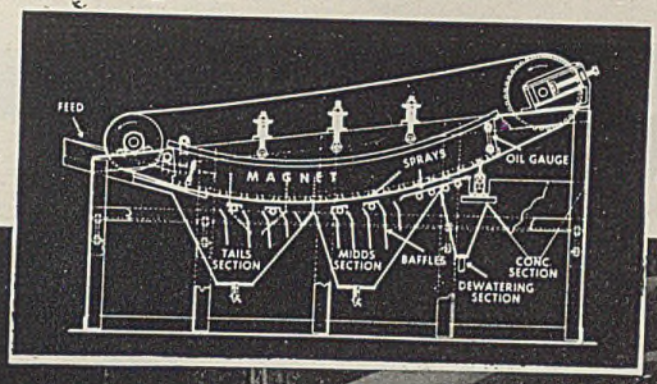
THE DAYTON RUBBER MFG. CO., Dayton, has named C. D. Bucher director of purchases to succeed J. C. Cunningham resigned.

KOLD-HOLD MFG. CO., Lansing, Mich., has transferred Frank A. Haag, former eastern manager, to the main office where he succeeds Paul R. Portteus as sales manager.

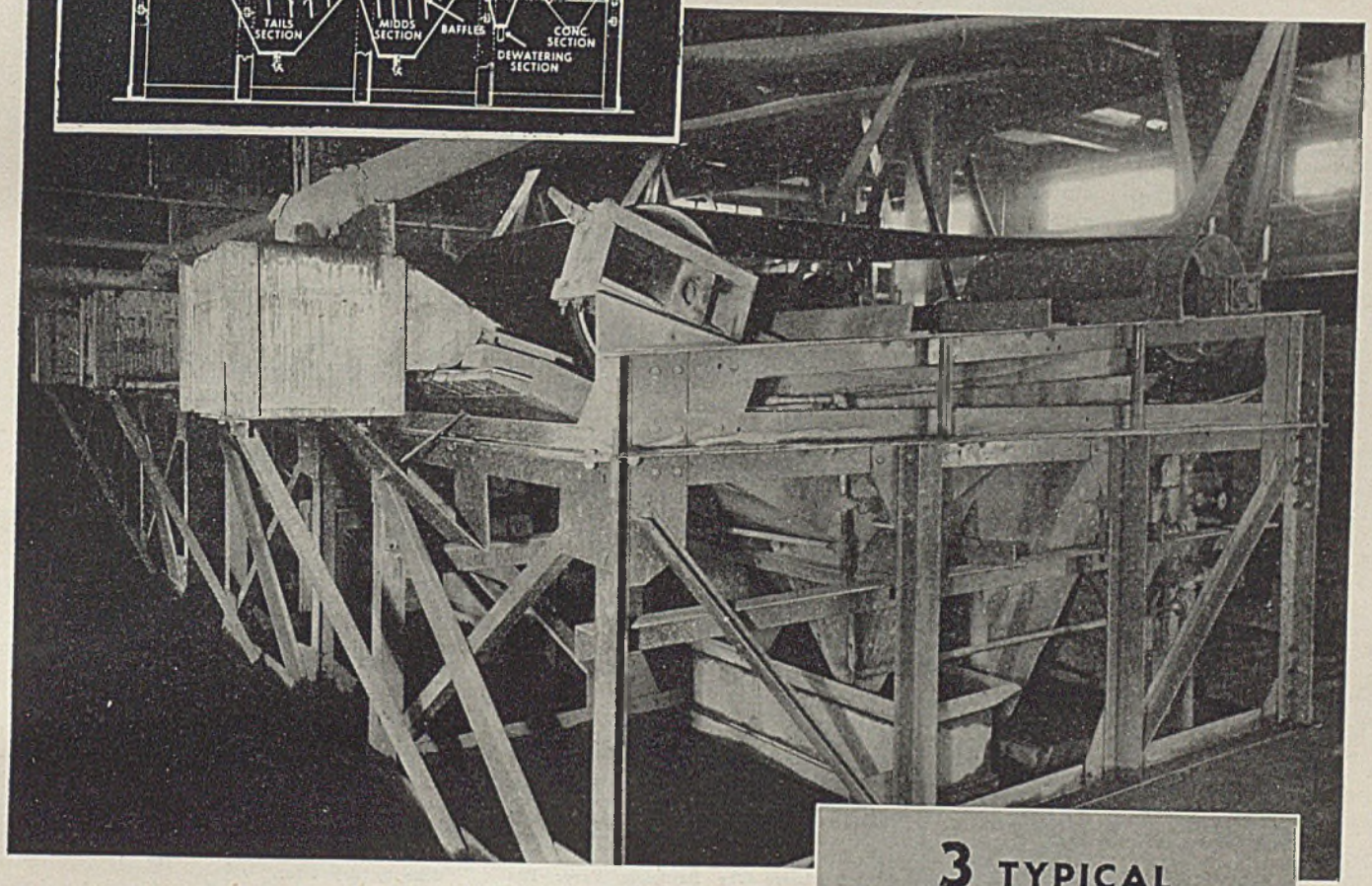
CHAIN BELT CO., Milwaukee, has promoted G. D. Gilbert sales manager of the Baldwin-Duckworth division, Springfield, Mass., to the position of general manager of that division and also elected him secretary of the company to succeed A. R. Abelt who has been made vice-president and director.

DETROIT REX PRODUCTS CO., Detroit, has moved its offices in Los Angeles to 1506 Santa Fe Ave. S. B. Crooks has been transferred from the midwestern region to manage the Los Angeles office. W. A. Vensel formerly Pacific region manager will supervise sales and service in the southern states.

ATLAS POWDER CO., Wilmington, has named Frank G. Pollock as general manager of the explosives department to succeed the late W. T. Penniman.



A Magnetic Separator...



...with Broad Application Possibilities

● The Dings Crockett Separator is a wet type machine, having a high capacity and capable of producing amazingly clean cut separations. A wet feed enters the machine and is carried by an endless belt under a series of High Intensity selective pickup sections.

Dings is actively seeking new applications for this machine and will welcome your inquiries if you feel that it may fit your picture. Complete information supplied on request without any obligation on your part.

DINGS MAGNETIC SEPARATOR CO.
505 E. Smith St. • Milwaukee, Wis.
World's Largest Exclusive Builder of Magnetic Equipment
SEPARATION — CONCENTRATION
CRUSHER AND GRINDER PROTECTION

3 TYPICAL APPLICATIONS OF DINGS CROCKETT SEPARATORS:

1. *Concentrating magnetite, ilmenite and similar minerals.*
2. *Cleaning ferro-silicon medium in sink and float process.*
3. *Concentrating blast furnaces flue dusts to overcome dilution of charge when they are recovered and returned to smelting process.*

Dings MAGNETIC SEPARATION HIGH INTENSITY

NEW CONSTRUCTION

	Current Projects		Cumulative 1942	
	Proposed Work	Contracts	Proposed Work	Contracts
New England	$40,000	$40,000	$2,710,000	$4,555,000
Middle Atlantic	120,000	195,000	7,271,000	109,581,000
South	.....	.....	11,640,000	98,373,000
Middle West	3,250,000	2,720,000	109,185,000	195,245,000
West of Mississippi	1,080,000	2,785,000	189,857,000	409,008,000
Far West	240,000	40,000	21,080,000	148,862,000
Canada	190,000	3,296,000	26,773,000	9,245,000
	$4,920,000	$9,076,000	$368,516,000	$974,869,000

PROPOSED WORK

Calif., Los Angeles—The United States Gypsum Co., 8430 Quartz Ave., South Gate, manufacturer of wall board products, insulating board, etc., plans the construction of an addition to its storage and distributing building.

Ind., Kokomo—Kokomo Sanitary Pottery Co., C. Leo Williams, Plant Mgr., North Washington St., plans to rebuild its plant here which was recently destroyed by fire. Estimated cost including equipment $150,000.

Louisiana—Defense Plant Corp., Washington, D. C., has entered into a contract with the Rubber Reserve Corp. to construct a synthetic rubber plant to be operated by the Copolymer Corp. The operating company has been formed by the Armstrong Rubber Co., Dayton Rubber Manufacturing Co., Gates Rubber Co., Lake Shore Tire & Rubber Co., Mansfield Tire & Rubber Co., Pennsylvania Rubber Co. and Sears, Roebuck Co.

Minn., St. Paul—Twin City Testing & Engineering Laboratory, O. W. Britzius, Pres. 2482 University Ave., is having plans prepared by Toltz, King & Day, Archts., 1509 Pioneer Bldg., for the construction of a 1-story, 40x120 ft. brick and tile laboratory building at Franklin and Cromwell Aves. Estimated cost $40,000.

Minn., South St. Paul—Farmers Union Central Exchange, E. A. Syfestad, Mgr., 1200 North Concord St., contemplates the construction of an oil refinery. Estimated cost $1,000,000.

N. J., Camden—The Armstrong Cork Co., foot of Jefferson St., Lancaster, Pa., manufacturer of cork board and insulating board products, contemplates rebuilding part of its plant here which was recently destroyed by fire.

N. J., Rahway—Woodbridge Metallurgical & Chemical Corp., Leesville Ave., plans the construction of a 2 story metal chemical plant. Estimated cost $40,000.

N. Y., Jamestown—Matthews Tire & Tread Co., 1905 Washington St., plans to rebuild its plant. Estimated cost $40,000.

Ohio—U. S. Government, Washington, D. C., plans to construct a plant to be operated by the Sun Oil Co., 1608 Walnut St., Philadelphia, Pa. Estimated cost will exceed $3,000,000.

O., Cleveland—The Great Lakes Box Co., 7275 Wentworth Ave., manufacturer of folding paper cartons and other paper products, contemplates the reconstruction of its 4 story plant which was recently destroyed by fire with a loss estimated at $100,000.

Rhode Island—U. S. Rubber Co., 355 Valley St., Providence, plans to construct an addition to its plant.

Tex., Bay City—Humble Oil & Refining Co., Bay City, plans to dismantle and remove its oil refinery from near Palestine and reconstruct same at Bay City. Estimated cost $40,000.

Wash., Colfax—R. H. Sunderland, Colfax, plans the construction of a starch plant. Estimated cost $200,000.

N. B., St. John—Canada Veneer, Ltd., 7 Wall St., is having plans prepared by G. A. Wilson, Archt., 50 Princess St., for the construction of a factory. Estimated cost $100,000.

Ont., Long Branch—Beacon Chemicals of Canada, Ltd., Long Branch, plans the construction of a plant here. Estimated cost $40,000.

Ont., Merritton—Alliance Paper Mills, Merritton, are receiving bids for the construction of a 2 story, 28x60 ft. plant, Lybster Div. Estimated cost $50,000.

Que., Montreal—Dominion Tar & Chemical Co., 3547 Allard St., plans the construction of a 40x120 ft. brick addition to its plant. Estimated cost $40,000.

Que., St. Jerome—Dominion Rubber Co., Ltd., 550 Papineau Ave., Montreal, Que., plans to construct an addition to its plant here. Estimated cost $40,000.

CONTRACTS AWARDED

Calif., Los Angeles—The Angelus Paper Box Co., 747-51 South Bway., has awarded the contract for the construction of alterations to its plant to Paul A. Stein, 2009 West 39th St., Los Angeles. The Company manufactures corrugated and other paper boxes and containers.

Md., Baltimore—The Baltimore Paper Box Co., 1300 Covington St., manufacturer of corrugated boxes and containers, has awarded the contract for rebuilding that part of its plant which was recently damaged by fire to the Consolidated Engineering Co., 20 East Franklin St., Baltimore.

Mich., Detroit—Detroit Aluminum & Brass Corp., 3975 Christopher St., has awarded the contract for the construction of an addition to its plant to James A. Moynes, 901 Milwaukee Ave. Estimated cost $100,000.

N. J., Newark—E. I. du Pont de Nemours, Jersey Ave., New Brunswick, has awarded the contract for the construction of a 3 story addition to its chemical manufacturing plant to Rogers & Sons Construction Co., 71 John St., New Brunswick. Estimated cost $40,000.

Ohio—National Carbide Co. has awarded the contract for the construction of a plant here to Rust Engineering Co., Clark Bldg., Pittsburgh, Pa. Estimated cost will exceed $2,500,000.

Pa., Knox—Knox Glass Bottle Co., R. R. Underwood, Pres., will construct a 1 story warehouse. Work will be done with own forces.

Pa., New Brighton—Brighton Clay Products Co., W. H. Schwartz, Pres., Pinney St., Rochester, will construct a 3 story, 40x50 ft. factory, a 1 story, 40x75 ft. machine shop and repair other buildings. Work will be done by owner. Estimated cost $75,000.

R. I., Cumberland—Owens Corning Fiberglass Co., Railroad St., has awarded the contract for alterations to its binder building also constructing 1 story, 70x100 ft. model manufacturing plant with batch storage and mixing facilities to Central Engineering & Construction Co., 210 Main St., Pawtucket, R. I.

Texas—Goodrich Rubber Co. and Goodrich Tire & Rubber Co., Akron, O., has awarded the contract for the construction of plants to O. W. Collins, Port Arthur. Estimated cost $67,000 and $70,000 respectively.

Texas—Lake Creek Recycling Plant, c/o Superior Oil Co., Lake Creek, has awarded the contract for the construction of a 1 story laboratory to Fluor Corp., Ltd., Mellie Esperson Bldg., Houston. Estimated cost $73,200.

Texas—U. S. Government, Washington, D. C., has awarded the contract for the construction of a plant to be operated by the Eastern States Petroleum Co., 624 Shell Bldg., Houston, to Foster-Wheeler Corp., Shell Bldg., Houston, and 165 Bway, New York, N. Y. Estimated cost $2,500,000.

Texas—U. S. Government, Washington, D. C., has awarded the contract for the construction of a plant to Chemical Construction Co., Fort Worth Natl. Bank Bldg., Fort Worth. Estimated cost $55,000.

Wis., Mellen—Penokee Veneer Co., Mellen, will construct a 1 story, 90x298 ft. and 40x120 ft. mill building. Work will be done by day labor.

Wis., Rhinelander—The Rhinelander Paper Co., manufacturer of glassine, greaseproof and other paper products, is building an addition to its plant. Work will be done by day labor.

Wis., Wisconsin Rapids—Consolidated Water Power & Paper Co., Wisconsin Rapids, will construct a 1½ story, 83x102 ft. brick press building addition to its factory. Work will be done with own forces.

Alta., Hartell—Gas & Oil Products, Ltd., 301 Lancaster Bldg., Calgary, plans the construction of an addition to its plant. Work will be done with own forces. Estimated cost $45,000.

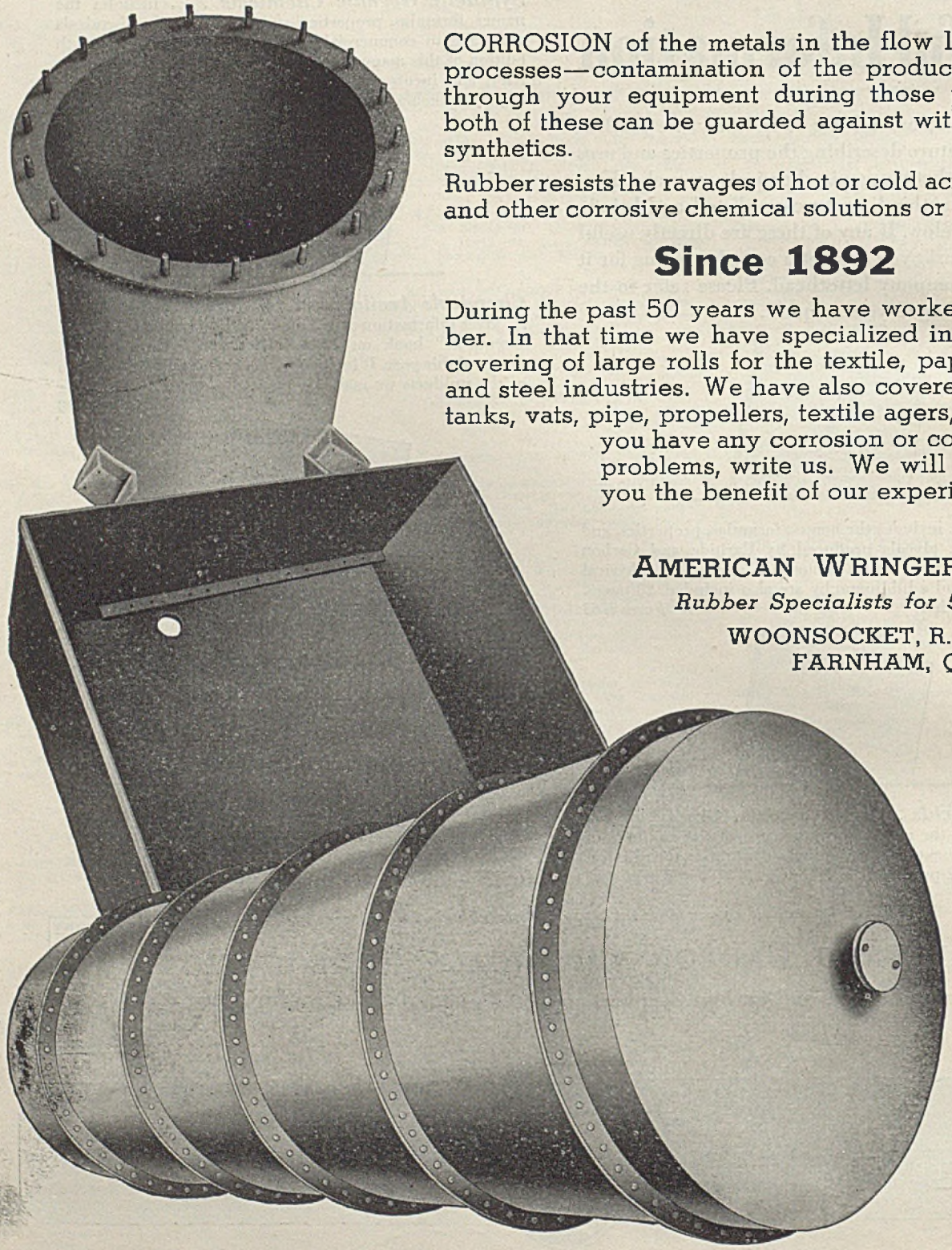
Ont., Deloro—Deloro Smelting & Refining Co., Ltd., R. A. Elliott, Gen. Mgr., Deloro, will construct an 18x27x57 ft. frame furnace building, also a 11x15x20 ft. building. Work will be done by own forces. Estimated cost $46,542.

Ont., Oakville—Barringham Rubber Co., Oakville, will construct solvent recovery plants for keytone and gasoline. Work will be done with own forces. Estimated cost $150,000.

Ont., Toronto—Aluminum Co. of Canada, Ltd., 158 Sterling Rd., has awarded the contract for the construction of an addition to its plant and office building in Etobicoke Township, to A. W. Robertson, Ltd., 57 Bloor St., W., Toronto. Estimated cost $100,000.

Que., Three Rivers—Aluminum Co. of Canada, Ltd., Sun Life Bldg., Montreal, has awarded the contract for the construction of a plant to Fraser-Brace Engineering Co., Ltd., 360 St. James St., W., Montreal. Estimated cost $3,000,000.

Guard against Corrosion and Contamination...Cover with RUBBER...



CORROSION of the metals in the flow line of your processes—contamination of the products that pass through your equipment during those processes—both of these can be guarded against with rubber or synthetics.

Rubber resists the ravages of hot or cold acids, alkaline and other corrosive chemical solutions or their fumes.

Since 1892

During the past 50 years we have worked with rubber. In that time we have specialized in the rubber covering of large rolls for the textile, paper, tanning and steel industries. We have also covered and lined tanks, vats, pipe, propellers, textile agers, etc., etc. If you have any corrosion or contamination problems, write us. We will gladly give you the benefit of our experience.

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SERVING AMERICAN INDUSTRY FOR HALF A CENTURY

Numbered among more than 500 Dow chemical products is an important group of industrial or heavy chemicals. Bromine and bromides were Dow's first contribution to the advancement of domestic chemical production. The bromine processes were soon adapted to the manufacture of chlorine. Shortly after 1889, a new field, that of producing chlorinated products such as sulphur chloride, carbon tetrachloride, etc., was added. In turn, the manufacture of Caustic Soda led to new processes for producing aniline, phenol, indigo and other organic compounds.

Thus from a meager beginning, has come a tremendous production capacity for chemical products of quality and dependability.

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New York · Chicago · St. Louis · Houston · San Francisco · Los Angeles · Seattle

DOW

CHEMICALS INDISPENSABLE TO INDUSTRY AND VICTORY

WE HAVE MARKETED for about two and one-half years, a water tubing named TUBE-LOY. This product, extruded from an alloy, principally lead plus small quantities of calcium, magnesium and tin, was specifically engineered for use as underground water service pipe.

For that purpose, Tube-Loy has established an excellent record throughout America. The product is available for prompt shipment, and through the cooperation of the Grinnell Company, fittings for its installation, produced from galvanized malleable iron are also readily obtainable.

Our Company produces Tube-Loy in diameters from ⅜" up to 1". Special sizes of Tube-Loy are produced in diameters from 1¼" up to 2", but no fittings have been developed as yet for sizes over 1"

Our product has the following characteristics: (a) It is recommended to withstand steady cold water pressure up to 125 pounds in sizes from ⅜" to 1". (b) The tubing retains lead's ductility, but is possessed of considerably greater strength than lead. (c) Tube-Loy is extremely resistant to corrosive conditions, as is lead. (d) Tube-Loy, unlike lead, is light in weight and easy to handle.

Tube-Loy and Grinnell fittings, as briefly described above, should also have important utility in manufacturing operations where it is necessary to conduct water through plants for use in various processes.

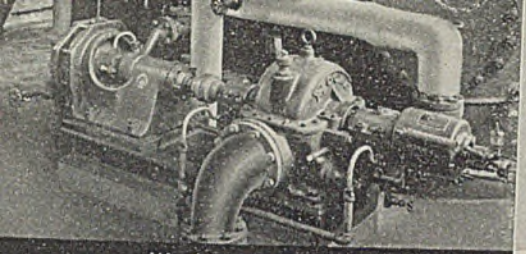
So that we may intelligently submit this product for such usage, we invite plant managers, engineers, or any parties interested, to discuss with us the complete technical information on these products, for the employment described. Our men will be glad to attend any conference during which this data may be submitted.

AMERICAN SMELTING AND REFINING COMPANY

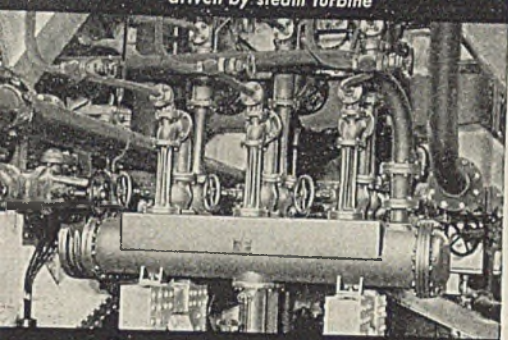
LEAD PRODUCTS DIVISION — 120 BROADWAY, NEW YORK

WORTHINGTON

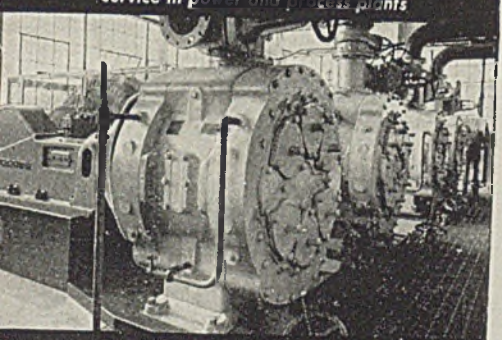
EQUIPMENT FOR THE CHEMICAL INDUSTRY



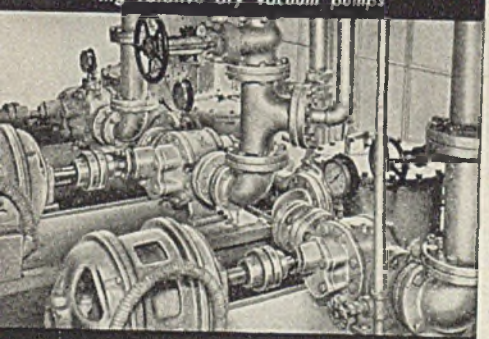
Worthite centrifugal pump, driven by steam turbine



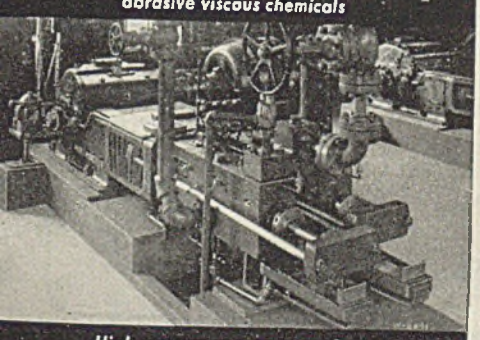
Steam-jet ejectors for high vacuum service in power and process plants



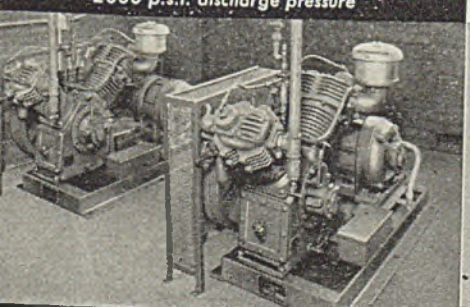
Two horizontal duplex direct-acting rotative dry vacuum pumps



Rotary pumps, for non-abrasive viscous chemicals



High pressure power pump for 2000 p.s.i. discharge pressure



★

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For acids, alkalies, solvents and process work.

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For industrial, power plant, process services.

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For water supply, drainage, sump, other services.

STEAM PUMPS
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For transfer of non-abrasive liquids.

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All types, sizes and drives.

REFRIGERATING AND AIR CONDITIONING EQUIPMENT
All types, including NH_3, Freon-12, CO_2, etc.; compression, absorption, steam-jet and centrifugal refrigeration.

STEAM CONDENSERS
Surface, barometric and low-level jet types.

STEAM-JET EJECTORS
For moderate to high vacuum.

VACUUM PUMPS
Rotative dry type.
Direct-acting wet type.

FEEDWATER HEATERS AND DE-AERATORS
Open type; for individual requirements.

WATER PURIFICATION EQUIPMENT
Pressure and gravity type filters.

DIESEL ENGINES

GAS ENGINES
Horizontal and vertical types.

CONVERTIBLE GAS-DIESEL ENGINES
Convertible from gas to diesel fuel.

STEAM TURBINES
All types, for generator and equipment drives.

SPEED CHANGE GEARS
Reducing and increasing.

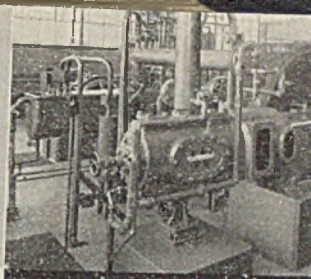
V-BELT DRIVES—(Multi-V-Drive)
Complete drives, sheaves or belts only.

LIQUID METERS
For chemicals, hot or cold water, etc.

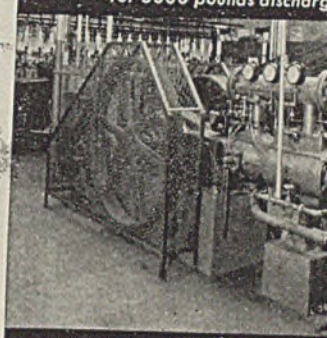
PORTABLE COMPRESSORS AND AIR TOOLS
For general plant maintenance.

★

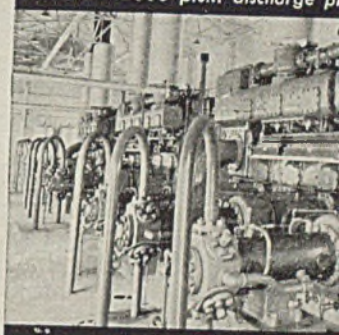
IC3-4



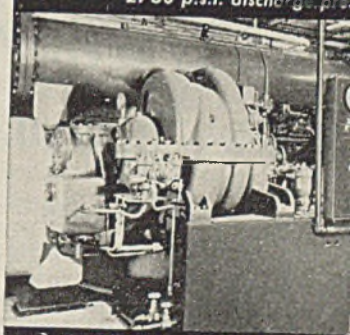
Four-stage horizontal air c... for 3000 pounds discharg...



Three-stage gas compres... 2500 p.s.i. discharge p...

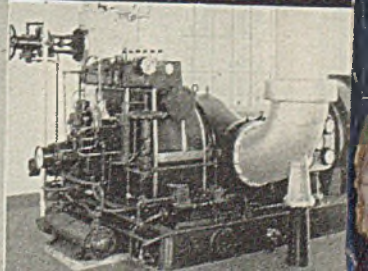


Angle gas engi... 2750 p.s.i. discharg... pre...



Centrifugal refrigerating ... pres... cooler, water-cooled condenser

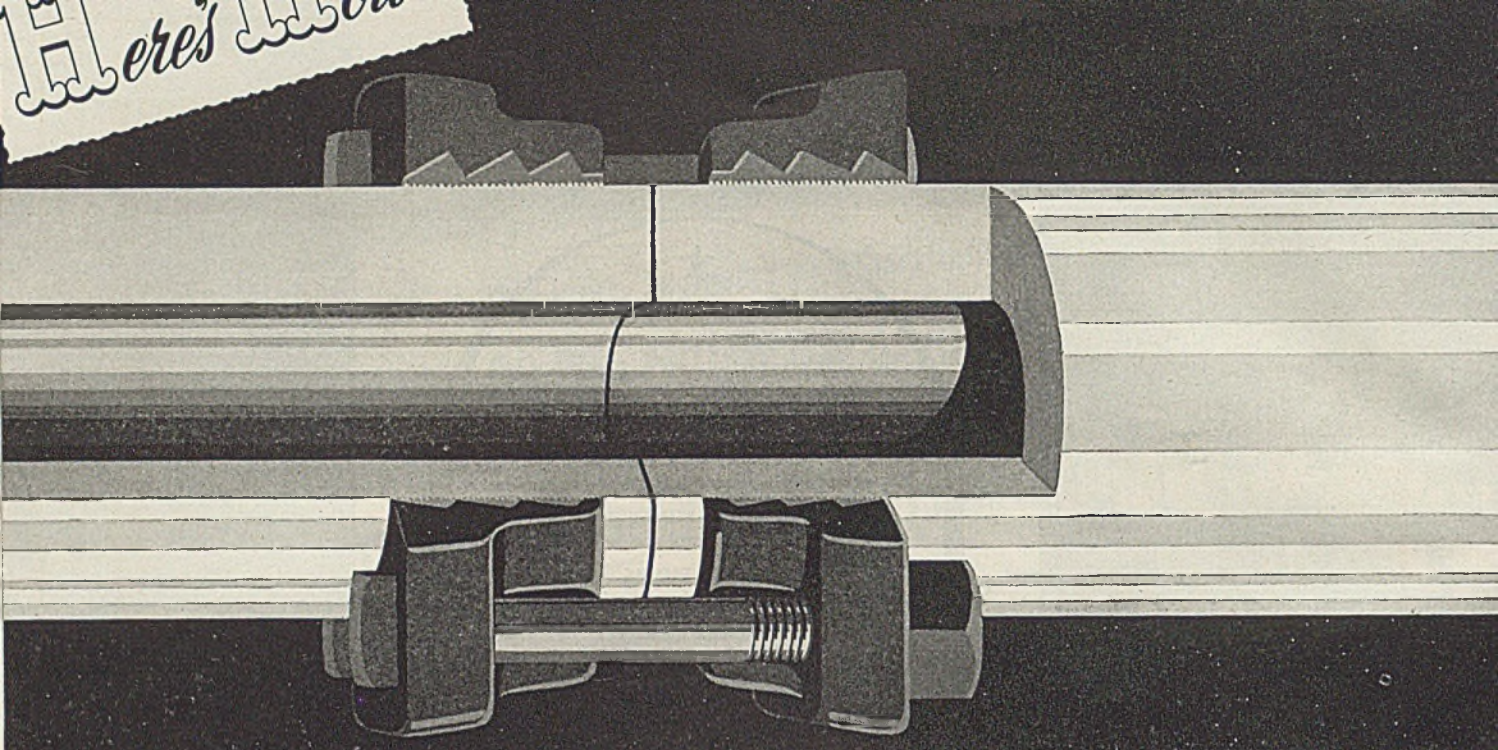
Steam engine driven compressor f... air supply in a large process ...



A complete coverage for every important chemical plant function

WORTHINGTON PUMP AND MACHINERY CORPORATION

Here's how



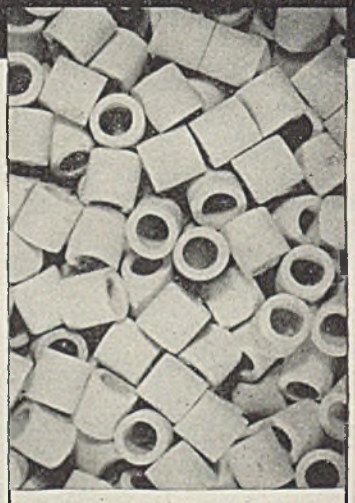
TROUBLE IN PIPING FOR CORROSIVE LIQUIDS FREQUENTLY STARTS WITH GASKETS

Pipe of *Lapp Chemical Porcelain* is Quickly Installed . . . *Eliminates Gasket Trouble*

We've heard all sorts of tales of woe about corrosion-free piping, joints of which could be made to seal only with thick soft gaskets, drawn tight. A fundamental advantage of Lapp Chemical Porcelain as a material of industrial processing is the ease and accuracy with which it may be machined and ground. In Lapp Chemical Porcelain, pipe ends are fine ground to a smooth flat surface. In installation, we recommend hard thin gaskets; by minimizing the gasket surface exposed to corrosion, much possibility of trouble is eliminated at its source. For special applications, where no gasket material can be tolerated, pipe and valve ends are polished and lapped to a perfect matching fit, making possible installation *without* gaskets.

Our ability to grind and polish Lapp Porcelain to fine precision limits also accounts for the remarkable efficiency of the Lapp Valve, in which porcelain only is exposed to the corrosive liquids, and which maintains a tight seal, even under vibration and temperature change.

For complete technical data and a surprising story on delivery schedules, write Lapp Insulator Co., Inc., Chemical Division, LeRoy, N. Y.



Lapp Raschig Rings bring to tower packing all the advantages of Lapp Chemical Porcelain—iron-free purity, high strength, non-crumbling long service. Most sizes are available from stock.

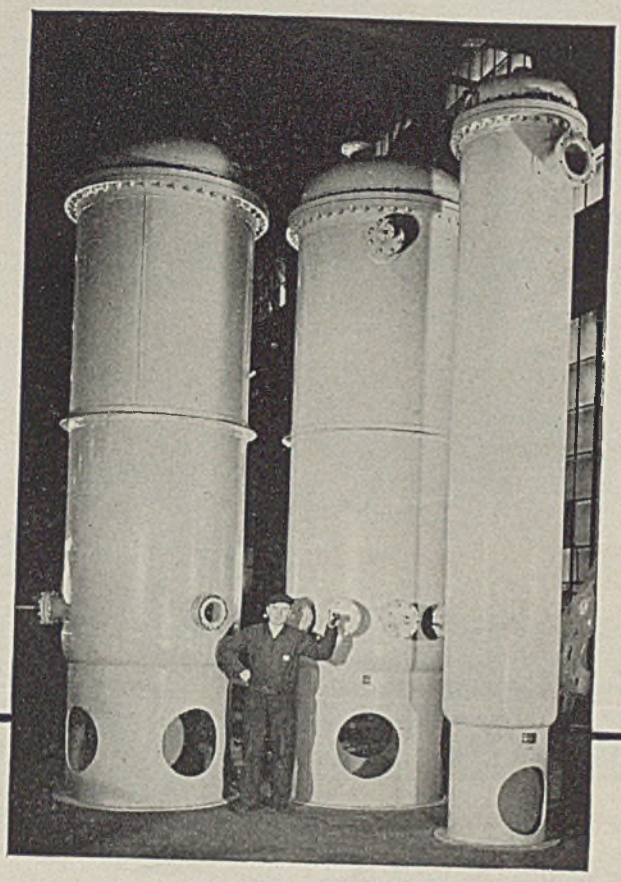
Lapp *Chemical Porcelain*

Valves • Pipe • Raschig Rings

They're in the Fight

FOR

Synthetic Rubber Production



These Lectrodryers, part of a constant parade to various war industries, were halted only long enough to have their picture taken. Then on to the job; in this case, a vital DRYing operation in a rubber synthesizing process.

Lectrodryers are DRYing MACHINES for air, gases and many of the organic liquids so important today. Working with Activated Alumina as their drying agent, they remove moisture efficiently and surely to dew points of –110°F. They dry air and gases at atmospheric pressures or compressed to as high as 3,000 pounds per square inch.

For years, Lectrodryers have been becoming a more and more important tool of processers everywhere. Then came the war, demanding greater speed of production, more uniformity in quality. Employing Lectrodryers, manufacturers have met these demands by working in atmospheres of known humidity, with materials of definite dryness.

In your postwar planning, be thinking of the manufacturing economies and improved quality of products possible only with adsorbent drying. Lectrodryers permit the standardization of processes and elimination of hit-or-miss methods, helping to achieve these results. PITTSBURGH LECTRODRYER CORPORATION, 303 32nd Street, Pittsburgh, Pennsylvania.

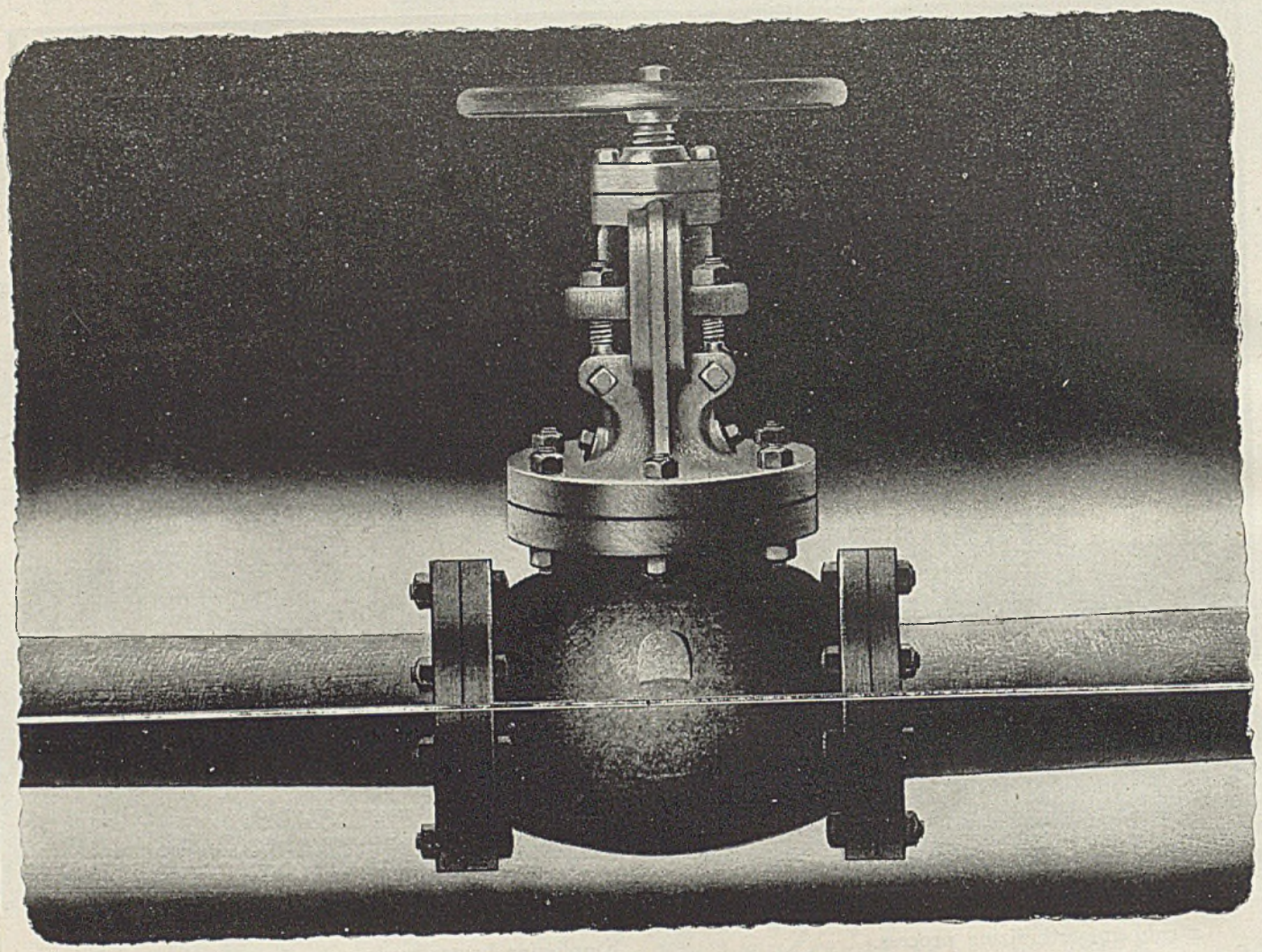
LECTRODRYERS DRY WITH ACTIVATED ALUMINAS

PITTSBURGH

LECTRODRYER

CORPORATION

Reg. U.S. Pat. Off.



GUARD YOUR VALVES GIVE THEM PROPER SUPPORT!

PROVIDE EXPANSION BENDS OR JOINTS

Don't so install valves that they carry the weight, sag or expansion of the line. Valves are not designed to carry that type of load. Distortion will result in inefficient operation, jamming, and need for early maintenance. Maintenance materials, you must remember, also are on the critical list.

It might be a good idea to approach inspection of every valve with one thought, *"What's wrong with this?"* Guard your valves. They will last longer.

Don't Use Gate Valves or Cocks for Throttling . . .

Gate Valves and Cocks should be opened wide and closed tight. When operated otherwise they are soon ruined, giving unsatisfactory service in the meantime. Use Globe and Angle Valves for throttling.

Write to Reading, Pa., general office, for copy of "VALVE DON'TS" —a poster for plant use that tells things NOT to do to valves.

READING-PRATT & CADY

MANUFACTURERS OF
READING CAST STEEL VALVES AND FITTINGS
PRATT & CADY BRASS AND IRON VALVES
D'ESTE VALVE AND ENGINEERING SPECIALTIES

Reading, Pa., Atlanta, Boston, Chicago, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco

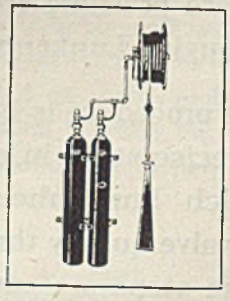
A DIVISION OF AMERICAN CHAIN & CABLE COMPANY, Inc., BRIDGEPORT, CONNECTICUT

STOP FIRE IN ITS TRACKS—AVOID DAMAGE AND SHUT DOWNS

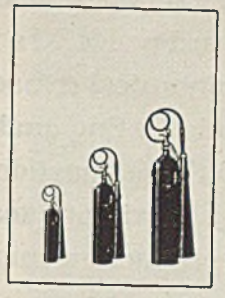
Many fires can be easily and quickly controlled with modern extinguishing equipment. If you have danger spots in your plant where flammable liquids are stored or are used in cooking kettles, mixers, process rooms, dip tanks, spray booths or drying ovens, C-O-TWO fire extinguishing equipment will give you modern fire protection.

C-O-TWO carbon dioxide equipment stops fire in its tracks. Gas, oil, paint, lacquer, highly flammable chemical and electrical fires are put out in seconds—fire is snuffed out under a freezing blanket of clean, dry, odorless non-damaging, non-conducting gas. It penetrates and kills hard-to-get-at fires that cannot be reached with other extinguishing agents.

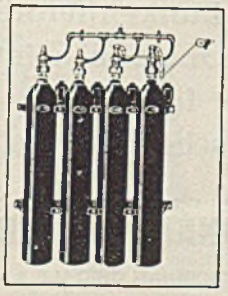
IT'S SAFER *because* IT'S FASTER



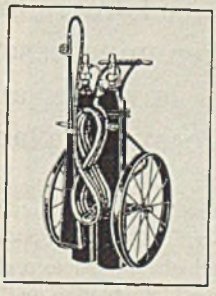
SMOTHERS FIRE
Fixed hose reel type with 25 feet of fast uncoiling, non-kinking hose, will put out fires in electrical machinery, dip-tanks or storage vaults.



FOR FAST KNOCKOUT
In laboratory or bench fires, these small, fast acting 4, 10 and 15 pound cylinders of C-O-TWO carbon dioxide gas kill fire in seconds.



INSTANT ACTION
Permanently installed automatic or manual system may be engineered to protect one or more spaces from the one C-O-TWO installation.



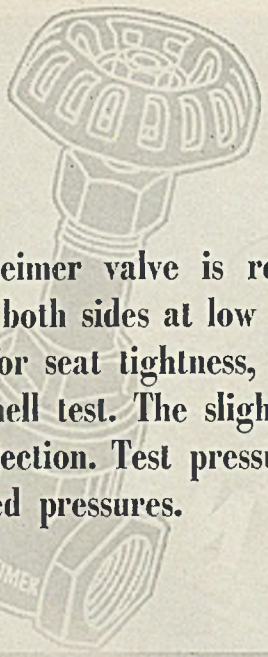
QUICK AS THE WIND
With C-O-TWO hand and wheeled type portables, carbon dioxide is directed at the base of the fire, it's out —without damage—in seconds.

C-O-TWO is a registered trademark. To be safe, specify C-O-TWO and this company's name

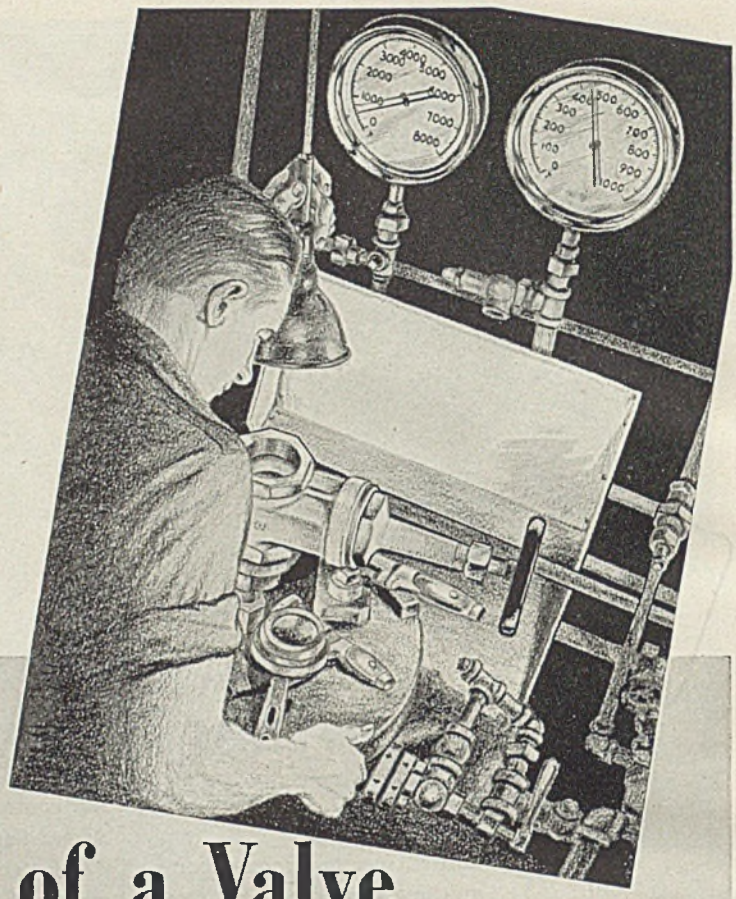
C-O-TWO FIRE EQUIPMENT CO.

NEWARK, NEW JERSEY

Sales and Service in the Principal Cities of United States and Canada



Every Lunkenheimer valve is regularly tested on both sides at low and high pressure for seat tightness, and then given a shell test. The slightest leak causes rejection. Test pressures far exceed rated pressures.



But

The Final Test of a Valve . . . is Performance

How does it hold up in service? Does it stand the gaff of hard usage? Is it dependable? Is it economical to use? How does it stack up in lasting qualities? The answers to these questions are the final and only convincing test of a valve. Ask any production man.

Now, when performance is more important than ever, when unnecessary time out for repairs is waste, and new valves aren't so easy to replace, valve users are profiting from their foresight in buying Lunkenheimer.

Rigid testing procedure is but one of the many precise steps in manufacture by which Lunkenheimer has maintained valve quality through the years. These steps are your assurance that Lunkenheimer Valves will give you more in uninterrupted performance for today's non-stop production schedules.

Since virtually all materials used in the manufacture of valves are on the list of critical materials, valve users are urged to furnish the highest possible preference ratings and proper "end use" information on their orders. This will be of mutual helpfulness.

ESTABLISHED 1862
THE LUNKENHEIMER CO.
"QUALITY"
CINCINNATI, OHIO, U. S. A.
NEW YORK CHICAGO
BOSTON PHILADELPHIA
EXPORT DEPT. 318-322 HUDSON ST., NEW YORK

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LUNKENHEIMER VALVES

ATLAS SPANS . . . EMULSIFIERS . . DETERGENTS . . . ATLAS TWEENS . . . WETTING AGENTS . . .

New Surface Active Agents

ATLAS Spans and ATLAS Tweens

To Meet New and Unusual Demands

Atlas Spans and Atlas Tweens are new emulsifiers with remarkable properties. They may prove to be just the thing to meet the present unusual specifications . . . or to improve those new combinations of oils and water that you are working out for the future.

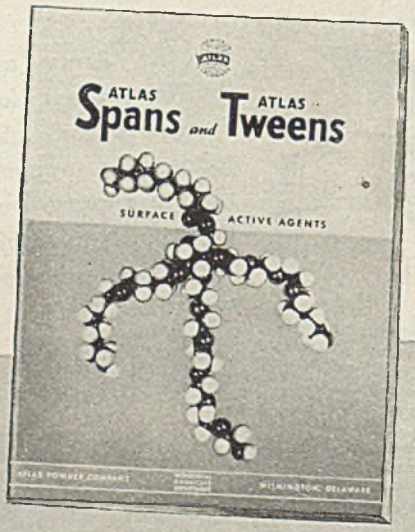
You should investigate them. Here is why:

New Effects—Atlas Spans and Atlas Tweens are unusual in the field of emulsifying agents. They are a series of both simple and modified partial fatty acid esters of hexitol anhydrides. They are non-electrolytes. They are supplied in 97% to 100% concentrations. They are neither sulfates nor sulfonated products. They are virtually free of soap and inorganic salts. This makes possible a whole range of new types of applications.

Wide Application—Atlas Spans and Atlas Tweens are versatile. They include emulsifiers for water-in-oil and oil-in-water emulsions of either the temporary or permanently stable types that hold up not only with hard water but with salts and acids. Their solubilities range from completely water soluble to completely oil soluble. The series offer a wide choice in viscosity, water holding power and compatibility.

Better Emulsions—Atlas Spans and Atlas Tweens are adaptable. An unlimited number of intermediate modifications or combinations can be tailor-made to do specific jobs. Because their properties can be so closely balanced to fit the work at hand, they often give more satisfactory finished emulsions than are possible with older, less complex emulsifiers.

Atlas Spans and Atlas Tweens are used in nearly every field of American industry where oil and water are made to mix. If you have emulsification problems—if you feel that your present results might be improved, a request will bring prompt assistance and samples. Send for book.



CHEMICALS ATLAS EXPLOSIVES

SPAN AND TWEEN—
Reg. U. S. Pat. Off.

ATLAS

INDUSTRIAL CHEMICALS DEPARTMENT

ATLAS POWDER COMPANY, Wilmington, Del. • *Offices in principal cities* • *Cable Address—Atpowco*