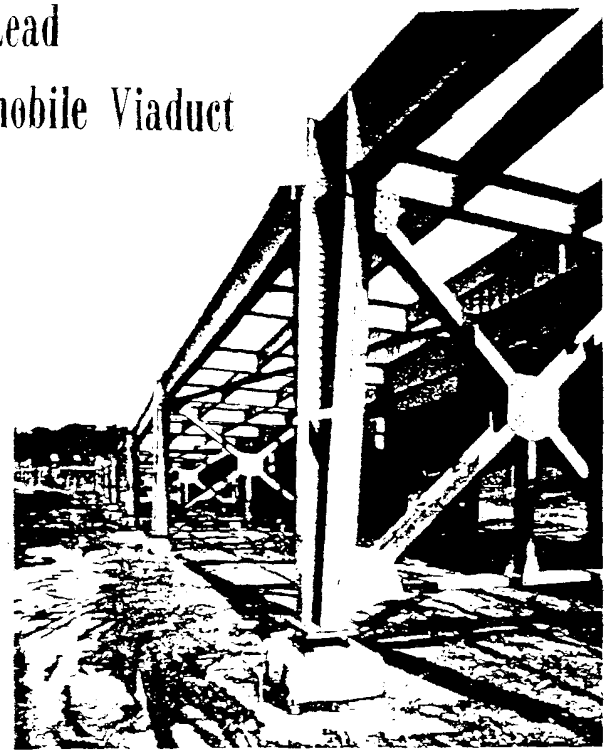
Red Lead and White Lead To Protect New Cincinnati Automobile Viaduct

THE new four thousand foot long Sixth Street viaduct will form an important link in the Master Plan to speed the flow of automobile traffic to and from the center, Western Hills and lower River Road sections of Cincinnati. It will also serve as a by-pass through the city, from east to west, making it unnecessary to drive through the center of town. Built to a height of thirty-five feet this structure passes over congested traffic areas and several railroads serving the city from the south and west. It will also allow a free flow of traffic without interference from the Ohio River and Mill Creek during flood stages.

A complete lead paint system will protect the structural steel in this viaduct, 4700 tons of it, against the deteriorating effects of a humid industrial environment. The steel was shop coated with a red lead-in-oil paint conforming to City of Cincinnati Specification M-9.9c. The paint calls for a red lead content of 75 to 80 percent by weight (95 percent grade or higher) and a raw linseed oil content of 20-25 percent. The shop coat was spray applied at the Detroit plant of the R. C. Mahon Company, who produced, fabricated and erected the structural steel.

A detail of the steelwork for the Cincinnati automobile viaduct. The paint system will include two coats of red lead followed by a top coat of white lead paint.



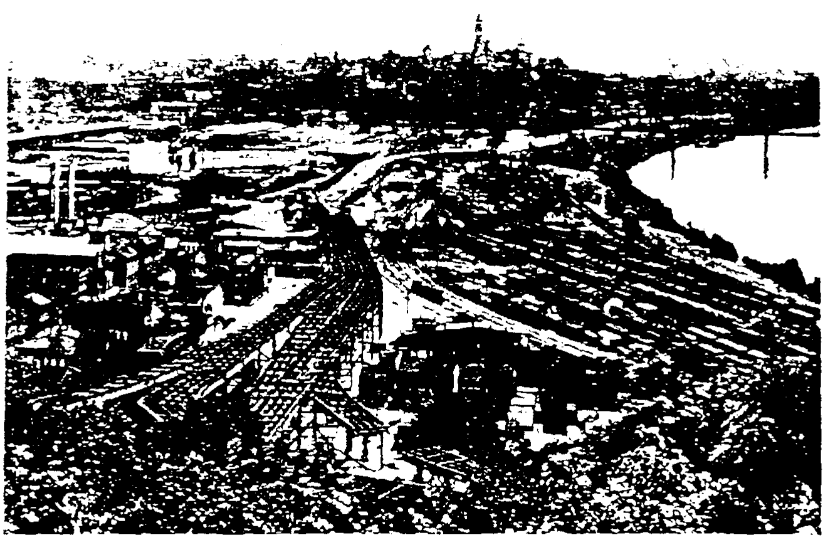
MARSH PHOTOS

After erection the structure was touched up with the M-9.9c paint used for shop coating and then given a full field coat of the same paint tinted with white lead paint to furnish contrast between coats. The red lead corrosion inhibitive coats will be followed by a finish coat of parchment colored white lead paint prepared to meet the requirements of the City of Cincinnati Specification M-9.6p. The pigment portion of this linseed oil vehicle paint is composed entirely of basic carbonate white lead tinted with French Ochre in the proportion of two pounds to one hundred pounds of white lead. This type of finish paint is preferred by many states and municipalities because it assures long time protection and can be readily tinted to contrast or harmonize with the surrounding landscape.

The red lead field coats and the white lead finish coat were brush applied by the G. S. Zagoras Company of Pittsburgh, Pennsylvania.

The planning and building of this viaduct were carried out under the jurisdiction of the City of Cincinnati at a cost of $3,377,000—exclusive of the cost of rights of way. Mr. H. H. Kranz, recently deceased, was the Chief Engineer. The project was begun in December, 1949.

The partly completed steel framework for the 4,000 ft. long viaduct protected against corrosion by a lead paint system.



LIA25964

Lead Plumbing in Deluxe Motor Hotel

ONE of the delights of touring motorists these days is the number of excellently equipped and delightfully located "Motels" available on practically every major highway in the country.

Among the finest of these, designed by architects Soule and Murphy, is the "Sea Captain's Motor Hotel," owned and operated by Captain Jokstad, retired. The Motel is located on a beautiful scenic drive through the Montecito district on Highway 101, just east of Santa Barbara, Calif.

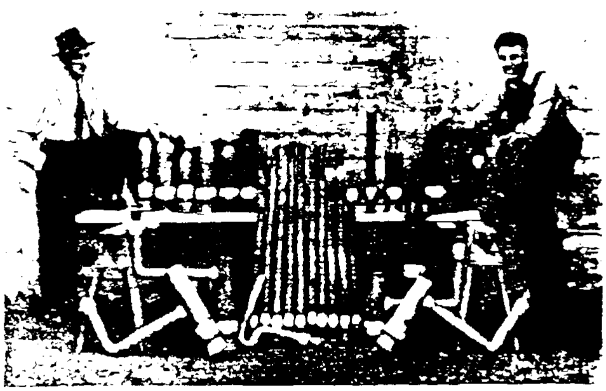
PAULDING'S

The well designed and equipped Sea Captain's Motor Hotel located on Highway 101, just outside the city limits of Santa Barbara, Calif.

The cabins, for the most part, are two stories and include kitchen as well as bathroom facilities. Each of the 38 cabins, unusual in this respect, has almost as many plumbing fixtures and waste and vent lines as are ordinarily found in the small one-family home. As every touring motorist knows, nothing appeals more after a long day's drive than a well equipped, perfectly functioning bathroom.

The "Motel" located just outside the city limits of Santa Barbara does not come under the jurisdiction of any city, county or state plumbing code regulations. In this connection, the architects and the general contractor, C. D. Craig Co., along with the plumbing contractor, Thomas M. O'Meara, Inc., favored the use of lead wastes and vents and lead bends or stubs under the water closets. Their selection, based on lead's unexcelled record of long life and trouble-free service, is assurance of a perfectly functioning waste disposal system at all times.

An added factor in the selection of lead was the minimum amount of cutting and notching of the supporting members that is necessary when lead is used. Lead's flexibility and the ease with which directional changes can be made without bulky joints makes this possible. The flexibility of lead also allows for minor adjustments to make up for slight inaccuracies in measurements.



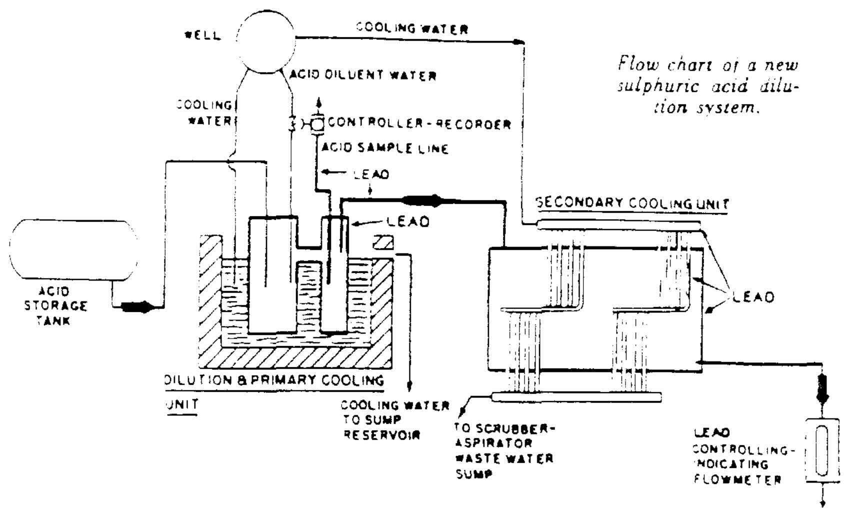
Some of the lead wastes and vents, lead traps, bends and stubs before installation in the Sea Captain's Motor Hotel located just outside Santa Barbara, Calif., displayed by the plumbing contractor and his son.

Practically all of the lead work was prefabricated in the plumber's shop and sent to the job as needed. This procedure often saves construction time as well as providing high quality workmanship because the work is done under ideal conditions only available at the plumber's own work bench.

New Sulphuric Acid Dilution System Uses Lead

ONE'S first exposure to chemistry usually brings the warning, "Never pour water into concentrated sulphuric acid!" Having once mixed sulphuric acid with water the wrong way, it is unlikely that the mistake will be repeated—at least intentionally. Technically speaking the reaction of water with concentrated sulphuric acid is highly exothermic, which is the chemists' way of saying that much heat is generated during the reaction. What can happen when mixing much acid with little water is that the water turns into steam fast enough to blow the whole corrosive concoction out of its container. Concentrated sulphuric acid as such can be used in only a limited number of applications, therefore it has been necessary for most plants using large quantities of the dilute acid to buy the concentrated acid and then to devise some practical means for cutting strong acid (66 Baumé) to the desired concentration by adding water.

For the dilution of acids greater than 60 Baumé, such as oil of vitriol, monohydrate or oleum, special pains must be taken to avoid spills and burns. With highly concentrated acid, special apparatus is generally employed. A typical acid diluting plant will usually include 1) mixing chambers where the concentrated acid and water are brought together, 2) some type of cooling system to dissipate the heat of reaction, and 3) storage vessels and handling lines for the concentrated and diluted acid. Because of its corrosive characteristics sulphuric acid up to 60 Baumé is almost



Flow chart of a new sulphuric acid dilution system.

universally handled in lead protected equipment. It is usually conducted through lead or lead-lined pipe, stored in lead or lead-lined vessels and reacted in lead, lead-lined or bonded lead reaction vessels. Therefore, since all corrosives become more active at higher temperatures, it is doubly important that lead be utilized in acid diluting apparatus.

In modern industrial practice it has oftentimes been necessary to dilute concentrated sulphuric acid by reversing the usual practice and adding the acid to water instead of water to acid. If proper precautions are taken and if the acid to be diluted is a moving stream, the water or weak acid may be added to the strong acid. A. J. Sackett & Sons Company in Baltimore, Md., constructors of modern fertilizer and superphosphate plants recently developed such an acid dilution unit.

The dilution equipment consists of a tapered lead mixing boot connected to one leg of an "H" shaped dilution chamber also made of lead. The entire unit is situated in a bath into which cooling water is pumped from a well. The acid, dilutent water and air for agitation are introduced into the mixing chamber through its removable cover. Although it is adjustable, the rate of the acid flow into the mixer is usually held constant, but the rate of dilutent water addition is automatically controlled by a specific gravity indicator and controller in the control room located inside the acidulation building. A continuous sample of the mixed acid is drawn into this device which actuates the water valve to produce the desired amount of dilution.

A secondary cooling of the diluted acid is made inside the acidulation building in an open, rectangular, lead-lined steel tank. In this case, the cooling water is passed through a series of lead immersion coils by a manifold which is fed from the plant's water supply.

After dilution the acid concentration is in the range of 50-56 Baumé or approximately 62 to 71 percent H_2SO_4. The diluted acid is now at a temperature of 115 deg. to 135 deg. F and ready for use. A controlling and indicating flow meter in the lead-lined acid line between the pump and the nozzle regulates the flow of acid to any desired rate. A flow plan of the entire acid dilution system is shown in the accompanying diagram.

Sulphuric acid, long regarded as the bellweather of heavy chemical activity still ranks today as our most important industrial acid. In 1949 more than 10 million tons of sulphuric acid were produced. This one example of lead's use with sulphuric acid illustrates why Riegel in his new fifth edition of "Industrial Chemistry" says, "It may be said that it is to lead that the chemical industries owe their success."

Confining X-Ray Radiation With Sheet Lead

ONE of the first considerations in planning X-ray rooms is that protection against the rays be sufficient to protect all personnel working near and around the equipment against overdosage. The National Bureau of Standards recommends that no person be subjected to more than 0.1 roentgen during any 24 hour period.

One of the most practical methods of affording this protection is with the use of sheet lead properly installed and of adequate thickness. Because

Sheet lead lining being installed in an X-ray room of the St. John's Hospital, Tulsa, Okla. All joints are lapped and lead headed nails are used to fasten the lead to the studs.

ROY SHERROW

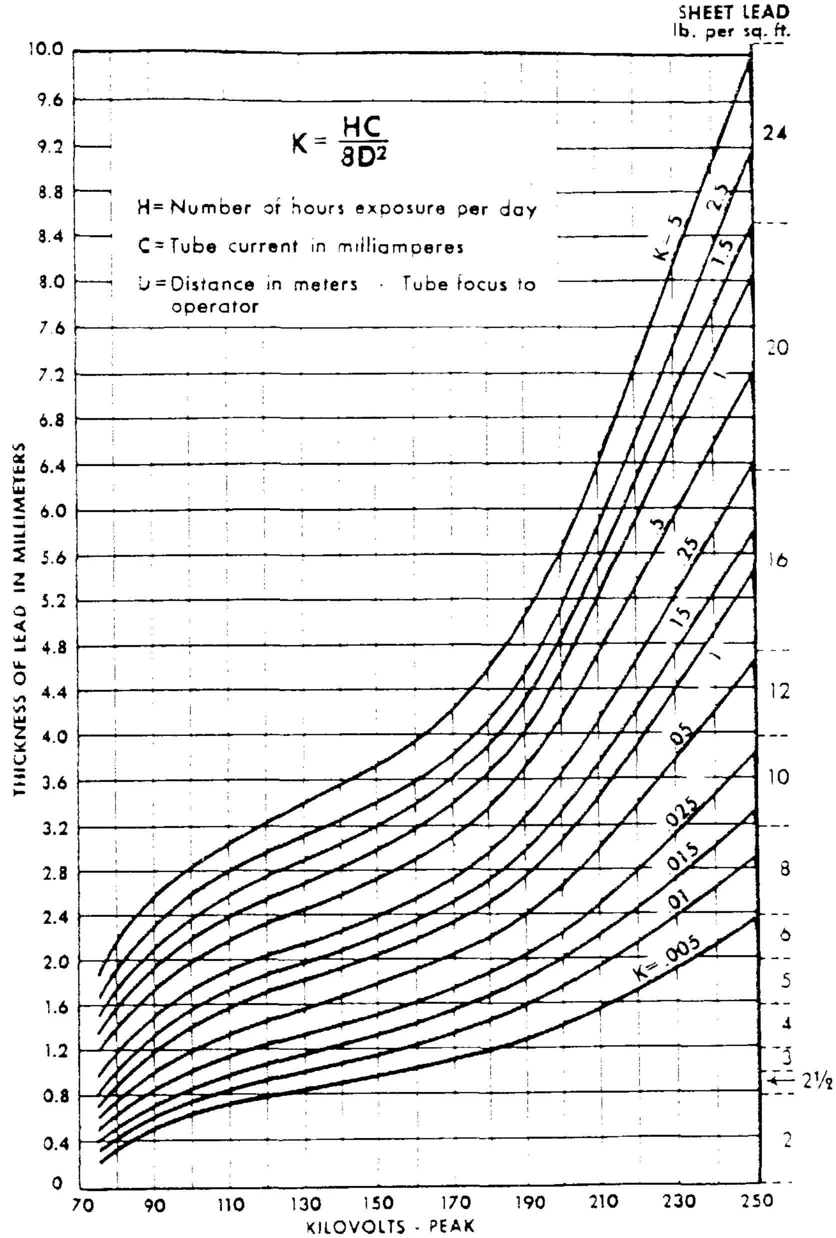
the conditions surrounding any X-ray installation may influence the magnitude and character of the hazards involved, no definite rule can be established for thickness of sheet lead required for protection against specified X-ray voltages.

For example, the Safety Code for the Industrial Use of X-rays prepared by the American Standards Association takes into account the number of hours of exposure per day, the tube current and the distance of the tube focus from the operator to determine the proper thickness of lead. The accompanying chart shows the protective shielding required for these variables at different X-ray machine voltages.

One of the methods used to line X-ray rooms is shown in the accompanying photograph of an installation in St. John's Hospital, Tulsa, Okla. The lead sheets were applied to the wall, each lapping over the other, and lead headed nails used to fasten the sheets to the studding. All corners were protected by lead angles. The work was done by the Watt Plumbing Co. of Tulsa, Okla.

With the use of lead, existing facilities can easily be converted to X-ray rooms without adding too greatly to the floor load as would be the case if other materials, such as concrete, were used. Another advantage of lead in such cases is the ease with which it can be made to conform to the shape of the room.

As a further and necessary precaution, every plan and specification for the installation of X-ray protection should be checked by a competent X-ray physicist.



Thickness of lead barriers required to reduce X-ray dosage rate of the useful beam to 0.25 milliroentgens per hour under indicated conditions.

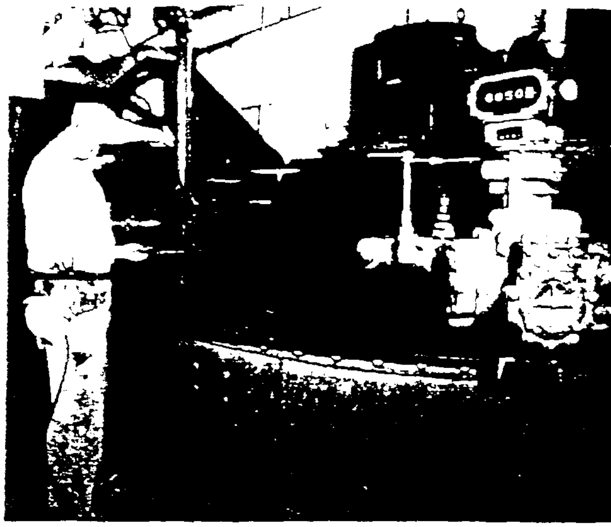
The Use of Lead in Lubricants

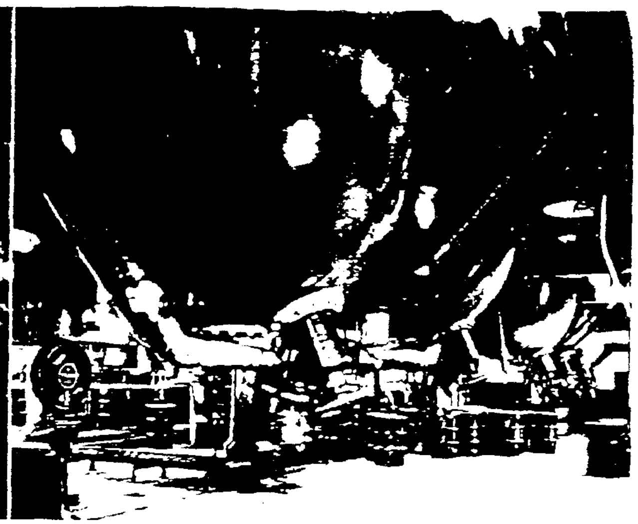
PART II

SIXTY-FIVE years ago the art of grease making was first developed by a man named Raecz who concocted a simple mixture of lime and oil to replace malodorous lard as an axle lubricant. Since then, grease making has become an important industrial process which has succeeded in meeting the challenge of service in high speed, heavily loaded machinery operating under a variety of conditions of temperature and corrosion.

Today the old, hand method of mixing crude petroleum and rosin oils with hydrated lime in a heated kettle has given way for the most part to mechanical mixers, steam-jacketed vessels and highly refined oils and fats. In addition, special compounds have been developed and utilized in greases designed to meet exacting requirements of color, gloss, texture, stability and consistency at widely varying working temperatures.

Among the noteworthy advancements in the art of grease manufacture has been the development and utilization of lead soaps. Lead soaps are the lead salts of fatty acids and include lead naphthenate, lead lino-





THE TEXAS CO.

The huge size kettles in which greases containing lead soaps are manufactured.

The lower half of the same kettles shown at left.

leate, lead oleate, lead recinoleate plus others. In addition to lead soaps, lead stabilizers such as lead oxide (litharge) and the recently perfected dibasic lead stearate are being added to improve high temperature and high pressure characteristics of petroleum lubricants. In more recent years the utilization of special additives such as powdered metallic lead have increased the advantages of certain types of lubricants and enable them to be employed under conditions of corrosion and abrasion where ordinary non-leaded greases have not performed successfully.

Greases contain four fundamental ingredients: 1) fat or fatty materials, 2) a base or alkali which is added to bring about saponification of the fat, 3) an oil material, usually petroleum, and 4) additives and other materials which impart special characteristics. Fats may be saponified by many materials among these being hydroxides of sodium, calcium, aluminum and lithium. However to obtain special characteristics, soaps of lead, barium, strontium and magnesium are used either alone or in combination with the aforementioned soaps.

Speaking of lead soaps in particular, their presence in the lubricant enhances the load-carrying capacity of extreme pressure agents and, in addition, is highly beneficial in improving resistance to corrosion when water is present.

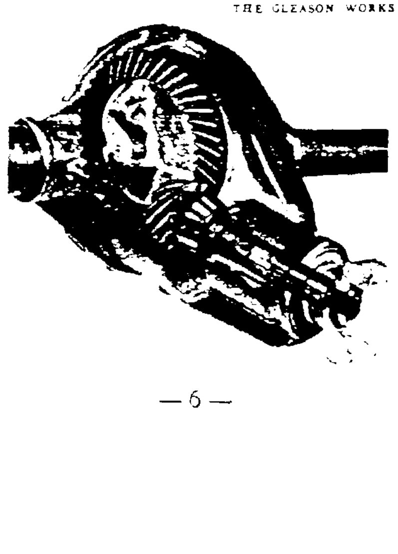
Greases made with lead soaps give particularly good service in automobile differentials and automobile worm gears where a very oily, free-flowing grease is required. Greases of this character resist the scraping, squeezing action of the worm against the gear wheel. A typical application is illustrated.

An added advantage of lead soaps is that they do not change in viscosity during storage and do not separate or hydrolyze in the presence of moisture. The latter characteristic is especially important because non-lead greases made with water soluble soaps absorb considerable quantities of water. This causes precipitation of the saponifying compound which in effect destroys the lubricating properties.

A. F. Brewer, research engineer of

A phantom view of automotive hypoid rear action drive gears in which lead soap lubricant for extreme pressure service is used almost exclusively.

THE GLEASON WORKS



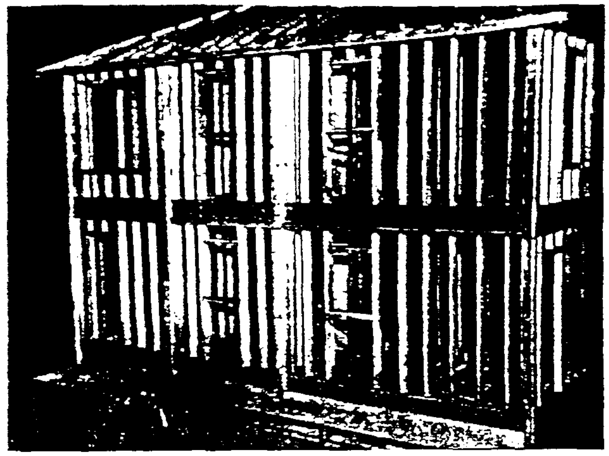
The Texas Company stated in a recent report on gear lubrication that, "Modern lubricants compounded with lead soap and sulphurized oils which are non-corrosive and have excellent stability even at high operating temperature, are receiving more favor. Evidence accumulated in actual service has proved that the mild, non-corrosive lead soap gear lubricant has a definite place in worm gear lubrication whenever severe duty prevails. It is also valuable in protecting the worm and gear tooth surface from wear, corrosion and rusting under heavy duty conditions and has no detrimental effect on anti-friction bearings if kept clean so there is no sludge and consequent abrasive wear of the bearing. The oil film is unusually persistent, resisting displacement by the shearing action of the sliding teeth. The resultant decrease in frictional heat gives added protection from fatigue pitting of the bronze and steel tooth surface. Also unusual protection from rusting of gears, gear case and bearings is afforded since the oil film resists displacement by water to a remarkable degree."

Acknowledgment is given to The Texas Company, New York, N. Y., and The Brooks Oil Company, Pittsburgh, Pa., for much of the information used in the foregoing article.

This is the second and concluding article, the first of which appeared in "Lead," Volume 18, No. 1.

Scale Model of Plumbing System Useful and Informative

MEMBERS of the Texas State Board of Plumbing Examiners recently prepared a very interesting and informative model of a complete plumbing soil, waste and vent system installed in a miniature two-family duplex apartment house.



A one-fifth actual scale model of a complete plumbing soil, waste and vent system prepared by members of the Texas Board of Plumbing Examiners.

The model, one-fifth actual scale, was displayed at the 1950 convention of the Associated Plumbing Contractors of Texas and the roughing-in was installed in accordance with the plumbing code regulations of most Texas cities.

All soil, waste and vent lines are cast-iron or lead with all lead fixture connections. The work, on a miniature scale, is done so perfectly that it is difficult to differentiate in the accompanying photograph between this and an actual job without the size comparison given by the post in the foreground. The same easy sweep of the lead wastes and vents for the kitchen sink is as evident here as it is on a full scale installation.

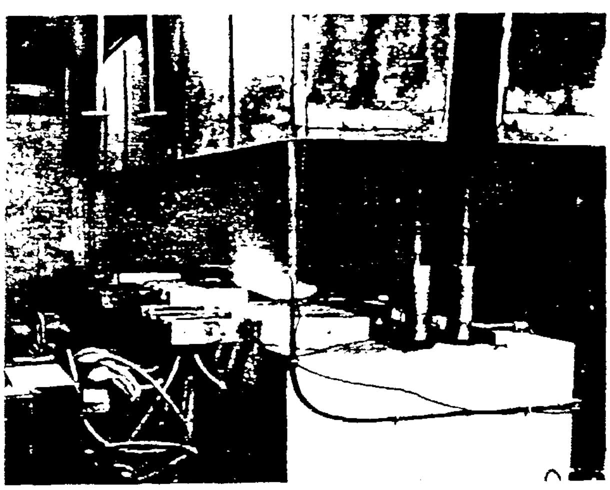
The model, in addition to making an excellent display piece, is put to much more practical use by the Examining Board. The Texas State law provides that all master and journeyman plumbers must pass an examination as to their qualifications before they are given a certificate of competency to practice plumbing within the State. The plumbing system in the scale model can be disassembled and one phase of the examination for a license includes the proper reassembling of the cast-iron and lead soil, waste and vent lines.

This is a very practical method of determining the applicant's knowledge as to proper procedures and good plumbing practice.

The importance of a plumber's competency to do good plumbing work cannot be overemphasized. The health risk inherent in poor plumbing is one to be avoided by all means.

New Liquid Lead Electrode Furnace

A NEW use for lead or lead alloy compositions in heat treating has recently been perfected. It is now being used as a liquid electrode in electric salt furnaces. The liquid electrode principle is a modern development in electric salt furnaces patented by The A. F. Holden Company, New Haven, Conn., and Detroit, Michigan, who also build the furnaces. The principle is simple, and, in practice, has already demonstrated several advantages over ordinary electric salt furnaces. A pool of molten lead alloy lying in the bottom of the furnace chamber contacts a source of electrical power on one end and a molten salt bath on the other. The flow of current between two such electrodes in the same salt bath creates the heat necessary to keep both the salt and the lead alloy molten. Varying power input varies the temperature of the bath.

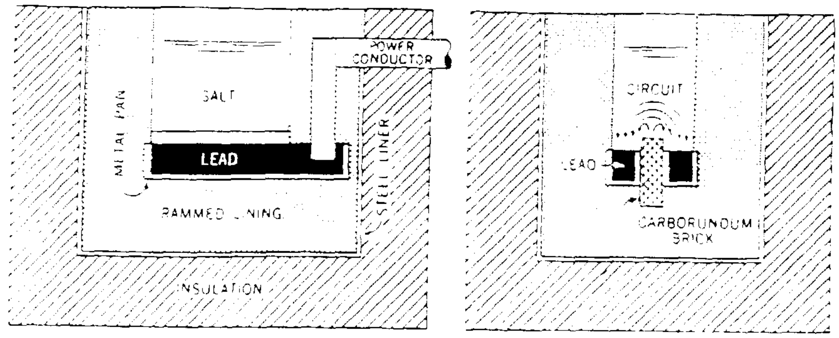


The type of heat treating furnaces in which molten lead is used as the electrode.

A battery of three furnaces installed about eight months ago for the Sparta Division of the Muskegon Piston Ring Company are shown in the accompanying illustration. A cross-sectional drawing of the furnace shows the position of the liquid lead electrode. The greatest advantage of the lead pool furnace is the fact that high nickel alloy electrodes suspended directly in the molten salt can be dispensed with. The disadvantage of this early arrangement was that the electrodes eroded at the salt line and soon built up resistance to the point of overheating, resulting in short electrode life. Another advantage in the case of a lead pool electrode is less power consumption because the usable heat treating area of the furnace is the only area heated. "Over-the-side" type electrode furnaces require more salt area for the electrodes thus using space which, of course, cannot be used for heat treating, but which nevertheless must be heated.

With a liquid electrode it is a simple matter to remove any sludge that might form; however, operators at the Muskegon Piston Ring Company found that during the eight months the furnaces have been used, no sludge deposits have been found on the lead pools. This may be attributed to the fact that in a liquid lead electrode furnace the heat treating salts neither decompose nor combine chemically with the electrodes.

This is not the first time lead has been used in heat treating operations. For many years molten lead has been used for heat treating steel at temperatures from 650 deg. to 1700 deg. F. Of all the metals, lead is the only one that has proved suitable as a commercial bath material for heat treating purposes.



Cross-sectional drawings of the new electric salt furnaces showing the position of the liquid lead electrode.

HOW TO IDENTIFY QUALITY

To be assured of the highest quality lead pipe, traps and bends and calking lead, specify L.I.A. "Seal of Approval" material identified by the symbol shown below. Manufacturers are licensed to use the "Seal" on such products meeting the high standards of workmanship, purity of metal, uniformity of wall thickness and weight set by the Lead Industries Association. These standards are identical in substance with Federal Specification WW-P-325, Lead pipe, traps and bends, and Commercial Standard CS94-41, Calking lead.

SEAL OF LEAD INDUSTRIES' APPROVAL

The following articles and reprints contain information, drawings and specifications on the use of lead products helpful to architects, engineers and others in the construction industry. They are available, free of charge, upon request to the Lead Industries Association, 420 Lexington Avenue, New York 17, N. Y.

PROPERTY PROTECTION WITH WHITE LEAD PAINT

A 28 page booklet on the protective value, durability and beauty of pure white lead paint with quantity estimating tables, formulas and mixing and tinting instructions for exterior and interior use.

A STUDY OF PAINTS FOR ENCLOSED STRUCTURAL MEMBERS IN STEEL HOUSING CONSTRUCTION

By H. A. Pray and R. S. Peoples, Battelle Memorial Institute

A reprint of a paper which was read before the General Meeting of the American Iron and Steel Institute, May 25-26, 1949, which sponsored the work. The study included some 34 kinds of paint systems.

AN INVESTIGATION OF PRIMERS FOR MARINE ATMOSPHERIC ENVIRONMENTS

By C. J. Vander Valk, Technical Director, Red Lead Division, Lead Industries Association

Results of an investigation of synthetic vehicles and red lead mixed pigment primers over an exposure period of three and one-half years in a rigorous marine atmosphere. Reprinted from "Official Digest" published by The Federation of Paint and Varnish Production Clubs

RED LEAD TECHNICAL LETTERS

A series of technical letters issued by the Red Lead Division, Lead Industries Association. The numbers and titles follow: (Available separately.)

Technical Letter No. 3—Red Lead Primers for Atmospheric Exposure
Technical Letter No. 4—Red Lead Paints for Marine Exposures
Technical Letter No. 5—Red Lead-Vinyl and Coumarone Type Paints

NEW MARINE PRIMERS

By K. H. Roll and C. J. Vander Valk, Lead Industries Association

An article on newly developed paint primers for metals exposed to marine atmospheres written expressly for the person who is not a paint technologist. Reprinted from "Marine Engineering and Shipping Review," March, 1949.

PHYSICAL AND CORROSION CHARACTERISTICS OF LEAD IN THE CHEMICAL INDUSTRY

By K. H. Roll, Lead Industries Association

A detailed discussion of the use of lead in the chemical industry presented before the National Association of Corrosion Engineers Conference, April 11-14, 1949.

COMPARATIVE CORROSION STUDY OF SOIL, WASTE AND VENT PIPE MATERIALS

By John D. Kane, Chief Plumbing Inspector, Department of Public Works, Fort Worth, Tex.

A study undertaken to determine the relative rates of corrosion of six metallic pipe materials used or suggested for use in the plumbing soil, waste and vent system.

Reprinted from 1949 Yearbook of the American Society of Sanitary Engineering.

CORROSION FORUM

A series of one page articles on the use of lead as a material of chemical construction in contact with the following chemicals (available separately): Chlorine, Hydrochloric Acid, Hydrofluoric Acid, Industrial Alcohol, Sulphuric Acid, Sodium Chloride, Sulphur Dioxide, Phosphoric Acid.

Reprinted from "Chemical Engineering."

COMMERCIAL STANDARDS:

Calking Lead, CS94-41

Official publications by the Government Printing Office promulgated by the U. S. Department of Commerce through the National Bureau of Standards, effective June 25, 1941.

FEDERAL SPECIFICATION WW-P-325

For Pipe, Bends and Traps, LEAD

Part 5 of Section IV of the Federal Standards Stock Catalog, official publication by the Government Printing Office.

FEDERAL SPECIFICATION TT-P-86a

Paint: Red-Lead-Base, Ready-Mixed

Covers four types of red lead base paints including two fast drying formulations. Many intended applications listed.

LEAD WELDING

An informative as well as practical guide to lead welding. Reprinted from the "Welding Handbook, Third Edition" published by the American Welding Society.

MATERIALS AND METHODS OF X-RAY PROTECTION

By George Singer, Acting Chief Radiation Section, National Bureau of Standards, Washington, D. C., and George C. Lawrence, Ph.D., National Research Council of Canada

A discussion of the materials suitable for use in shielding X-ray installations. Reprinted from "Industrial Radiography" Vol. IV, No. 2, Fall, 1945

DECORATIVE FINISHES FOR LEAD

By K. H. Roll, Lead Industries Association

A description of the various methods used to produce special surface effects on lead destined for decorative uses. Reprinted from "Metal Finishing," January, 1949.

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