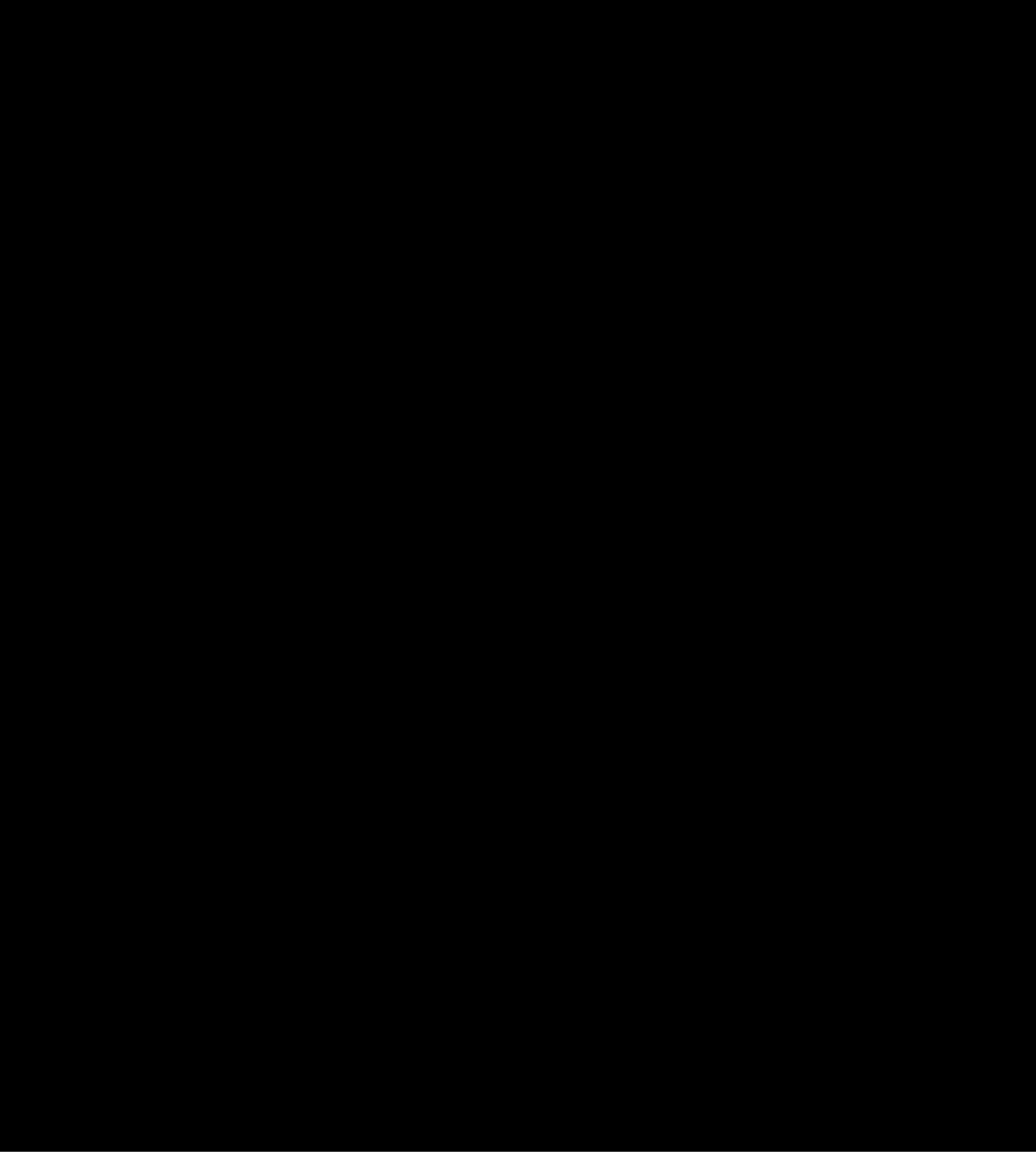




Wide Variety of Lead Equipment Used In Chemical and Manufacturing Industries

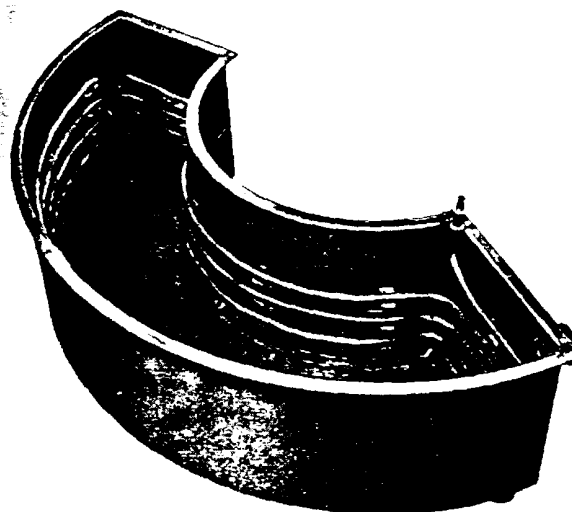
ANYONE who is conversant with the commercial uses of lead is aware that this corrosion resistant metal is used extensively by the chemical industries as a construction material for equipment to handle active chemicals. The extent to which lead is utilized for similar purposes in general manufacturing industries is perhaps not so generally recognized. The accompanying photographs show several applications of lead which make use of its corrosion resistant properties in heavy industry as well as chemical manufacturing.

The first is a semicircular steel tank lined with lead lining and containing a heating coil of lead pipe, used by the Estate Stove Co. of Hamilton, Ohio. This tank is 12 ft. in overall length, 2 ft. 6 in. wide and 2 ft. 6 in. deep. The lining is 12-lb. per sq. ft. chemical lead which extends over the flange angle at the top. The heating coil is 1-in. chemical lead pipe supported on lead hangers. All joints in the lead work are welded. The joint visible where the inside vertical wall joins the bottom clearly shows the characteristic uniform overlapping appearance of a skillfully welded seam. At the right of the picture can also be seen a lead lined overflow pipe with a flanged connection.

The picture on the cover shows a lead lined wood tank, one of three which were recently furnished to the

Kamen Soap Products Co. of Barberton, Ohio. Two of these tanks are 6 ft. in diameter and 6 ft. high, the other 7 ft. diameter and 7 ft. high. They are constructed of 3-in. fir staves and each is equipped with a power

A lead lined steel tank shaped to fit the work it is to handle. Heating coil is of lead pipe on lead hangers.



driven stirring unit. These tanks are lined with 8 lb.-per sq. ft. chemical lead which turns out over the top edge of the wood construction. Additional vertical support is provided by five steel straps located at the joints in the lead lining and bolted through the tank walls. These straps are in turn covered with 8-lb. sheet lead welded

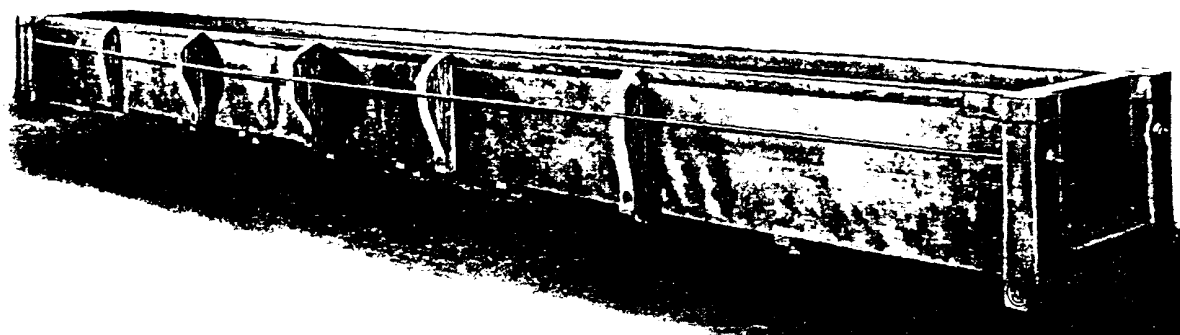
to the tank lining. The heating coil is of 2-in. A weight lead pipe and the agitator is of wood covered with 8-lb. sheet lead.

The picture at the bottom of the page is of a 35-ft. long wood tank both lined and covered with tellurium lead. The 12-lb. sheet lead lining is turned over the top edge and welded to the 8-lb. sheet lead covering on the outside which extends 1 in. below the

bottom of the tank structure to protect the wood from the splash of the corrosive contents of the tank. This tank is used by the Wolverine Tube Co. of Detroit.

The fourth picture is of a group of lead anodes used by the Delco Products Co. of Dayton, Ohio. They are 21 in. high and 8 in. in diameter of

This large wood tank, lined and covered with sheet lead, is protected both inside and out from corrosive action of its liquid contents.





Anodes of antimonial lead suspended from sheet lead covered copper rings and hooks will have long life in electrolyte solution.

16-lb., 6 per cent antimonial lead. A copper supporting ring and part of the $\frac{1}{4} \times 1\frac{1}{4}$ -in. copper hanger are covered with lead. With 1-in. holes

spaced $1\frac{1}{2}$ in. on centers these anodes present a large surface area of corrosion resistant metal to the electrolyte solution.

Power Furnished by Lead-Acid Battery Drives U. S. Navy's Wakeless Torpedo

LEAD-ACID storage batteries along with many other completely dependable commodities of civilian economy are essential products which were thoroughly adaptable to military use and they have served countless purposes on the ground, in the air and at sea. The combination of long life, ability to supply heavy current requirements, and easy maintenance made the lead-acid battery indispensable to the mechanized military organization. No other source of equal power is so universally available as the lead-acid storage battery.

Since this power is produced by chemical reaction within the battery with little or no by-products to be disposed of, the storage battery was chosen by the designers of submarine torpedoes of the United States Navy as the source of propelling force for the latest type of torpedo. The outstanding feature of this torpedo from the Naval point of view is that it leaves no wake and it therefore gives no warning of its approach to the enemy ship under attack as does the older type engine driven torpedo.

The lead-acid storage battery, by means of variations in design, is

highly adaptable to a wide range of power requirements. In this application which requires but one great surge of power for a comparatively short time the battery was designed with thin plates pasted with specially developed material. It has the highest capacity per pound of weight of any storage battery ever developed.

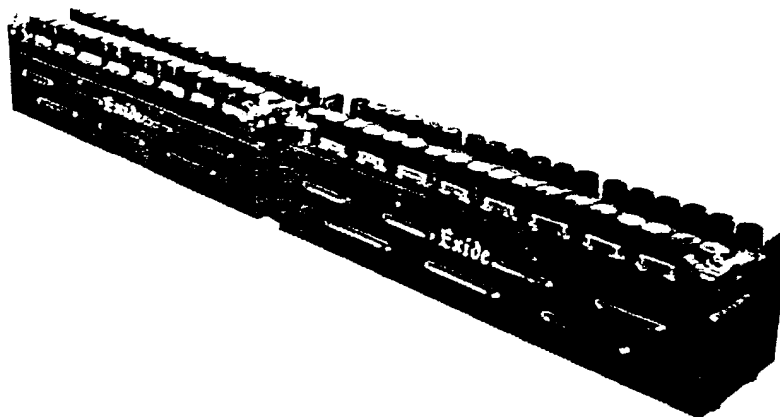
The battery driven torpedo accounted for 1,856,200 tons of Jap-

All of the above described items were made by the Hauser-Stander Tank Co. of Cincinnati, Ohio. They are but a few examples of the use of the corrosion resistant properties of lead in heavy industry outside of the chemical field. They are, however, more or less typical of applications in processes dealing with cleaning, pickling, mixing and plating. In addition to endless variations of similar uses in connection with liquids and mixtures, lead is also indispensable in handling corrosive gases. It is so used as a basic construction material in the form of sheet, pipe, extruded shapes and castings and as a coating which may be applied by hot dipping, electroplating or spraying over other metals.

anese ships sunk and made possible a number of outstanding submarine operations which accomplished multiple sinkings. It is much simpler and less expensive to manufacture than the engine driven torpedo in addition to being undetectable from the surface.

The design of the torpedo, including the electric motors which propel it was entrusted by the Navy to the Westinghouse Company. The battery, called the "Suicide Battery" because of its dedication to destruction at the completion of its single mission, was designed and manufactured by the Electric Storage Battery Company of Philadelphia.

The "Suicide Battery" which is designed to furnish but one great continuous surge of power for the U. S. Navy's new wakeless torpedo.

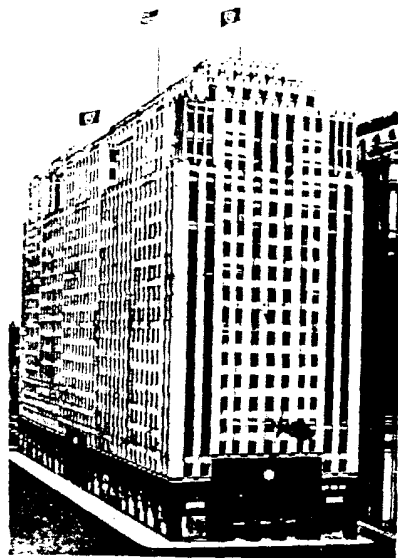


ELECTRIC STORAGE BATTERY CO.

THIS issue of "Lead" marks the fifteenth anniversary of its publication. Through these busy years it has been our purpose to present to our readers information which would be interesting and helpful and which would call to their attention the many ways in which lead is being used and can be used to accomplish both the routine and special objectives of their work. We are encouraged by the numerous responses we have received to believe that we have been successful.

In looking over early issues we note a constant pattern which recurs in nearly every issue. Along with items concerning old established uses for which lead have proved to be highly satisfactory there appear accounts of new applications of lead or entirely new adaptations of well known uses which in turn become common practice as they prove successful. For instance Volume I, Number 1, contains two accounts of architectural uses of lead which have been common for centuries. These consist of decorative lead work in the form of cast lead roof crestings and finials on the Shedd Aquarium in Grant Park, Chicago, and stamped lead spandrels on the Tribune Tower, also in Chicago, as

Office building and suburban station of the Pennsylvania Railroad in Philadelphia built in 1929 rests on lead-asbestos vibration isolation pads.



PENNSYLVANIA RAILROAD

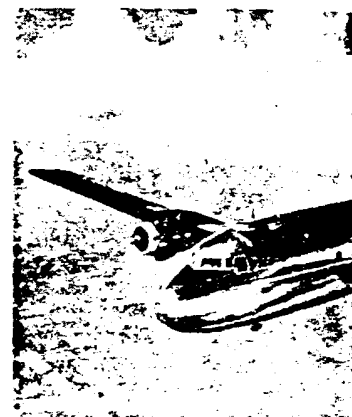
well as sheet lead roofing and flashings on both of these buildings.

On another page in the same issue is an account of the growing use of the then newly developed tetraethyl lead treatment of gasoline, citing an increase in the amount of lead used for this purpose from 650 tons in 1927 to an estimated 4,000 tons in 1930. This use of lead has continued to increase until in 1945 over 85,000 tons of lead was consumed by the gasoline industry in this country. Of much greater significance than the amount of lead used, however, is the increase in percentage of gasoline that is lead treated. In 1930 only 8 percent of the gasoline consumed contained lead, whereas at the present time over 95 percent is so treated. This use of lead in the manufacture of the best gasoline ever produced in the world was one of the most important factors in the creation of American air supremacy in the war and had much to do with the achievement of victory by the Allied forces.

Another item in our first issue dealt with lead sheathed submarine cables. Cable sheathing continues to be one of the major uses of lead and the cable manufacturing industry produced one of the most spectacular accomplishments of the war effort by adapting their machinery to the production of continuous armored lead pipelines which reached from England to France to supply gasoline to the invading armies.

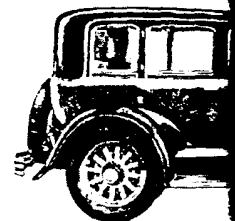
Lead-asbestos vibration isolation pads had proved their worth by 1930 and "Lead" carried an account of their use under the footings of the new office building of the Pennsylvania Railroad in Philadelphia as well as the projected 30th St. Station. This type of vibration insulation has been used under many of the buildings in the Grand Central area in New York and a recent issue of "Lead" described an installation of lead-asbestos pads in the recently completed station of the Canadian National Railways in Montreal. In fact their use has become virtually standard practice for

Fifteen Years Publication of LEAD Of Uses of

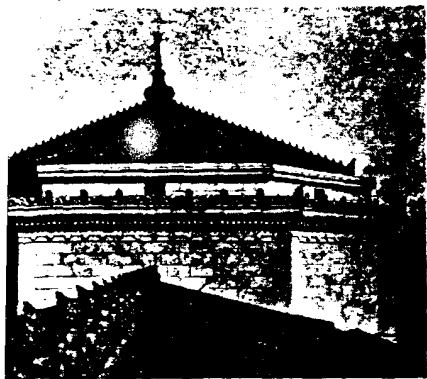


High performance characteristic of tetraethyl lead

A 1929 automobile, one of the early models having high compression engines designed to take advantage of the anti-knock properties imparted to gasoline by the addition of lead tetraethyl fluid.



the Progress and Development of Metal



lead covered skylight construction and crests on the Shedd Aquarium, published in "Lead", November. and left, lantern roof and structural dome of the Pennsylvania State Capitol, one of the latest large applications of lead for roofing and flashing purposes.



AMERICAN AIRLINES

airliners of today is designed in high test gasoline.



This car, like its more modern counterparts, also makes use of lead in battery, bearings, solder, brake linings, cables and other structural and mechanical parts.

structures subject to railroad vibrations.

Other articles in the first issue of "Lead" were devoted to lead water service pipe and to pure white lead paint, two of the most ancient uses of lead for which no superior materials have yet been found. Another item on a present day application of a most ancient use of Lead dealt with burial caskets. Lead has, for centuries, been chosen as the medium for the preservation of precious relics, one of the most recent applications having been the sealing of priceless French tapestries in lead boxes before they were hidden away underground to preserve them from the looting invaders.

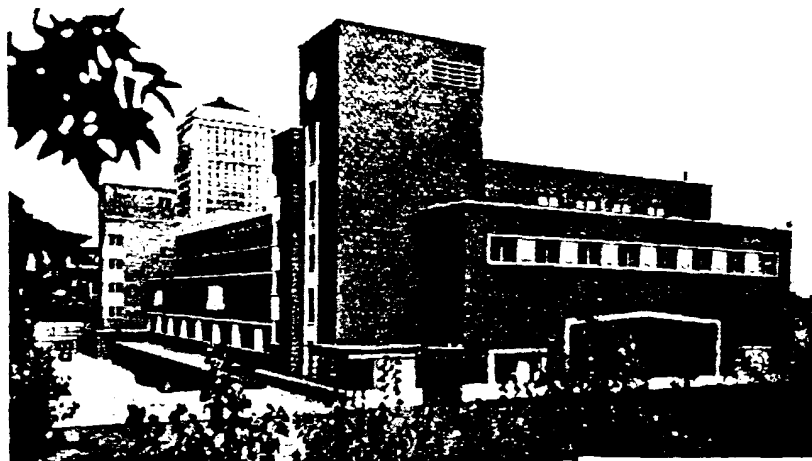
During the war years we have been privileged to show many new uses and adaptations of lead most of which are of such a nature as to be of great usefulness in peace as well as war. For instance, hot dip lead alloy coatings on steel which were used extensively on army radio containers ("Lead", Sept.-Oct., 1940) on pole line hardware and other materials have assumed an important place in the fight against corrosion. Electroplated lead coatings ("Lead", July-Aug., 1945) and sprayed lead coatings ("Lead", Nov., 1943) have also established their worth. Cast hard lead was adapted to use where strength and stiffness are required in the hard

lead water closet floor flange ("Lead", Nov., 1942). These flanges have been freely accepted and widely used by the plumbing trade along with other hard lead items such as trap screws and drum trap covers. This demonstration of the adaptability of lead to mechanical service opens possibilities for wide applications.

Frangible bullets of lead powder and plastic for air force gunner training constitute a strictly military use of lead but lead powder-plastic mixtures may well become an important commercial commodity by reason of weight or x-ray absorptive qualities. The use of lead azide as a detonating agent has increased the stability and keeping qualities of small arms ammunition. High lead content bearing metals are firmly established in the estimation of engine manufacturers. Lead alloy stamping dies, lead foil packaging materials, lead moulds for plastics and many other applications have all been reported.

The list is endless and constantly growing. We plan to continue to bring to our readers accounts of the many ways which lead is used in its many forms and the new developments which are constantly coming to light. We will endeavor to keep "Lead" interesting and informative and we hope that our readers will feel free to communicate with us whenever they have need of additional information about the uses of lead or any of its products in any phase of their work.

The modern station of the Canadian National Railways at Montreal completed in 1944 relies on lead-asbestos vibration isolation pads for insulation of track structure.



CANADIAN NATIONAL RAILWAYS

Lead Pipe Installed In Hydraulic System Eliminates Rust Scale Nuisance

ONE of the most important advantages gained by the use of lead pipe is its freedom from the inconvenience and danger of accumulation of rust scale in the water system. This is particularly important where the water is used in hydraulic machinery since such scale can cause serious damage if it enters the valves or cylinders of pump or presses. Even if protective strainers are provided the time consumed in periodic cleanings can be a serious economic loss.

Recently a change from iron pipe to lead pipe was made in the plant of a large manufacturing concern in Cleveland, O., for the purpose of eliminating the nuisance of rust scale from the hydraulic system of their heavy presses. The entire system of return lines from the presses to the storage tanks was relaid in 1-in. Class 100 lead pipe (Class 100 is the designation for lead pipe safe for working pressures up to 100 lb. per sq. in. established by Federal Specification WW-P-325. It is identical in weight and wall thickness with AAA (XNS-

weight lead pipe as set forth in Commercial Standards CS-95-41).

To provide maximum possible safeguard against rust scale the storage tanks also were lined with sheet lead. In addition the entire service and supply line was replaced with lead pipe so that no scale will be carried into the system by the make up water.

Rust in this hydraulic system has, in the past, been a serious nuisance since, in spite of the reasonable protection provided by strainers, scale has accumulated in the high pressure



Three weeks' accumulation of rust taken from high pressure chamber of hydraulic pump served by iron pipe.

chamber of the pumps serving the presses where it creates a hazard to valves, seats and packings as well as to cylinders and pistons. The photograph shows the deposit removed after only three weeks' running time.

The thin film which forms on the inner surface of lead water pipe is highly insoluble. It does not absorb water and swell nor does it slough off. Therefore the bore remains open and the walls remain full thickness.

With the new lead pipe in place in both return system and supply line and with the storage tanks lined with lead the risk of damage to the machine by corrosion products is virtually eliminated. In addition the piping can now be regarded as permanent and without need for future maintenance.



Above, supply line and two return lines, all lead, from hydraulic presses.



Below, supply line and one of the returns from hydraulic press.

Right, steel supply tanks for hydraulic system were lined with sheet lead further to decrease the hazard of rust accumulation in the pumps.



A Portfolio of American Landmarks

No. 34

Rensselaerville, A Charming New York Village

RENSSELAERVILLE in the east central part of New York State is a picturesque and charming village, the main street of which wanders up a gently sloping hill parallel to rocky Ten Mile Creek. The village was established in February, 1788, and soon became one of the most prosperous communities in the State. Three mills were operated by the water power of the creek and several tanneries were in operation.

After years of operation the hemlock timber, source of tanbark, was exhausted and the tanneries were compelled to cease operation. Later the mills ceased operations or were destroyed and Rensselaerville declined in commercial importance. It is today a delightful isolated village accessible only by highway which makes it doubly pleasant as a summer home for the present owners of many of the fine old residences erected when the town was at the height of its prosperity.

Many of the original settlers came from southwestern Connecticut and the architecture shows unmistakable influence of builders from that area. The lovely old houses shown on this page are in perfect condition. Pure white lead paint with which they are all protected from the weather has played an important part in keeping them so.

The Stevens house, built in 1809, was originally operated as an inn by Rufus Watson. Its perfect condition demonstrates the effectiveness of the protection provided by its pure white lead paint.

Middle Mill Cottage, built about 1820, later owned and occupied by the miller of the middle mill on Ten Mile Creek, received its latest coat of pure white lead paint this past summer.

The Brock-Sployd house, built in 1825. Pure white lead paint effectively emphasizes its prime fresh daintiness.



PHOTOS BY DAYTON SNYDER

THIS IS NO. 34 OF A SERIES REPRESENTATIVE OF THE MANY AMERICAN LANDMARKS IN VARIOUS SECTIONS OF THE COUNTRY THAT ARE PRESERVED FOR THE FUTURE WITH PURE WHITE LEAD AND OIL PAINT. MANY OF THEM HAVE ALWAYS BEEN PROTECTED WITH THIS RELIABLE MATERIAL ACCORDING TO AVAILABLE RECORDS.

Used Engine Oil Tested With Lead Plated Strip

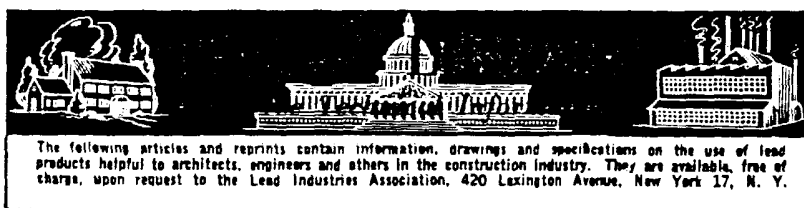
ONE of the newer uses to which lead plating is now being applied is the determination of corrosivity of used crank case oils in internal combustion engines. It is well known that engine oils oxidize and become corrosive to bearing surfaces after extended periods of use at high temperatures. A convenient means of determining the degree of corrosivity

of such oils without tedious laboratory tests will be of great value to operators of gasoline and diesel power.

Such a means is provided in a bearing corrosion test strip manufactured by Randall and Sons of Berkeley, California. It is a narrow strip of copper plated with lead in steps varying in thickness from 0.00003 in. to 0.001 in. The test for corrosivity con-

sists of the immersion of the plated strip in hot oil (138°C or 280°F) for a period of one hour and the observation of the extent to which the lead plate is removed from the copper base. The test may be conducted in the crank case by attaching the strip to the dip stick or it may be applied to oils which have been withdrawn and heated in a beaker.

Minute thicknesses of lead plate may be accurately achieved because the rates of deposition of lead at given



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.

RED LEAD FOR STRUCTURAL WORK

By Dr. L. L. Carriek, Director, Red Lead Research, Lead Industries Association
A discussion of the rust inhibitive qualities of red lead paint and the best means of making use of those qualities for the protection of structural metal. Reprinted from *Engineering News Record*, April 6, 1943.

LEAD CARRIERS ITS WEIGHT

By Fred P. Peters
An interesting resume of many of the long established uses of lead plus information on a number of recently developed adaptations of the properties of lead to special purposes. Reprinted from *Scientific American*, June, 1944.

SOME PAINTING PROBLEMS AND THE ANSWERS

By Dr. F. L. Browne, Senior Chemist, Forests Products Laboratory, Madison, Wis.
Reprinted from the *National Real Estate Journal*, Sept., 1939.

STAMFORD'S DOUBLE LIFETIME HOME

A complete analysis of hard lead flaking, white lead paint, lead plumbing, plywood and red cedar. Certificate shingle details and installation methods. Reprinted from *American Builder*, July, 1939.

STOP DEMON RUST

Leaflet giving concise, simple instructions in the use of the rust preventing qualities of Red Lead Paint in protecting farm machinery.

FEDERAL SPECIFICATION W.W.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.

LEAD EQUIPMENT USED IN INDUSTRY

By F. E. Wormser, Secretary of Lead Industries Association

A summary of the uses of lead in the production and handling of corrosive chemicals. Reprinted from "Metal Progress" to be included in the next edition of *American Society for Metals Handbook*.

SUMMARY OF NOTES ON LEAD ROOFING

A brief description of the uses of lead for roofing and flashing purposes and the proper practices of its application. Reprinted from *Sheet Metal Worker*.

NEW LEAD COATING PROCESS ELIMINATES USE OF ZINC ALLOYS

By W. Yonkman, Engineer, Western Electric Co.

A description of a successful hot dip lead coating process with complete instructions for changing over from hot dip galvanizing using the same equipment. Reprinted from *Product Engineering*, May, 1944.

COMMERCIAL STANDARDS:

Galking Lead, CS94-41
Lead Pipe, CS-95-41
Lead Traps and Bends, CS96-41

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

LEAD COATINGS ON STEEL

By Harold A. Knight, News Editor, Metals and Alloys

A thorough discussion of hot dip and electroplated coatings on steel sheet, wire and fabricated products including the technique of application, thickness of coatings, uses and advantages. Reprinted from the November, 1944 issue of *Metals and Alloys*.

LEAD X-RAY SHIELDING

Graphic chart based on recommendations of the International Commission on X-Ray and Radium Protection giving thicknesses of lead for respective voltages in millimeters, inches and pounds per square foot.

Above, a dip stick oil gage with oil test strip attached.

Below, examples of used and unused lead-plated corrosion test strips. Used strip at left indicates corrosiveness sufficient to be damaging to bearings.

current densities are known and because these rates are dependably uniform. Because such minute differences are so plainly evident the lead plated test strip provides a serviceable test which can be used in the field where laboratory service is not readily available.

UPON REQUEST, THE LEAD INDUSTRIES ASSOCIATION WILL BE GLAD TO MAIL "LEAD" REGULARLY, FREE OF CHARGE, TO THOSE INTERESTED, AND WILL COOPERATE WITHOUT OBLIGATION IN THE SOLUTION OF YOUR LEAD PROBLEMS