Lead Structures In A Byproduct Sulphuric Acid Plant

(Concluded)

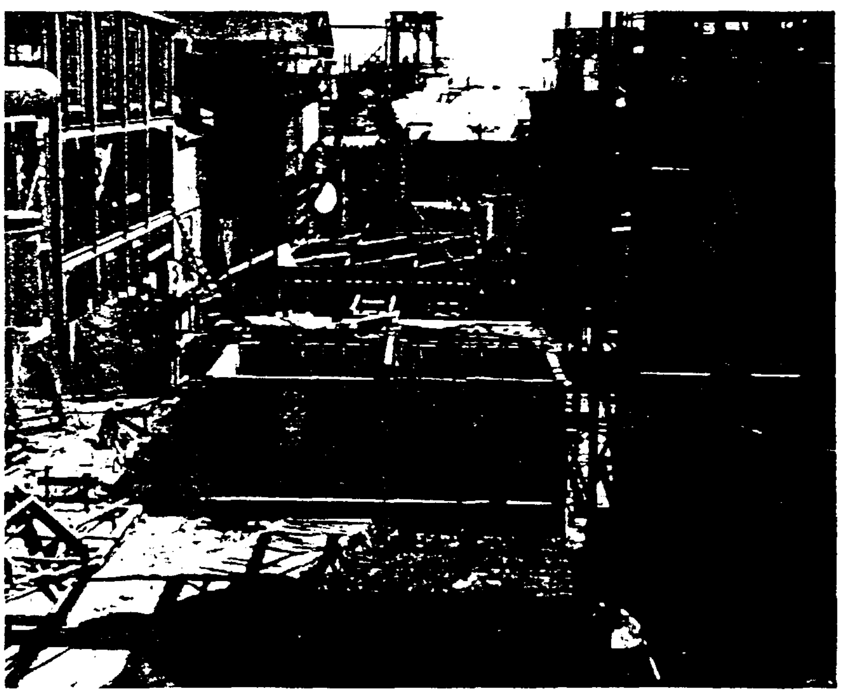
THE production of sulphuric acid as a by-product of the smelting of sulphide metal ores is an important phase in the operation of most primary metal smelters. An example of the type of process used to recover this important by-product is that employed in a large zinc smelter in Josephtown, Pa.

The smelter treats a zinc sulphide ore which is roasted to recover the metallic content. In doing so an impure sulphur dioxide gas, the basic raw material for the acid, is liberated. Before production of sulphuric acid can begin, however, the gas must be reduced in temperature and contaminants removed.

In the process used at Josephtown, Pa., the gas leaves the hearth roaster at a temperature of approximately 1,300 deg. F and is directed through a waste heat boiler that converts water to steam for plant use. The gas containing a very fine ore dust leaves the waste heat boiler at about 800 deg. F and enters an electrical precipitator that recovers the zinc dust. The sulphur dioxide gas now reduced to 550 deg. F enters a scrub tower where additional impurities are removed. From this point on the gas travels in lead ducts supported by steel straps and is processed in lead lined equipment.

The scrub tower is in two sections and the gas first enters a humidifying chamber, the smaller of the two tanks shown in the accompanying illustration, which is of steel construction entirely lined with 12-lb. sheet lead. Because of the comparatively high temperature of the gas at this point three courses of acid-resistant brick are placed over the lead at the bottom of the chamber and a 12-in. course at the sides to give support to the lead and to dissipate some of the heat. The gas then enters the second section of the scrub tower, the larger of the two in the illustration, where it passes counter-current to a cooling liquor.

Another step in the purification process is a lead-lined coke filter box shown nearing completion. Right, foreground, is the mist cottrell and, rear, the steel strapped lead ducts through which the hot gas is conducted.



The impure hot sulphur dioxide gas enters the lead lined scrub tower, shown above, where it is cooled and partly purified.

The tower is packed with 6-in. and 3-in. single spiral rings over which the cooling liquor flows at the rate of about 15 lb. per minute for each square foot of cross section.

This section of the scrub tower is also of steel lined with 10-lb. sheet lead covered with a single course of acid-resistant brick.

The tops of the two sections are fabricated of 10-lb. sheet lead supported by 2-in. steel pipe on 1-ft. centers over which are wrapped 1-in. supporting bands of lead.

The cooling liquor is a zinc sulphate solution containing 40-140 grams per liter of sulphuric acid and is continuously recirculated through lead pipe and lead lined equipment throughout its use in the process. The cooling liquor after leaving the scrub tower where it further purifies and reduces the temperature of the sulphur dioxide gas from 550 to a maximum of 104 deg. F is returned to a 100 ft. diameter settling tank lined with 10-lb. sheet lead where slurry is settled out and the clear liquor recirculated. Throughout the circulatory system cast lead pumps are used wherever necessary.

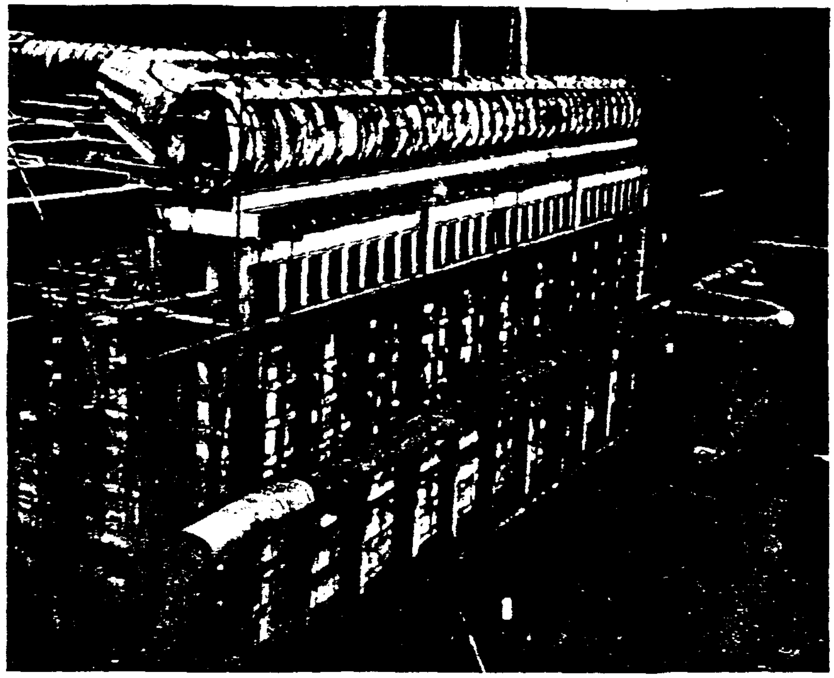
Before returning to the scrub tower the cooling liquor, which is no longer cool, is circulated through a scrubber liquor cooler. This is a steel structure containing seven decks of 34 ft. lengths of lead pipe, each deck having 18 lead tubes, all interconnected, through which the liquor is circulated. Water at a temperature of 55-65 deg. F is introduced at the top of the cooler at a rate of 550 gal. per minute and circulates downward about the lead pipe cooling the liquor circulating within.

From the scrub tower the sulphur dioxide gas now considerably cooler enters the first of two mist cottrells. This part of the process was described in LEAD, Vol. 17, No. 1.

The mist cottrells remove the sulphur trioxide and the sulphur dioxide now almost completely free of contaminants enters the final step of purification where it is filtered by coke.

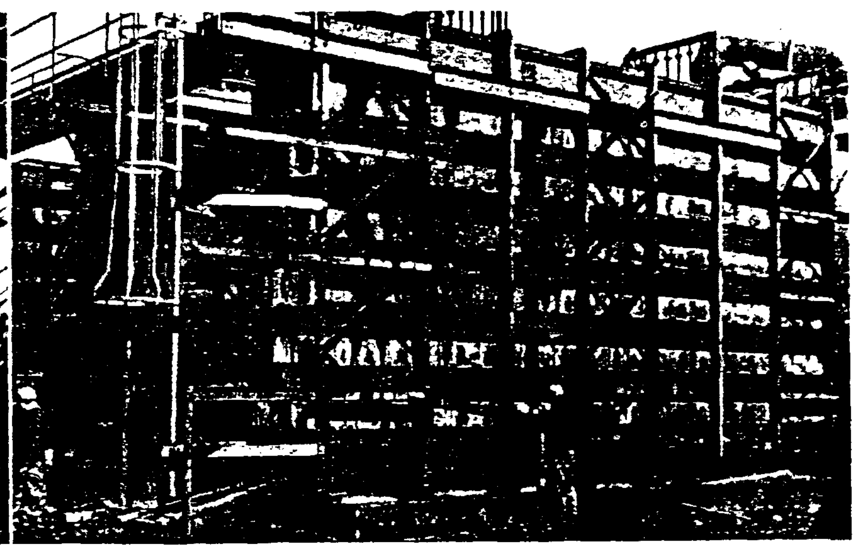
The gas passes through two rectangular lead lined chambers, the first of these containing 6 in. of 2 to 5 mesh coke and the second 4 ft. of coke ranging in size from 1½ in. down to 20 to 40 mesh. Both of these tanks are completely lined with 10-lb. sheet lead and the lead tops are supported in the same way as the top of the scrub tower, that is, sheet lead hung from 2-in. steel pipe by means of 4-in. sheet lead bands welded to the sheet lead top.

The sulphur dioxide gas now completely free of impurities and reduced to the correct temperature is converted to sulphuric acid by the contact process.



The completed lead-lined coke filter box and the lead ducts used to convey the gas at this step in the process.

Construction detail of the scrubber liquor cooler. The protruding lead tubes are joined together in series with return lead bends.



The completed scrubber liquor cooler wherein the circulating liquor used to cool the hot gas in the scrub tower is itself cooled by cold water running over the lead tubes used to convey the liquor.

A Portfolio of American Landmarks

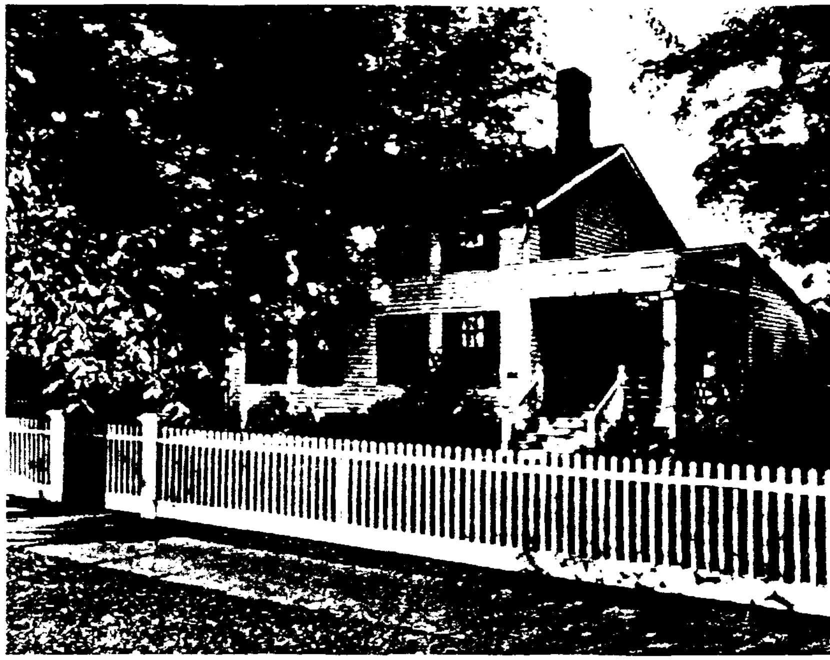
No. 42

Canandaigua In Central New York Has Many Fine Old Houses

IN 1833 James Stuart, a Scotsman who had recently returned from a three year tour of America wrote of the houses in Canandaigua, New York, "There is more appearance of their having been designed and set down with taste than I have ever observed elsewhere. In short, advantage has been taken of the ground and its relative situation with the lake to place them in the fittest spots. They are generally separate and distinct dwelling houses, their exterior painted perfectly white, and they recede from the street of the village, the streets of which are shaded with trees enclosed in neatly laid out gardens."

This description will still fit many of the houses of Canandaigua, some of which now standing were, no doubt, the very ones seen by Mr. Stuart. There is little doubt that the "perfectly white" paint was, at that time, pure white lead paint, the same dependable material which beautifies and protects many of the old houses even today.

The charm of these Canandaigua houses has been appreciated by each succeeding generation and as a consequence, they have been preserved free of any serious alterations in their outward appearance.



The Foster House, built circa 1830, now the home of Glen Jones, painting contractor, who says it has always been painted with pure white lead.

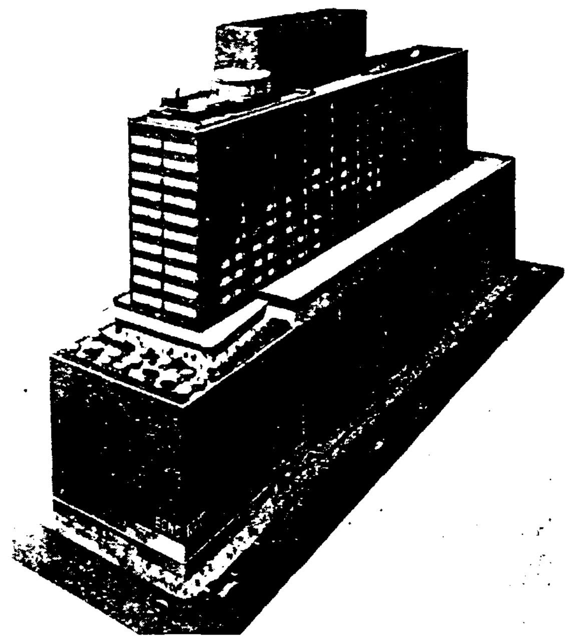
The Paul House, built in 1809, the first brick dwelling in Canandaigua, housed the Masonic Lodge from 1809 to 1819. Its most recent coat of pure white lead paint was brand new when the photograph was taken.

THIS IS NO. 42 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.

A Combination Hotel and Stores Building Now Under Construction In Cincinnati, Ohio

ONE of the few cities in which a hotel is now under construction is Cincinnati, Ohio, and its method of construction is unique. The structure will be known as the Terrace Plaza Hotel and Stores Building, and as the name implies, is a combination hotel and store building. The first seven floors are to be devoted to commercial activities, the lobby of the Hotel is to be located on the eighth floor, in itself an unusual arrangement, and above that will be located the 400 guest rooms, all with outside exposure. The building rises more than 300 ft. above ground and contains 18 stories.

The new 400-room Terrace Plaza Hotel and Stores Building scheduled for July opening, owned and operated by Thomas Emory's Sons, Inc., who also own and operate the Netherland Plaza, Cincinnati.



The entirely different uses to which the building is to be put presented many difficult problems to the architects, Skidmore, Owings and Merrill. It was very desirous to have as few columnar obstructions as possible in the store floors and yet the hotel floor columns could be spaced at conventional intervals. However, the architects found that this method would entail considerable application of column transfers and would greatly increase structural costs. After all of the various possibilities were studied, it was found most economical to use large column spacing for the hotel as well as the stores section thus eliminating the need for column transfers.

Another factor that had to be considered was wind bracing because of the comparatively narrow structural width. The store part of the building is 90 ft. and the hotel section 50 ft. wide.

The installation of the plumbing system also posed many problems. The construction was such that in the lower part of the building the toilet facilities are concentrated in several locations and in the upper part of the building each guest room is provided with a complete bathroom.

One of the problems was solved by having the vertical cast-iron soil and waste lines servicing the hotel floors enter horizontal waste lines located between the seventh and eighth floors. In effect, what would normally be the basement roughing-in in conventional hotel construction is located on an upper floor. These horizontal lines are then connected to the vertical lines serving the store section of the building.

The entire plumbing waste system is being installed by E. J. Nolan Corp. of Cincinnati using "lead and soil pipe," a phrase frequently used in the trade to describe those materials best suited for the waste system. To the initiated, a "lead and soil job" means

Plumbing foreman and the mechanical engineer inspecting the spun closed lead stubs before installation.

Plumbers at the lead bench preparing lead stubs for installation in the Terrace Plaza Hotel and Stores Building, Cincinnati, Ohio.

that, in general, all fixtures will waste into lead pipe, traps or bends and then into cast-iron soil pipe. The same thing will be true of the vent connections.

There are many reasons why a lead and soil pipe installation, properly installed, is preferred over any other combination of materials. The durability of lead and cast-iron, insofar as their use in the plumbing waste system is concerned, has been proven by their continuous use over many years. The flexibility provided the system by the lead connections prevents premature breakdowns when building settlement or movement occurs. This is a particularly important advantage in a building such as this one, where, because of its height and comparatively narrow construction, wind movement is an important factor.

The magnitude of the plumbing installation in the Terrace Plaza Hotel and Stores can be best described by the number of water closets installed. Almost 600 were required and each of them was connected to the cast-iron soil pipe by a lead stub. Almost 25,000 lb. of calking lead was required to make the joints in the cast-iron pipe.

An innovation on this job was the delivery to the building site of the lead stubs with one end already spun closed. This makes it unnecessary to cap or close the lead stub with solder on the job. It also facilitates the inspection and tests placed on the completed system by the plumbing inspection department.

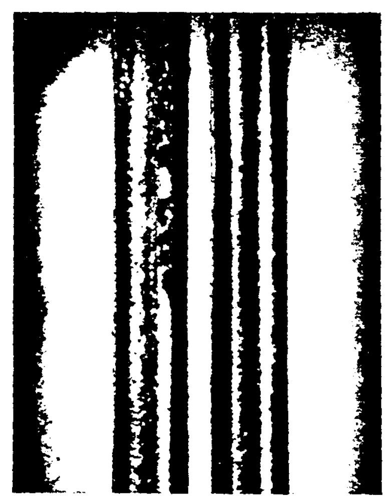
Thomas Emery's Sons, Inc., are the owners of this building and Frank Messer & Sons of Cincinnati, Ohio, are the general contractors.

Lead Alloy Coated Conductors Resist Sulphur Corrosion

SULPHUR, one of the most useful nonmetallic elements found in nature, has probably contributed more to technological advance in the last century than any other nonmetallic element. Without sulphuric acid, a major product of sulphur, practically every industry in this country would be seriously hampered.

Sulphur and its products however, have a seamier side, in that they probably help to create more destructive influences to materials and equipment through their corrosive action than any other element. Sulphuric acid itself whenever present in known quantities is handled with extreme care, usually in lead lined vessels; as a matter of fact, most of the sulphuric acid is produced in lead or lead lined equipment. However, a more insidious side of sulphur is often encountered and this occurs when sulphur is a constituent of a manufactured article that may come in contact with water. Under certain conditions, sulphur and water form sulphuric acid which then attacks any of the other constituents of the manufactured article that is subject to the corrosive properties of the acid. For many years this condition plagued the manufacturers of rubber insulated conductors.

The sulphur essential to the vulcanization of rubber would react with water to form this acid which would in turn corrode the copper conductor. Furthermore, the catalytic action of copper in contact with rubber insulation eventually harms its insulating properties. To prevent these combined attacks, a coating on the copper wire was needed to provide an inert barrier. A coating of tin was first used, but this was not entirely satisfactory though the destructive action was slowed to some extent. Tin readily alloys with copper at the temperatures used to coat the wire and what actually happened was not a coating but an alloy of the two materials, rich in copper at the base and rich



Comparative tap water immersion test on tin-coated, left, and lead alloy coated rubber insulated copper conductors.

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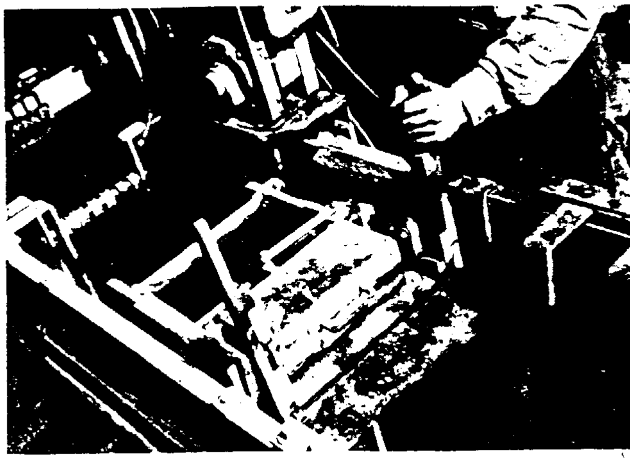
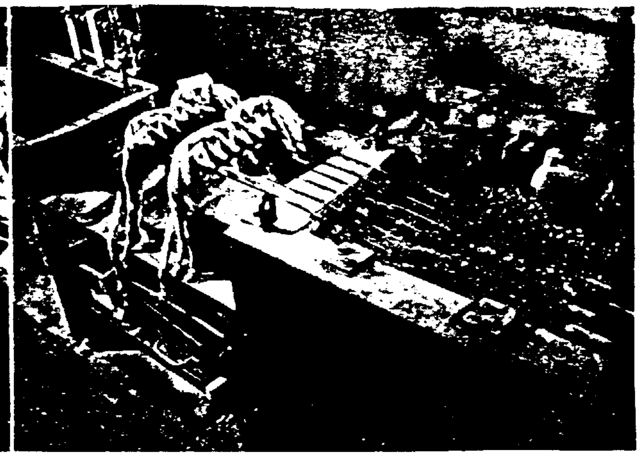




Before the lead alloy coating of conductors, the annealed copper wire is electrically cleaned, thoroughly scrubbed and rinsed.

After cleaning and coating with flux, the wire passes through the lead alloy bath. Heat resistant fiber glass wipes smooth the coating as it emerges from the bath.

in tin at the surface. Thus, in spite of the tin coating, some copper remained in contact with the rubber insulation.

About 20 years ago, research engineers at the Okonite Company developed a method for applying a lead coating on copper conductors. The coating, which bears the trade name Okoloy, has proved to be most satisfactory. Recently a section of Okoloy-coated wire was removed for inspection from a major railroad right-of-way after 13 years service and found to be in perfect condition. This wire not only had to stand its own internal corrosive action but had the added difficulty of overcoming a very sulphurous external atmosphere.

Lead's superiority is due to its basic chemical characteristics. The fact that it does not alloy with the copper is advantageous. Also, lead is more resistant to sulphur corrosion than pure tin, and much more so than alloys of tin. Lead does not affect the flexibility of fine copper strands and lead's inherent flexibility results in a rupture-resisting coating that remains as a long-lived, continuous barrier even when the wires are coiled in the factory or bent during installation.

Interesting Lead Work on Fleche of New York Church

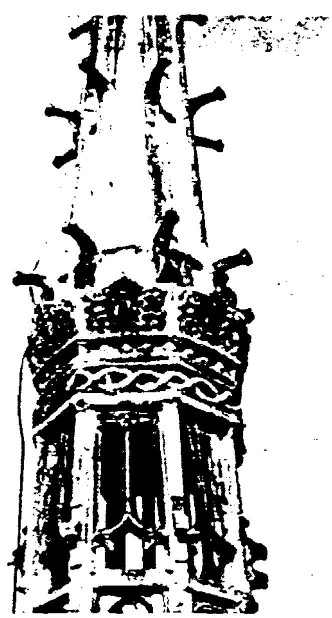
REPAIRS recently executed on the roof and fleche of the Park Avenue Christian Church in New York afforded an opportunity to inspect an interesting piece of lead work.

The entire fleche of cast lead supported upon a steel frame was made in England and erected when the church was built in 1909. The lower portion is entirely enclosed but from the top of the louvres up to the pinnacle it is an open structure with the steel members encased in lead. A scuttle just above the louvres affords access to the upper part.

In order to inspect the steelwork thoroughly and make any repairs that might be necessary the entire lead sheath was removed down to the louvred section. This required very careful work and in some cases resulted in the necessity of making new sections by bossing and welding to replace the original cast parts. In fact the entire sheet lead section and some of the lookouts of the pinnacle were made new as well as some of the more intricate panels lower down.

In replacing the leadwork due regard was paid to the expansion char-

Below, left, lead welding the joints in the sheet lead and a detail of the upper part of the fleche.



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acteristics of lead as compared to the steel frame and ample overlaps were provided for both expansion and weathering. Special care was taken to secure overlaps against wind damage.

The repairs and replacement to the leadwork were done by John F. Abernethy & Co., Inc. of Brooklyn. It is interesting to note that, though the usual work of this firm is strictly utilitarian and concerned with the lead requirements of the chemical and heavy construction industries, the craftsmen in their employ had no difficulty in adapting their skill to the reconstruction and fabrication of sculptured forms and architectural mouldings.

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.

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 Products Engineering, May, 1943.

DON'T GAMBLE WITH PAINT
An instructive article on the selection of paint for farm use reprinted from the March, 1942 issue of Country Gentleman.

LEAD, A METAL OF MANY USES IN THE THEATRE
By J. Leland Benson
A discussion of the many ways, both utilitarian and decorative, in which lead is or can be used in the theatre. *Reprinted from Theatre Catalog 1945 Edition.*

COMMERCIAL STANDARDS:
Calking 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.

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.

STAMFORD'S DOUBLE LIFETIME HOME
A complete analysis of hard lead flashing, white lead paint, lead plumbing, plywood and red cedar Certigrade shingle details and installation methods. Reprinted from *American Builder*, July, 1939.

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".

LEAD WELDING
By Robert L. Ziegfeld and David M. Boreina
A concise discussion of the process and methods of welding lead sheet and pipe with descriptions of tools and procedure. Includes brief historical notes and a list of commonly used corrosive chemicals with notes on their reactivity with lead.

LEAD X-RAY SHIELDING
A graphic chart adapted from American Standards Association Bulletin Z 54.1—1946 "Safety Code for the Industrial Use of X-Rays" to show weights per square foot and thicknesses in inches of commercial lead sheets corresponding to metric dimensions indicated on the original chart.

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.

OMISSION

The name of the contractor, Standard Waterproofing Corp., New York City, who had the contract for waterproofing the N. Y. Public Library, was inadvertently omitted from the article entitled "Extruded Lead Cap Strip Protects Masonry Joints from Weather" appearing in Volume 17, Number 1, 1947, issue of "Lead." This omission is sincerely regretted.

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