Lead Work on Federal Court House, New York

Lead Used for Flashing, Roofing, Waterproofing, Shower Pans and Paint

ONE of the finest buildings of its kind is the monumental new United States Court House in Foley Square, New York City, designed by Cass Gilbert, Inc. This beautiful structure rises some 40 stories above the street and was erected with the intention that it should endure for hundreds of years. With this in mind, materials were selected for their proved durability, and that is why sheet lead was used in its construction. Literally, from the deep foundations to the lofty roof, hundreds of tons of sheet lead have been utilized. White lead was specified for the painting and red lead was used on the steel work.

Lead is used in waterproofing the foundations, for flashing and various other waterproofing purposes on the exterior of the building, for waterproofing the many shower stalls in the building and for roofing. Of course, lead is employed for numerous other purposes, such as water closet connections, but this article will be devoted mainly to its use in the form of sheets for waterproofing, with sections devoted to the painting.

Tank room in the Court House tower. The floor is completely covered with sheet lead with "burned" seams. The lead turns about 6 in. up walls and columns.

James Stewart & Co., were the general contractors for this building, and the sheet lead was installed by J. J. Fisher Co., Inc., of Brooklyn, the sheet metal and roofing contractor, and W. G. Cornell Co., of New York, the plumbing contractor. J. I. Hass, Inc., of Jersey City, and Arthur M. Gelden, of Chicago, were contractors for the interior painting, and McClintic-Marshall Co. applied both shop and field coats of red lead to the steel.

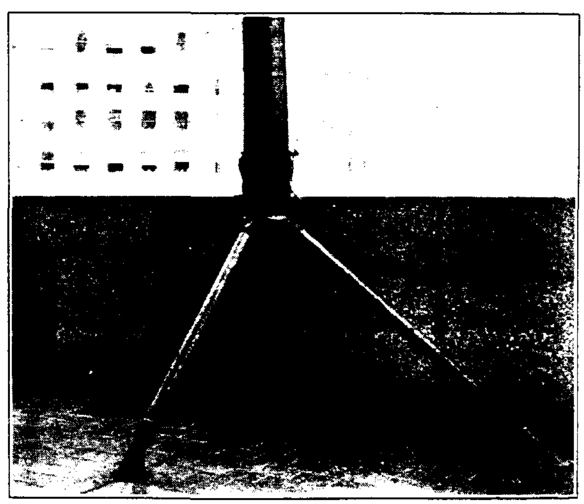
In this issue of LEAD, detailed descriptions of the installation of lead for foundation waterproofing and flashing on the Court House appear. In the next issue, the description of the Court House lead work will be concluded with articles on the shower stall waterproofing, roofing and painting.

The following comments of Cass Gilbert, Jr., dealing with the importance of proper installation of metal flashing and other building materials are particularly noteworthy:

> "Specific attention must be called to the users of any metal for flashing to the possibilities of expansion and contraction. No material is free from this movement, including brick, stone and concrete. If provision is not made for movement, the results will be disastrous. Railroad rails are laid with spaces between each rail to provide for expansion and contraction so that each separate piece works within itself. If the rails are laid too closely in cold weather, they will buckle due to expansion in hot weather. The same happens with any metal for flashing. On the Court House, New York, the subject of expansion and contraction was given most careful study so that each sheet of lead may have movement in itself, and loose locks made by folding the different sheets together were generally used to let each piece breathe."

Foundation Waterproofing

Waterproofing the foundations of the new United States Court House in New York City was of particular importance because the building is erected over an old pond and as a result large amounts of water were discovered in the ground. Soil conditions were such that it was not possible to reach rock. Consequently, the building is erected on what might be termed a forest of



PHOTOS BY WURTS BROS.

The Court House flag pole has lead flashing at its base and the braces are also flashed with lead.

concrete piles driven to an average depth of 45 ft. On top of these piles a concrete slab was poured, and under the tower section of the building the column footings rest on a huge concrete mat. Because of the water conditions on the site, it was necessary to have the entire basement as water-tight as a ship's bottom. Lead was exclusively used under all columns as the material which would endure indefinitely under the enormous pressure.

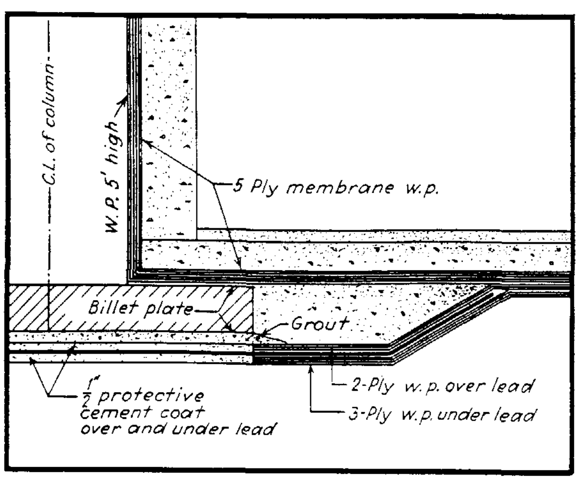
Hard lead weighing a minimum of 8 lb. per sq. ft. (1/8 in. thick) was employed. In most cases, the billet plates were set in depressions in the foundation slab about 18 in. deep with sloping sides. Cement 1/2 in. thick was laid to a smooth surface over the rough concrete and the lead laid on this. The lead was worked down onto the bottom of the depressions and extended up the sloping sides. By working the lead in this way, no joints were necessary. Membrane waterproofing was lapped both over and under the lead waterproofing as far as possible. Another 1/2 in. of cement was placed on top of the lead and the billet plates superimposed on this. Membrane waterproofing was also run several feet up the columns, and concrete was poured around the billet plates. Some of the lead sheets were as large as 12 ft. square.

A peculiar condition arose in connection with the roof of the subway. A portion of the building rests on steel work over the subway and it became necessary to waterproof the roof of the subway at the point of contact with the steel carrying the building. It required the ingenuity of the architects, the general contractors and the subcontractor for sheet metal work to solve the problem satisfactorily to the Government and to the subway authorities. The use of lead gave the answer.

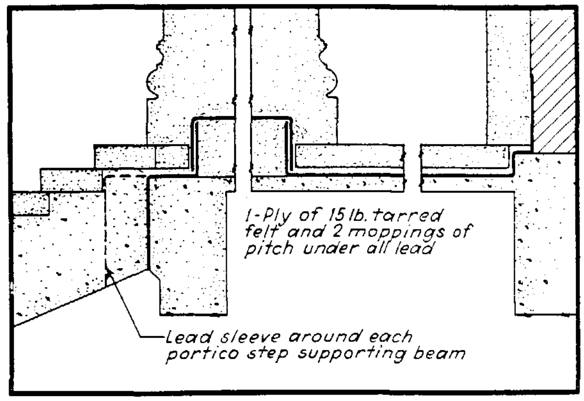
This contract was executed by J. J. Fisher Co., Inc.

Flashing

The design of the United States Court House at New



Section through column footing, showing the lead waterproofing under the billet plate, where heavy loads had to be carried by the waterproofing.



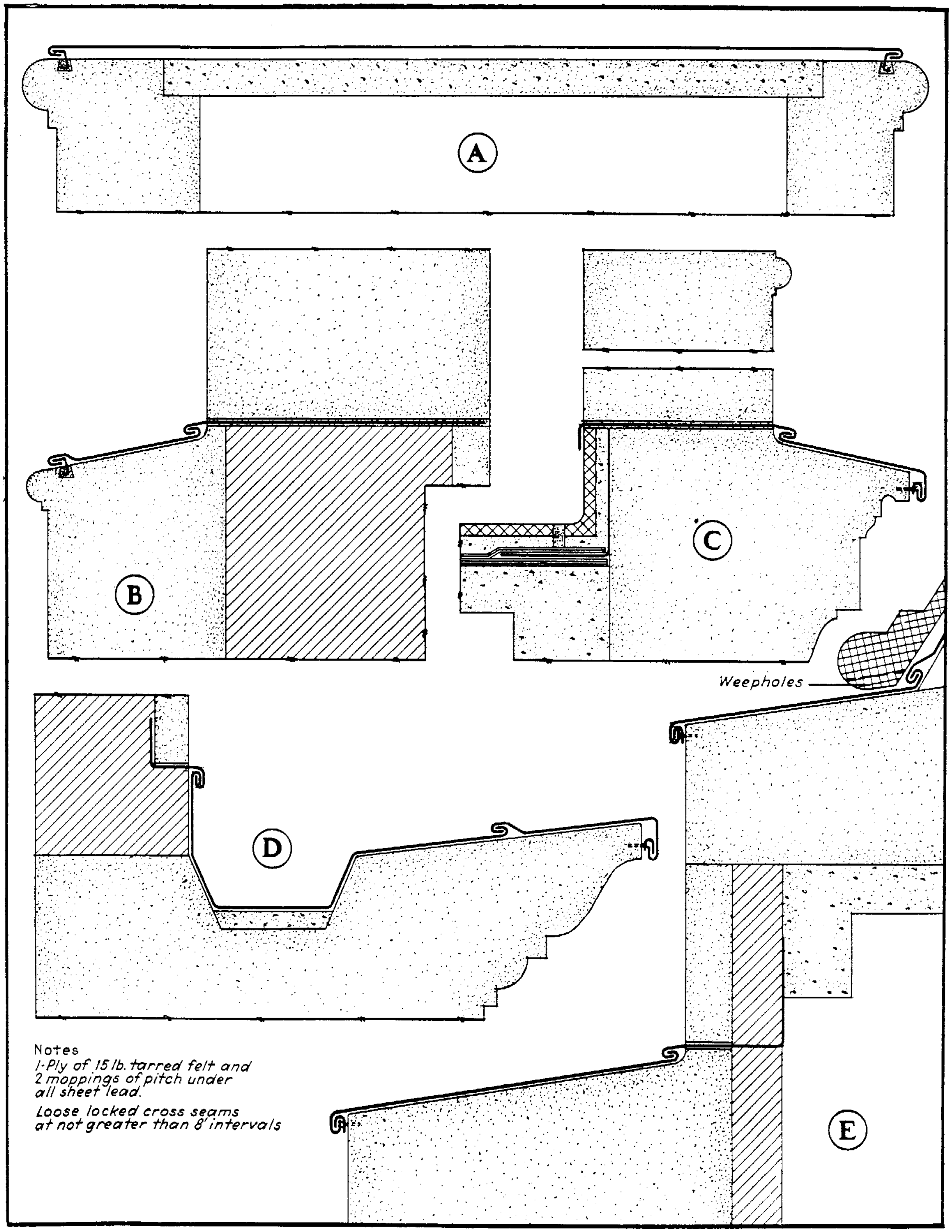
Section through the Court House portico, showing the manner in which sheet lead waterproofing was installed.

York, with its numerous terraces, porticos and cornices, made a large amount of flashing and cornice covering essential. Hard lead weighing 3 lb. per sq. ft. (3/64 in. thick) was used for practically all of this work. In a few instances, as for lining the floor of one portico, heavier lead was employed. All through-wall flashing was hard lead of a patented interlocking design. Wherever through-wall flashing extended out into the open more than a few inches or was adjacent to a cornice covering, the exposed lead flashing or cornice covering was loose-locked to the through flashing. Also the exposed flashing and cornice covering was installed in not greater than 8 ft. lengths with the cross seams between lengths loose-locked. In this way the exposed flashing was free to expand and contract without being impeded in any way.

In a number of places, bends had to be made in the lead at right angles and crossing loose-locked seams. Since the ends of the lead sheets had to be bent back for the joints when the sheets were flat, a second bend across this first one would crimp the first one tightly together at the intersection of the two bends and it would then be impossible to make the joint. To prevent this, pieces of leather belting 1/8 in. thick were placed in the first bend where the second bend would cross it. Then when the second bend was made, the leather prevented crimping of the first bend and, after all bends were made, the leather was removed and joints made without difficulty.

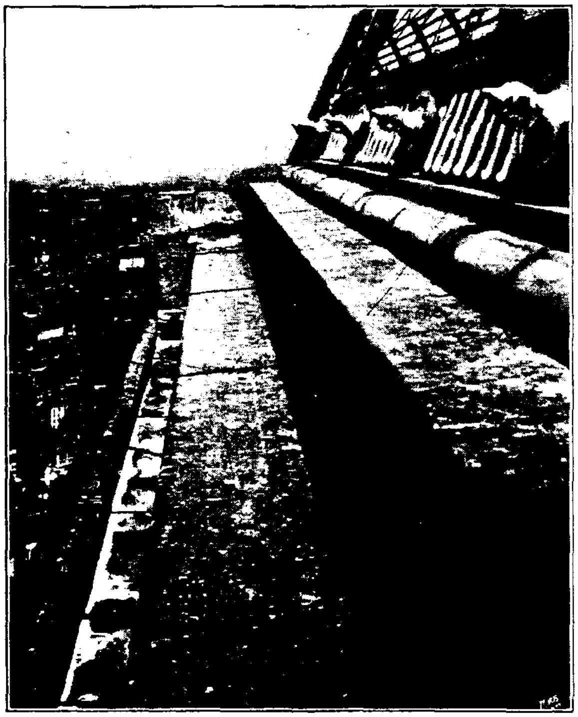
In waterproofing the porticos, the entire floor was lined with sheet lead. At the base of the stone columns, which rested over square raised pedestals, the lead waterproofing was turned several inches up the sides of these large dowel-like structures. A separate inverted lead pan was then made for each column and was placed over the raised base, overlapping the lead waterproofing turned up the sides by about 6 in.

Where lead flashing had to be calked into reglets in the stone work, continuous lead locking strips were first

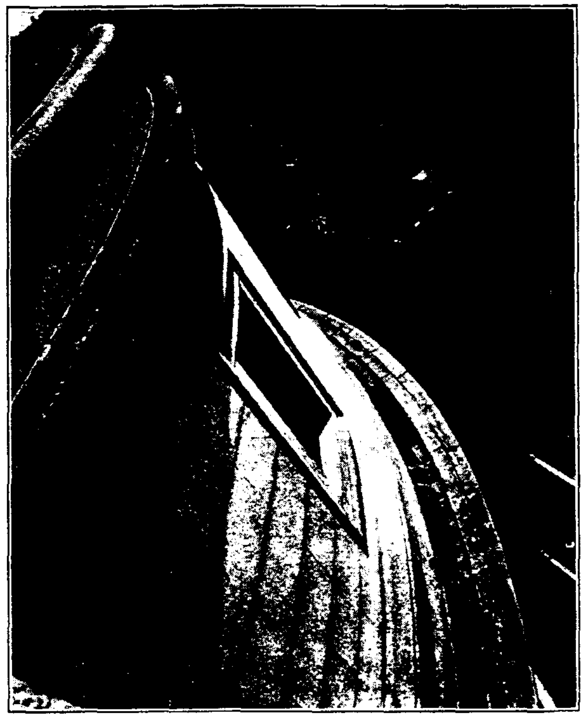


Typical Lead Flashing Details, Federal Court House, New York.

A—Small sheet lead roof on a ventilating shaft. B—Lead parapet wall flashing and cornice covering. C—Lead cornice covering, through wall flashing and base flashing at tile roof deck. D—Lead cornice covering and gutter lining. E—Lead covered set-backs and flashing at base of tower roof.



Lead covered set-backs at base of lead-lined tile tower roof (detail E, page 4). A lead lined gutter is visible at the left.

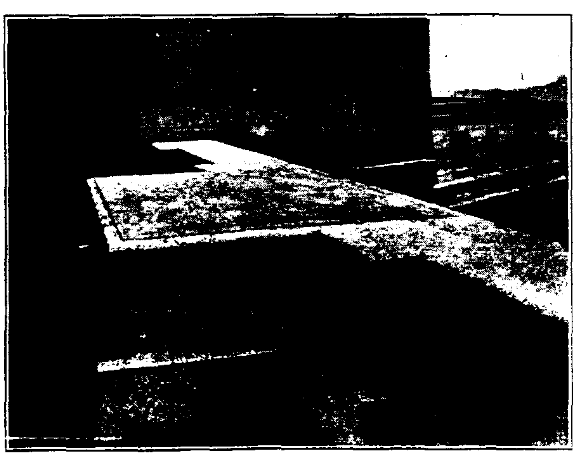


Lead covered cornice and through wall flashing at top (detail C, page 4), and lead lined gutter and cornice at bottom (detail D, page 4).

calked into the reglets and the lead flashing was loose-locked to these strips. Gutter linings were handled like cornice coverings with loose-locked cross seams at 8 ft. intervals. Where tile decks ended in parapet walls, interlocking cap flashing was installed to overlap base flashing with loose-locked cross seams. The base flashing was run under the tile deck. In some cases the flashing was entirely concealed. Where lead had to be fastened along cornice edges and similar locations, continuous lead cleats were fastened to the stone by means of lead plugs and brass screws inserted in holes drilled in the stone. The lead cornice covering or flashing was loose-locked to this cleat.

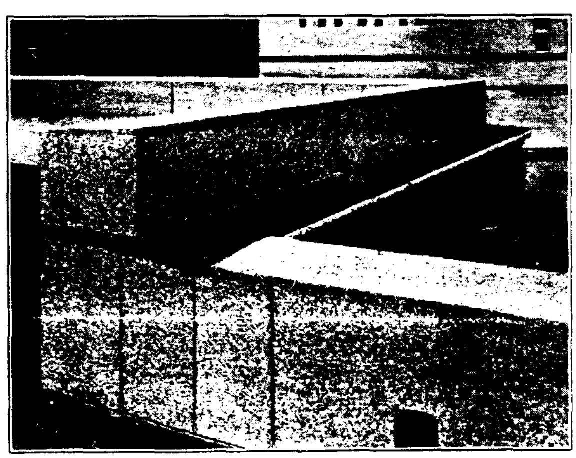
All loose-locked joints were filled with non-hardening compound.

J. J. Fisher Co., Inc. installed the lead flashing. This firm also lined the floor of the water tank room in the tower with sheet lead turned up about 6 in. along all the walls and around the columns to form a complete waterproof lead pan. The lead forms the finished floor.



PHOTOS BY WURTS BROS.

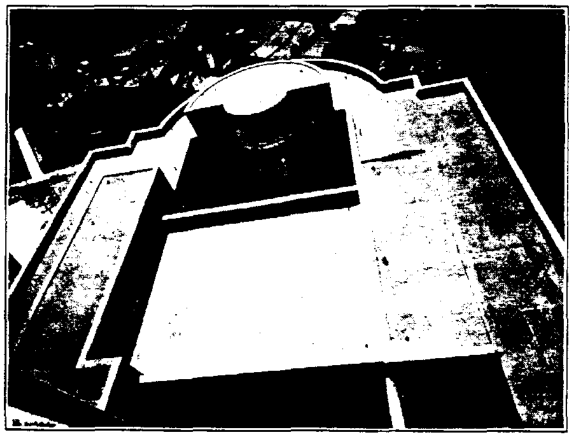
Small lead roof over a ventilating shaft (detail A, page 4).



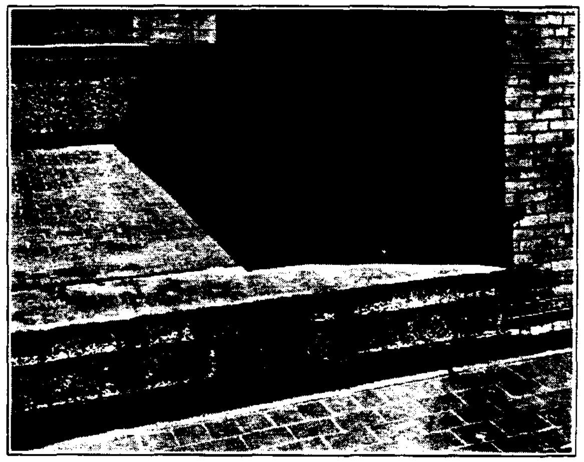
Lead covered cornices, through wall flashing and flashing to tile deck (details B and C, page 4).

The advantages of lead for flashing are many in addition to its great durability, greater than that of any other common metal. Since lead flashing is about twice as thick as most other flashing, that fact also adds to its life. One of lead's greatest advantages is that it will not cause unsightly discoloration of adjacent materials. All too frequently ugly stains from roofing or flashing ruin an otherwise beautiful façade. This can not happen if the roofing or flashing is lead.

Lead is more easily worked than other sheet metals and as a consequence, work can progress rapidly and labor costs can be minimized. Furthermore, this makes it a simple matter to fit lead flashing to irregular or curved surfaces, a fact exemplified by the ease and neatness with which lead was applied to the curved copings, gutters and cornices on the back of the Court House.



Looking down on part of sixth and seventh floor roofs from a tower window. The seventh floor copings are lead covered, and the sixth floor parapets have lead through flashing.



PHOTOS BY WURTS BROS.

Some of the lead flashing on the sixth floor roof. Note the loose-locked cross seam filled with non-hardening compound on the lead-covered coping. Base flashing is completely concealed under the tile but the edge of the cap flashing is visible.

(To be continued)

Red Lead and Lead Wool on San Francisco's Bridges

Red Lead Paint

SAN FRANCISCO is the scene of two mighty bridge projects, the Golden Gate Bridge and the San Francisco-Oakland Bay Bridge, both now under construction and both to be protected by lead paints. The Golden Gate bridge will be the longest suspension bridge in the world, about a third again as long as the George Washington Bridge at New York, also painted with lead paints (LEAD, January, 1931). The main span of this bridge will be 4,200 ft. long, 700 ft. longer than the Hudson River span, and its overall length will be 8,940 ft. The towers will rise 746 ft. above mean high water, which is 150 ft. higher than the towers of the New York bridge. Six traffic lanes and two walks for pedestrians will be provided. This bridge crosses the famous entrance to San Francisco Bay, the Golden Gate.

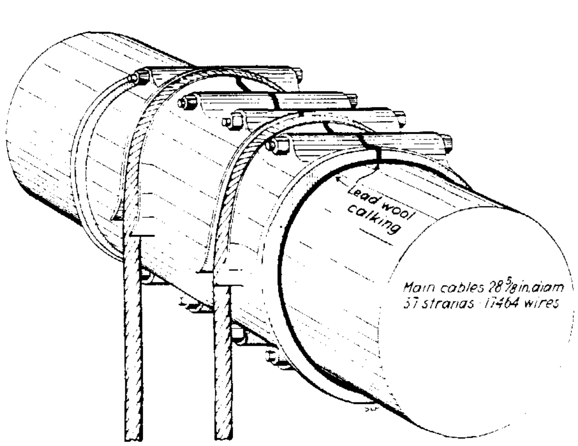
Joining San Francisco with Oakland and Berkeley, the other great bridge will have a total length, including approaches, of about 8¼ miles. The bridge itself will

A view of the Golden Gate Bridge at San Francisco, which is protected with two coats of red lead paint, as it will appear when completed.

be about 4½ miles long. Actually it will consist of two bridges, one running from San Francisco to Yerba Buena Island, composed of two huge suspension bridges placed end to end with one of the cable anchorages in the water in the middle. The other section, from the Island to Oakland and Berkeley, will be a combination of cantilever and truss spans. A tremendous double deck tunnel across Yerba Buena Island will join the two sections of bridge. The bridge will be a double decker with six lanes of automobile traffic on the upper deck and three truck lanes and two interurban tracks on the lower.

When engineering marvels such as these are constructed much depends upon the protection they will get against the elements after completion. Thin coats of paint afford this protection. Since the investment amounts to many millions of dollars, for these two bridges around $100,000,000, the engineers naturally gave the paint most careful consideration. They must rely on paint that has thoroughly proved it will prevent rust and corrosion and stand up under the most rigorous conditions, for bridges, particularly those near the sea, are exposed to the worst possible weather conditions, including hot sun, fog, salt air, rain and rapid temperature changes. Through years of use in every part of the world and in many an impartial competitive test, red lead has proved its superiority for painting metal and has established itself virtually as standard, particularly for priming coats, which are most important. That is why the engineers for these two magnificent projects selected pure red lead paint for the first two coats on each bridge.

In the instance of the San Francisco-Oakland Bay Bridge, the engineers laid such stress on the painting that the steel was allowed to remain three months and then sandblasted to remove rust and mill scale before being primed. So in this particular case, the shop coat



Method of making suspender rope saddles waterproof with lead wool, San Francisco-Oakland Bay Bridge.

COURTESY AMERICAN BRIDGE CO.

Suspension spans of the San Francisco-Oakland Bay Bridge on which lead wool is used to calk suspender rope saddles and red lead protects the steel.

was really applied in the field where the sandblasting took place.

Lead Wool Calking

For a special weatherproofing condition on the San Francisco-Oakland Bay Bridge many tons of lead wool has been used.

Each cable of the twin suspension spans consists of 17,464 steel wires, each 0.195 in. in diameter, protected by a spiral wrapping of wire. This wrapping is interrupted at intervals of about 30 ft., where saddles are provided for the suspender ropes which support the steel for the roadway. These saddles are made in two pieces and bolted together around the cables. Each saddle is provided with two grooves on its upper half into which the suspender ropes fit. Each suspender rope is 2¼ in. in diameter and twice as long as the distance from cable to roadway, being looped over the saddle with its ends secured to sockets at the bottom.

It is extremely important that water be prevented from entering the spaces between the cable wires at the saddles. Lead wool performs the exacting part of this task. Calking grooves are provided around the edges and where the two halves of each saddle join. These grooves are calked with lead wool in the same way that bell and spigot pipes are calked. Thus all moisture and other corrosives are prevented from getting between the cables and saddles at these points.

Lead wool is a very useful calking material. Since no heat for melting is required, it can be used in locations where melting would be inconvenient or heat dangerous. Also since it is used in the solid state, vertical, overhead or underhand joints may be calked with equal ease.

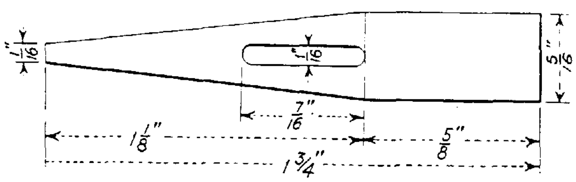
Mr. C. H. Purcell is chief engineer of the San Francisco-Oakland Bay Bridge and the American Bridge Company had the contract for the entire superstructure.

Special Lead Gaskets for Jointing Huge Concrete Mains

TO SUPPLY with water a group of 13 cities in Los Angeles and Orange Counties, California, comprising a population of some 2,500,000, the Metropolitan Water District of Southern California is constructing a main aqueduct 242 miles long from the Colorado River to a reservoir near Riverside, California. From this reservoir, a distribution system will carry water to the various communities cooperating in the project. The distribution system will contain 127,000 ft., or 24.1 miles of pre-cast concrete pipe with lead calked joints in the upper feeder line and is now under construction.

The pre-cast concrete pipe with lead calked joints varies from 9 ft. 8 in. to 11 ft. 8 in. in diameter and will operate under heads of from 15 ft. to 240 ft. The method of making the joints is novel although it relies on time-tested lead for its effectiveness. Lead is employed for the joints because it provides adequate flexibility to take care of ground movement without damage to joints or to the rigid pipe material, just as it does for cast iron mains.

The pipe is in 12 ft. lengths. Sections are jointed by inserting a lead ring, like the accompanying diagram in cross-section, into the joint and calking from the inside. The joint is finished with cement

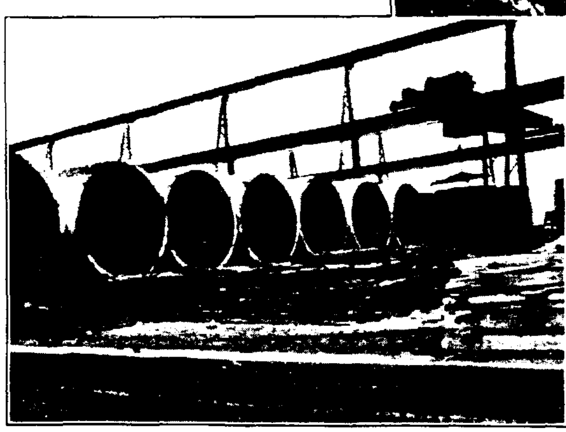


Section through special lead gaskets for jointing large concrete pipe.

mortar on the outside. The lead provides the flexibility necessary in any pipe laid in the ground. If any hub runs large and the lead ring calks in too far, the remaining space is filled with lead wool calked into place.

As an example of the amount of lead required to joint this huge pipe, each lead gasket for pipe 10 ft. 3 in. in diameter weighs about 60 lb. and is made from an extruded strip of lead about 32 ft. 6 in. long with the ends burned together to form a ring. Nearly 11,000 of these lead gaskets should be required to complete the upper feeder line.

Installing huge concrete pipe for Metropolitan Water District of Southern California project and, below, concrete pipe in the manufacturer's yards with piles of special lead gaskets for jointing it.



It is essential in pipe lines made of rigid materials to provide flexibility at the joints. When ground movement occurs, as it inevitably does, hard jointing materials either crack and leak, or, if they are too strong, cause the pipe itself to break (LEAD, November, 1932, and January, 1934). On the other hand, flexible lead joints adjust themselves to the movement while still filling the joint tightly and relieve strain that would otherwise be placed on the pipe. Naturally, manufacturers of concrete pipe have turned to lead for joints in order that their product may give maximum service. Rigid jointing materials may cause blame for pipe failures to be placed on the pipe when the pipe is really not at fault.

This huge project is under the supervision of Mr. F. E. Weymouth, General Manager and Chief Engineer of the Metropolitan Water District of Southern California. The joints are patented and are used by the District through arrangements with the American Concrete and Steel Pipe Company.

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