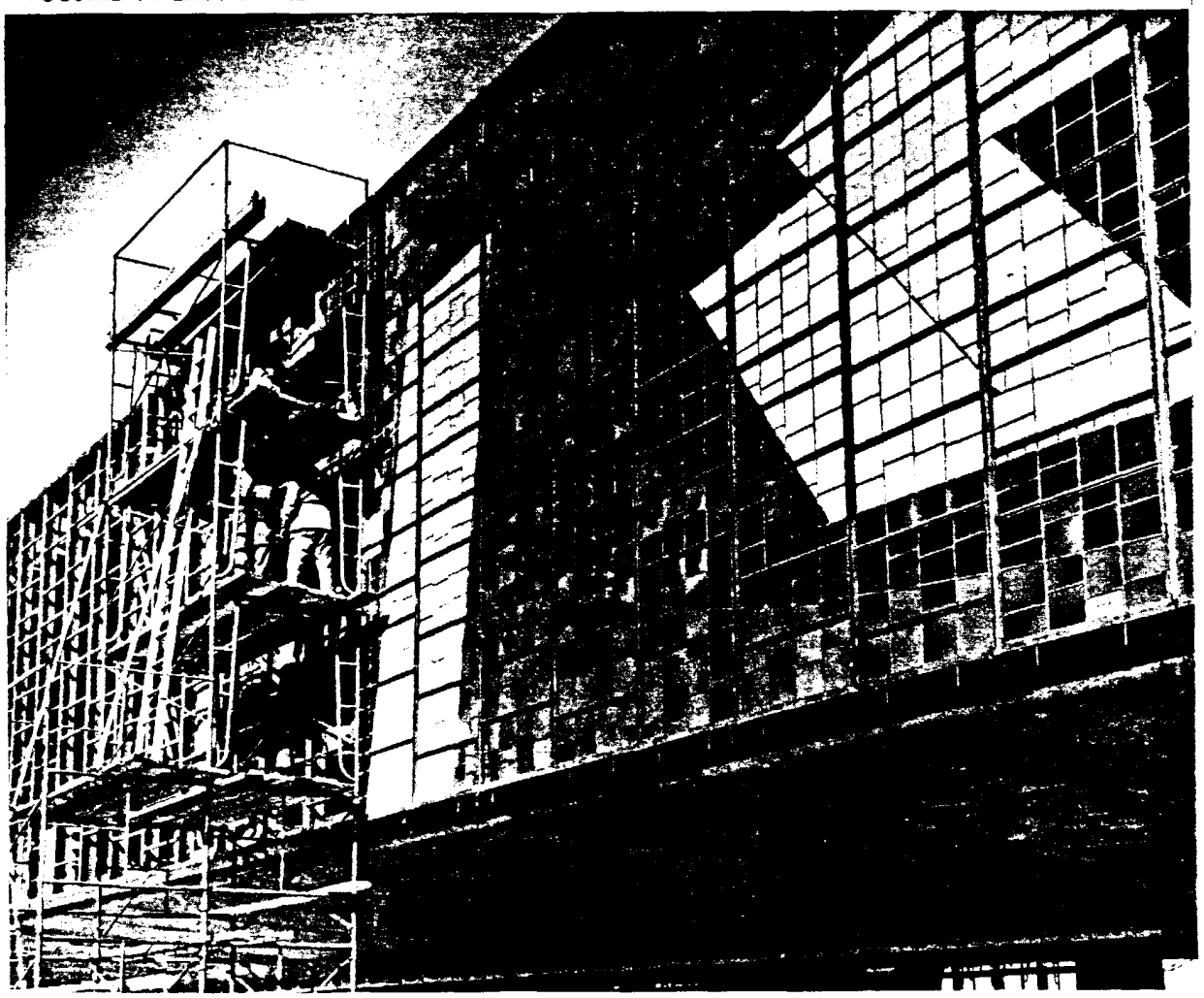
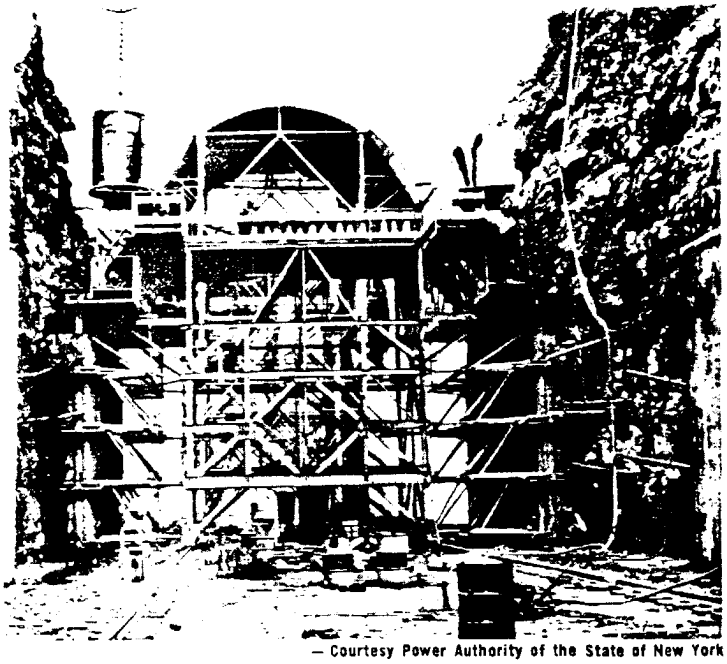
# Lead

VOLUME TWENTY-THREE 1959 NUMBER FOUR



**Glaziers at work on a four-tiered scaffold give the scale of the 22½ x 317 ft. expanse of window for the new American Airlines Passenger Terminal at Idlewild Airport. Twenty-eight tons of lead were used in lead comes and in covering for the structural steel. (See story, page 6).**



— Courtesy Power Authority of the State of New York

Massive sections of the wall are poured atop the sheet lead at each stop of this mobile scaffold with concrete forms on both sides.

# NIAGARA POWER TUNNELS USE 16½ MILES OF LEAD AS LUBRICATING SEAL

Under a treaty with Canada the U. S. is building the $720 million Niagara Power Project—the largest hydroelectric development ever undertaken in the Free World. Development has advanced under auspices of the Power Authority of the State of New York. The Boston firm of Uhl, Hall & Rich, engineers, is serving as consultants for design and construction of the power plant.

Such a vast undertaking naturally encounters unique engineering problems. One of the unique techniques developed to solve them is the ingenious use of sheet lead as a sort of gasket that will act both as a lubricant and water seal. This lead seal gaskets the joint between the base and vertical members of two parallel concrete conduits, each more than four miles long.

Water diverted from the Niagara River above the falls flows through the conduits, placed below grade by cut and cover, into an open canal and thence to the main power plant or is pumped into a storage reservoir.

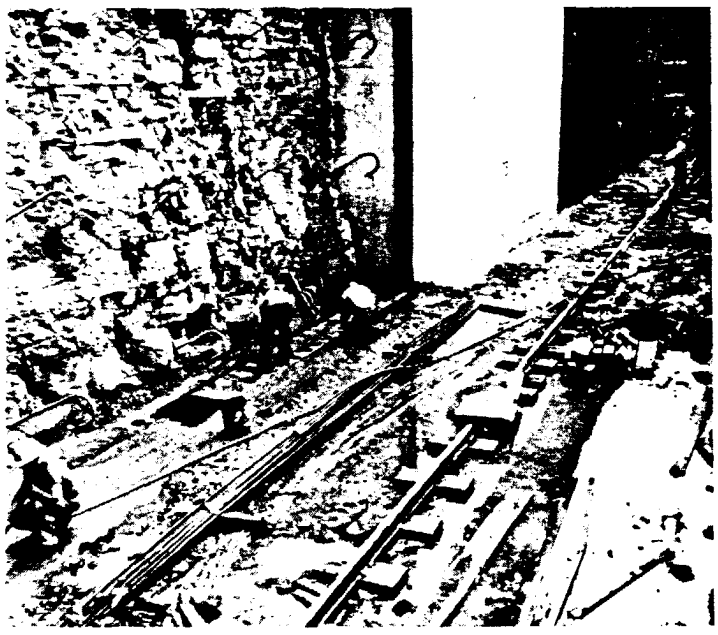
The conduits themselves will be 66 ft. high and 46 ft. wide including their three-hinged arch concrete roofs. Thickness of concrete walls and base will vary generally between 2½ and 3 ft., and thicker at the base of the arch. Tops of the conduits will average 40 ft. below ground level, the base averaging 106 ft. below ground level. Pitched ¾ in. in each 100 ft. through most of the run, each 22,000 ft. conduit will drop the water about 11 ft. in elevation.

As illustrated in the photos, massive sections of the wall are being poured at each stop of a mobile scaffold complete with concrete forms on either side. This rig shuttles back and forth through the open cut depositing whole section forms ready for the concrete to be poured.

Sheet lead is placed in the joint formed by the wall sections and the concrete base (see detail drawing) to serve as a lubricant during any wall movements due to stress induced by contraction or expansion. The lead is also the water seal for the joint.

The base area where the wall section will be joined is first cleaned of debris with an air hose. This surface is next painted with an asphalt emulsion. Strips of 4-lb. sheet lead 10 ft. long with ends butted are then placed over the prepared strip and painted with asphalt to protect them from reaction with the free lime in the fresh, curing cement. A gridwork of steel reinforcing bars is anchored in the rock wall. Finally, the mobile scaffolding rig is rolled up on railroad tracks running the length of the ditch, and another unit of concrete wall is poured.

Since the asphalt-lead-asphalt preparation is laid the length of both conduit trenches, on either side of each, 88,000 linear ft. of lead sheet is required. Width of these strips is 2 ft., thickness 1/16 in. Weighing 4 lbs. [illegible] square foot, the lead in the com-



The 4-lb. sheet lead is placed in position.

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# TUNNEL
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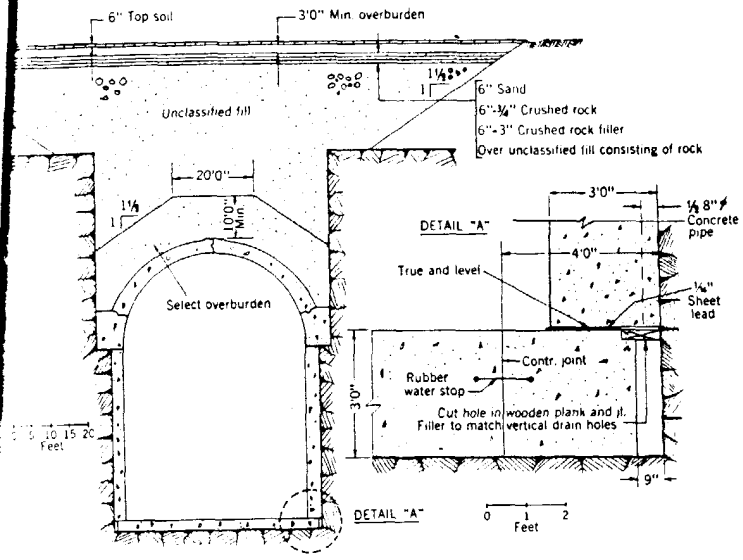


## NIAGARA POWER PROJECT — BASIC FACTS


**Location:** On the Niagara River, near the falls.

**Watershed:** Drains four of the Great Lakes; more than a quarter million square miles.

**Flow:** The river has an average flow of 202,500 c.f.s. A U. S.-Canadian treaty earmarks 100,000 c.f.s. for the falls during tourist season daylight hours, 50,000 c.f.s. other times.

**Power output:** 2.19 million kilowatt installed capacity, 13 billion kw-hr per year.

**Size:** The Niagara power project will be the largest in the Free World. 39 million cubic yards of earth excavated, 3.5 million yards of concrete.

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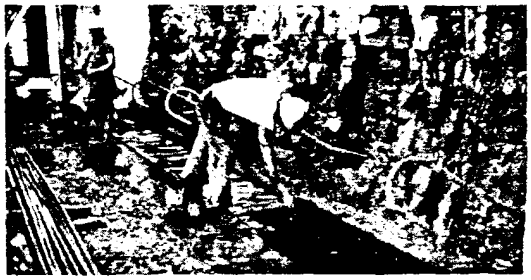
### hy Lead Was Specified

d was specified for its malleabil- d lack of resilience, or "poor y," of course. But several other als might have competed suc- lly if these properties had been the only criteria. The lubricity of lead recommended it, because if the massive wall blocks were not free to adjust their position, tremendous thermal and ground forces might easily buckle or shatter them. And lead's ability to carry heavy loads, its low cost, and the ease with which it is cut and worked are other points listed in its favor.



The sheet lead lubricating seal is painted with asphaltum.

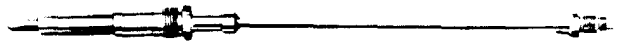
## *Outdoors or Indoors—*

## *LEAD-BEARING ENAMELS FOR COLOR IN CHRISTMAS LIGHTS*

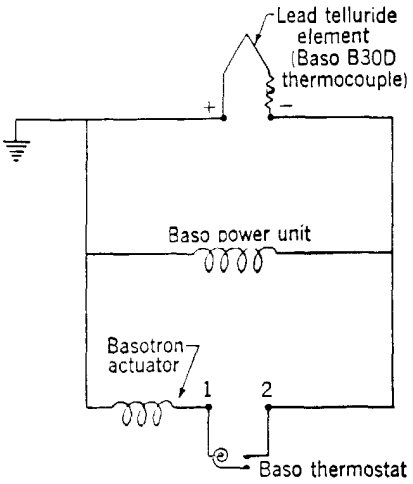
LIA26190

Lead-bearing glass color enamels are used by the Westinghouse Lamp Division to provide beautiful, durable colors on their premium Christmas tree lights. Specifically designed to be resistant to the ravages of weather, these color enamels containing about 30 per cent lead oxide are suitable for continued exposure outdoors — ideal for decorating the house or trees on the lawn. Other enamels were tried but, without lead, their weather resistance was too low. As always, these bulbs come in a variety of festive colors. Something new — bulbs decorated with swirling patches of gay Christmas hues are available this year. Thus, another colorful lead product joins lead foil tinsel which traditionally adorns our Christmas trees.

# Lead Telluride Semimetals *Find First Commercial Use*



A lead telluride (B30) thermocouple used in combination with Basotron Flame Powered Systems. It is available in lengths from 12 to 60 inches. The stainless steel jacket of the probe is the p element of the n-p couple.




Look, Ma, no power lines! This schematic of the Baso system clearly shows that operating power for the heating system control comes solely from the lead telluride thermoelectric element.

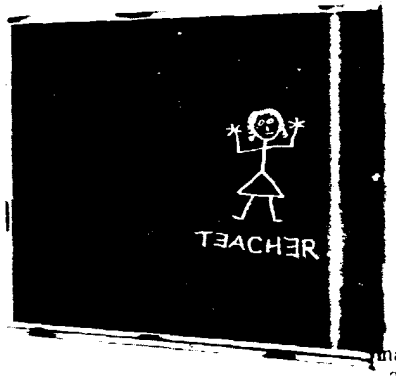
Apart from military use and envisioned use in atomic reactors, (LEAD, **Vol. 23,** No. 1) lead telluride thermoelectric elements find their first use in Baso's Appliance Control System. Completely flame powered, it is independent of outside electrical power.

The important feature of the system is a lead telluride thermocouple generator which provides as much as 140 millivolts with the aid of a pilot burner. In combination with a magnetic gas metering valve and thermostat, it is readily adaptable to a variety of gas appliance and heating systems. In fact, several companies now use the Basotron control in their room heater products — Ohio Foundry and Manufacturing Co., Steubenville, Ohio; Adams Manufacturing Co., Pittsburgh, Penna.; and Empire Stove, Belleville, Illinois. The Basotron system imparts surety and safety of operation.

In the event of an outside power failure in the home — in the dead of winter let's say — though the lights go out and the refrigerator stops, heat will still be provided. This example is easily extended to industrial needs where a reliable, independently supplied control unit is identifiable with safe and efficient operations.

***Colorful "blackboards"***

# Leaded Porcelain Enamel *Goes to School*




In the olden days, the classroom "blackboard," where the student frequently was required to display his ignorance with a piece of chalk, was made of slate. Today's "blackboards" are superior to the old slate boards in almost every way.

Even the word "blackboard" does not properly describe these chalkboards as they are available in several colors — 4 greens, coral, "mist" white, blue, gray, black and brown. The difference? — today's chalkboards are lifetime lead-bearing porcelain enamel on steel produced by the AllianceWall Division of Alliance Ware, Inc., Alliance, Ohio.

AllianceWall "Life-Rite" chalkboards have been manufactured under the rugged specifications of the Porcelain Enamel Institute — PEI:S-104 (specification for porcelain enamel chalkboards) and are being used extensively in new schools, laboratories, and institutions. The chalkboard is a 28 gauge steel sheet with a conventional porcelain enamel ground coat on both sides and an ultra low-temperature lead-bearing cover coat on only one side.

This cover coat is fired at below 1200 deg. F. and yields a beautiful matte finish with an ideal surface for taking chalk marks. The porcelain enameled sheet is then laminated on a rigid board. This lead-bearing low-temperature cover coat has excellent acid resistance (class B or better), is color fast, and extremely abrasion resistant being significantly harder than chalk.

Porcelain enamel, of course, is renowned for its durability; so much so that these chalkboards come with a 20-year guarantee. Porcelain enamel surface quality has been carefully controlled during manufacture so that it contains just the right degree of matte. The result is consistent performance. The surface takes chalk easily and can be erased without leaving any tra of the original chalk marks; it d not "load" or become smooth w use; in fact the properties of the por lain enamel surface are such tha improves with use — apparentl certain amount of chalk on the surf "conditions" the chalkboard. And, yond this, porcelain enameled cha boards are virtually without gl under any lighting.

A variety of sizes is available convenient wall hung models mak them ideal for use in the home, e in the kitchen; in the playroom the children; in conference room demonstration rooms; lecture room and a multiplicity of other areas. small addition to the versatility of board is its magnetic nature (it's s after all) which permits it to dou

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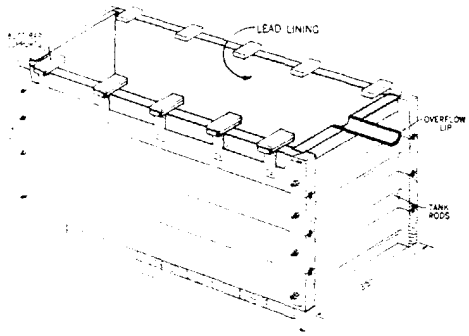
# Tanks for Cadmium Refining

Lead, for years important in the chemical industry because of its excellent resistance to many chemicals, has an important place in the electrolytic refining of a variety of metals including copper, zinc and manganese. An illustration of the use of lead in this industry is at Great Falls, Montana, where the Anaconda Co. electrolytically refines zinc and cadmium in process equipment lined with lead.




Principal dimensions and construction details of a lead-lined electrolytic cadmium tank.

Thousands of tons of lead sheet have been used to line the electrolysis tanks and associated recirculation and storage tanks, pipes for conveying the electrolyte, and as cast insoluble anodes. Lead is a natural choice for this application because of its excellent resistance to the corrosive electrolyte based on sulphuric acid.

As electrolysis takes place in open tanks 3 ft. 10 in. deep at ambient temperatures, pressure and temperature conditions are not severe and the simplest and least expensive method of lead construction, hanging sheet lead in wood and concrete tanks, is dictated.

An illustration of the lead lined wooden tanks presently in use in cadmium plant is shown in the accompanying drawing. Concrete tanks of the same type are used in the zinc plant. The cell is lined with 8-lb. chemical sheet lead which is obtained pre-cut in two sizes.

One sheet is 8 ft. 6 in. wide x 12 ft. 10 in. long and is used to line the sides and bottom of the cell. Two sheets 4 ft. 4 in. and 5 ft. 10 in. long are used to line the two ends of the cell. When in place, the seams between the three sections are welded (burned) with standard soft lead rod. Corners on the bottom and top of the cells are trimmed and filled in with pieces of sheet lead which are welded to form a tight liner for the cell.

In the electrolytic refining of certain metals, e.g., copper, the metal ion is introduced into the electrolyte from the anode. In cadmium and zinc refining, however, the practice is to add the metal ions to the electrolyte by leaching before charging into the electrolytic cells. The anode, therefore, has to be strongly resistant to the solvent action of the electrolysis.

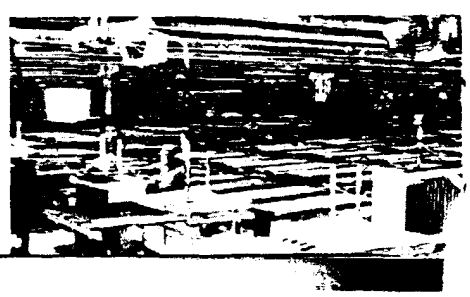
Although lead is an adequate anode material, its resistance to solution can be improved by adding 0.5 per cent silver. (This reduces the amount of lead which is carried over into the re- the electrolysis process.) In refining cadmium, the lead carry-over is less because of different operating characteristics and ordinary or silver-bearing lead may be used for anodes.

Although lead's corrosion resistance is renowned, it is not noted for its high mechanical strength. Consequently, the use of lead in the chemical industry as a material of construction has fostered development of special construction methods to support the lead. Homogeneous bonding and strapping methods have allowed the use of lead at temperatures and pressures far in excess of its own mechanical strength. The additional use of a special acid resistant brick lining which acts as a thermal barrier has allowed the use of lead in equipment whose reaction temperature is even higher than the melting point of lead.

The technology of lead construction has so extended the physical range practical for lead equipment that it is possible to lose sight of the virtues of the simple time-honored method of hanging lead sheet in wooden, concrete, or steel tanks. This construction method, competitive in cost to that for any lined tank, has given long years of service in extremely corrosive environments, in pickle tanks, storage tanks, and many other uses.

As always, cost of the tank is effectively lowered even further by the exceptionally high scrap value of lead — as high as three quarters of the original price — which is recoverable at the end of the life of the installation. The versatility and ease with which lead can be worked when designs are changed and linings repaired adds to the overall value of this mainstay of the chemical construction industry.

Part of Anaconda's cadmium area.




Architect's sketch of the American Airlines Passenger Terminal for Idlewild International Airport, designed by Kahn & Jacobs, Architects, Roy S. Bent, Associate. When completed, the building will have the world's largest stained glass window.

# Contemporary Architecture Returns to Sta

*"The more things*

A hint of grandeur to come — an interior view of the partially completed window.

At sprawling, futuristic Idlewild International Airport in New York, dozens of startling examples of contemporary architecture are springing up in a complex suggestive of a world's fair. Among these, the American Airlines Passenger Terminal has been cited as outstanding in blending traditional aestheticism and modern functionalism. The dominant feature of this building is a stained glass window used as facade and "sun break."

Executed in vivid colors, a non-objective design extends 317 feet across the upper level of the terminal. The window is 22½ feet high. During the day it will provide tempered daylighting for the interior: at night, interior lighting will make it a unique landmark. This window, designed by Robert Sowers, is the keynote of the building.

Unique in size — it is thought to be the world's largest—the American Airlines window is part of a trend making itself felt in hotels, termin and other public buildings just stained glass was the mark of cat drals, the public buildings of the century. Still, the long, low, functio lines of the airline building leave doubt that it was built to serve b 20th century people.

The stained glass window itself made up of 78 panel frames, e holding 12 units composed of seve pieces of stained glass held in pl with lead cames. The frame struct was welded from steel T-sections form the mullions and transoms. the steel was then wrapped with 2 lb. sheet lead and lead-burned al the seams to form a hermetic seal.

In glazing the windows, work shave the outer cames of each uni achieve a good fit and true up all lines of the design which run ac several lights. Then they place light in the frame so that it rests

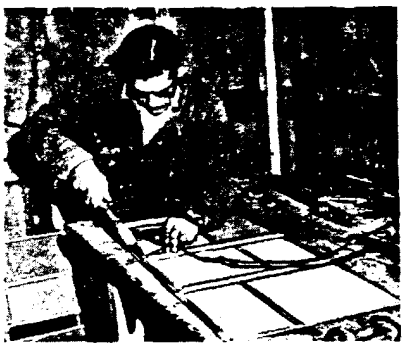
— Designed by Marius Plamondon

## Stained glass indoors, too . . .

. . . this time in traditional scenic depictations, form a striking 60 x 3-ft. mural in the *Les Voyageurs* cocktail lounge of the magnificent new Queen Elizabeth Hotel in Montreal. Fur traders and trappers of two centuries ago are shown against a pictorial map of the area.

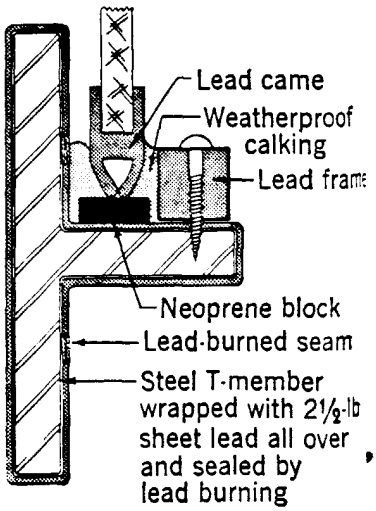
### Other Recent Stained Glass Uses

| | |
|---|---|
| Ringside Restaurant<br>Columbus, Ohio | Matched windows with the Democratic donkey and the Republican elephant |
| Hertz Hall (symphony hall)<br>University of California | 30 foot stained glass curtain wall with an abstract of musical instruments |
| Arcadia Bowling Court<br>Arcadia, California | Two walls of a cocktail lounge (750 sq. ft.) in gray and white harlequins |
| Canada House<br>New York City | 16 x 8-ft. stained glass mural in lobby shows Canadian history, sports, symbols |



Each unit is shaved to ensure an even fit and alignment of the design elements.

Lead covered steel saddle bars are sweated to the back of each uni port.




Section through transom and light sho lead wrapping for the steel, lead ca of the light, and the lead retaining fram

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small *neoprene* pads. A fitted lead retaining frame is secured with stainless steel screws to complete the structure.

When the installation of the lights is completed, the space between the structural frame, the retaining frame, and the lights themselves will be sealed with a weatherproof plastic calking.

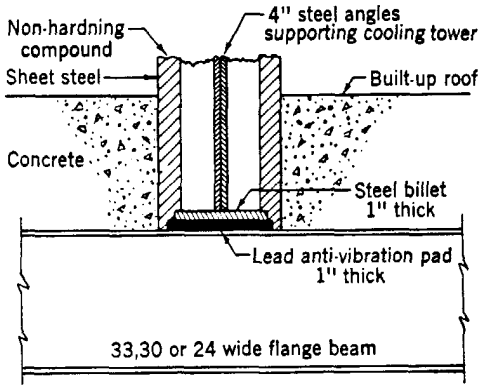
Each light draws its own structural strength from ½ x ½-in. lead coated steel saddle bars sweated and held vertically across the light along the vertical came seams. Panes of glass within the light are cemented into the H-section lead cames and rolled to form a weatherproof joint.

The finished window, thus, is weatherproof, rattle-free and resistant enough to withstand any "sonic booms" or other future vicissitudes.

The American Airlines Terminal is being built at a cost of $14 million. The architects, Kahn & Jacobs of New York, point out that while the window was not inexpensive, it has just about all its maintenance built in — it should serve for years without painting, calking, or any other attention. And they feel, it will be more immune to damage than any conventional windows in the area.

The wrapping and burning of 25 tons of lead onto structural steel, done by John F. Abernethy & Co. of Brooklyn, and the fabrication and glazing of 936 sections, (3½ tons of lead) by Rambusch Decorating Co., New York, went off without any of the "on the job" bugs usual in this sort of work, according to the contractor, Turner Construction Co. Though the building was not complete as LEAD went to press, the work was several weeks ahead of schedule and the window was complete. The terminal will be in service early next year.

# LEAD-ASBESTOS PADS Confine Vibration to Roof-Top Cooling Tower




Lead antivibration pads that have proved an effective barrier to vibration created by railroad trains, newspaper printing presses and commercial laundry equipment are now effectively damping the vibration created by commercial air conditioning equipment.

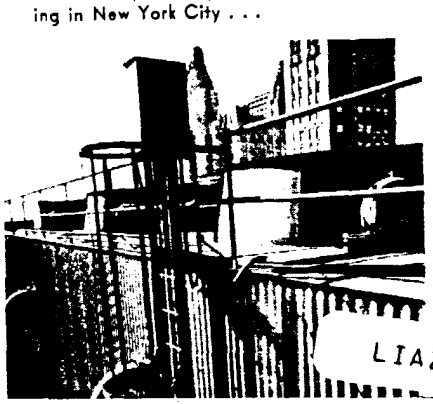
One of the first installations was made on the roof of the new 35-story air conditioned office building at 575 Lexington Avenue, New York City. The cooling tower — wet weight of 205,000 lb. — is supported on 10 steel angle columns resting on the building's own structural girders. Between the base of the cooling tower's supporting columns and the structural steel are steel billets distributing the load over lead-asbestos antivibration pads (see accompanying drawing).

The cooling tower's corner posts are on pads 8 in. x 8 in., and the remaining columns on pads 8 in. x 14 in. The ten pads provide an antivibration bearing surface of 928 sq. in. for the 205,000 lb. cooling tower, or about 220 lb. per sq. in. Weinberger, Frieman, Leichtman & Quinn, New York City, were the consulting engineers who specified the lead asbestos antivibration pads (supplied by the John F. Abernethy Co., Brooklyn, N. Y.) and Sylvan Bien & Robert L. Bien, New York City, were the architects. Sam Minskoff & Sons, Inc., also New York City, are the owner-builders.

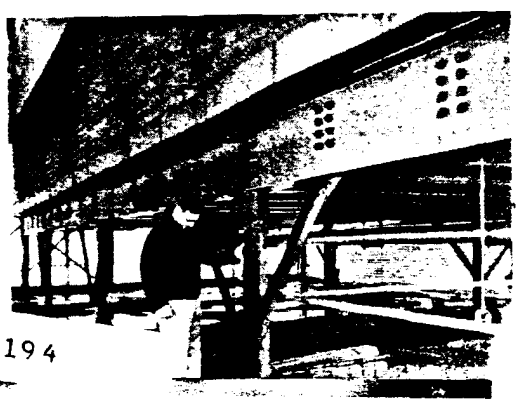
The engineers reported that the method of construction used for the supports for the cooling tower saved considerable time and expense in that they could be placed in position while the steel work was in progress rather than waiting for the concrete to be poured and then placing the footings.

The cooling tower is equipped with three 60 H.P., 1800 RPM motors, with spiral bevel gears driving a 12-bladed adjustable pitch fan at 202 RPM, plus a water pump of 6,000 gal. per min. capacity. As revealed by a check this past summer, the vibration created by this equipment while operating at peak load was effectively damped by the lead-asbestos antivibration pads.

The roof-top cooling tower of a new building in New York City . . .




. . . is mounted on lead pads to isolate vibration from the building. Pads foot directly on beams.



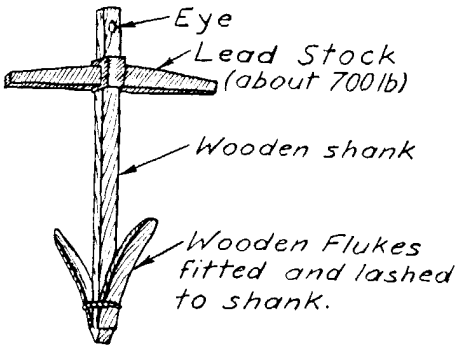
# Seawater Immersion Test Completed

# — 2000 YEARS LATER

— Courtesy Submarine Research Institute
303 W. 42 St., NYC. 36

This remarkable photo was taken by the Laboratoire Rebikoff, Cannes, France, as the lead stock of a Roman galley's anchor was raised in 30 feet of water off the famed Cote d'Azur. Weighing nearly 700 pounds, the stock is excellently preserved despite a 2000 year exposure to seawater. Under its coating of mud and slime the metal is solid and unpitted. Note the sharpness of edges and the smooth surfaces.

Though restricted in their engineering materials, the Romans came up with an ingenious anchor design using a central shank of wood with wooden flukes fitted and lashed to it (sketch at right). Quite a heavy stock was required to initially lay the anchor with its flukes in a vertical plane so that one would dig in when the hawser was put under tension. So heavy was this stock, in fact, that Rebikoff's expedition had to buoy it with air bags before it could be raised.




# THE *Lead* LIBRARY
## *of Technical Information*

**The following articles and reprints contain information, drawings and specifications on the use of lead products helpful to architects, engineers and others interested. They are available free of charge except where otherwise indicated, upon request to the LEAD INDUSTRIES ASSOCIATION, 60 East 42nd STREET, NEW YORK 17, N. Y.**

**THE MATERIALS YOU BUY — LEAD**
Descriptive information about lead from mine to finished products. Reprinted from "New York Purchasing Review," January, 1959.

**USE LEAD TO CONTROL CORROSION**
Latest practices in lead construction for the petroleum refining industry are described. How to avoid the difficulties sometimes experienced with lead-lined equipment. Reprinted from "Petroleum Refiner," April, 1958.

**BEST DESIGNS FOR LEAD INSTALLATIONS**
A special report on the applications of lead and lead alloys in the chemical and metallurgical industries. Recommended practice for joining lead sheets, and the construction of wood stave tanks, launders, towers and flues where lead is involved are included. Reprinted from "Chemical Engineering," March, April and May, 1956.

**RADIATION PROTECTION**
The place of lead in shielding against radiation in X-ray and atomic energy applications. Principles of lead shielding construction. Reprinted from "Lead In Modern Industry."

**LEAD WORK FOR MODERN PLUMBING**
**$1.50 Postpaid, $1.00 per copy in quantities of 10 or more**
Profusely illustrated with over 140 photographs and drawings, the textbook presents clearly to the plumbing student the necessary tools, procedures and the methods required for lead work.

**LEAD IN MODERN INDUSTRY**
**$1.00 Postpaid**
A fully illustrated 230 page, cloth bound book describing all phases of the production and use of lead, lead alloys and lead compounds.

**LEAD BUILDING CONSTRUCTION BULLETIN NO. 1**
Specifications for Lead Waste Connections for Plumbing Fixtures with Integral Traps (Water Closets — Pedestal Urinals — Service Sinks).

**LEAD-ACID BRICK CONSTRUCTION**
Reviews use of lead-acid brick for corrosive, abrasive, and hot chemicals. Installation techniques and case histories supplement cost and corrosion data. Reprinted from "Corrosion," Feb. 1959.

**FEDERAL SPECIFICATION WW-P325**
**For Pipe, Bends and Traps: Lead**
Dimensions and weights of lead products used in the plumbing and water works fields are given. Published by the Government Printing Office.

**LEAD GUTTERS RUN WATER OFF DUKE'S BACK**
A description of the installation of hard lead gutters on a new dormitory at Duke University. Reprinted from "American Artisan," October, 1958.

**FLASHING WITH HARD LEAD**
A complete "How-to-do-it" article on the use of hard lead in roofing and flashing. Reprinted from "American Roofer & Siding Contractor," December, 1958.

**RED LEAD TECHNICAL LETTERS**
**No. 12** Seven formulations and schedules for painting highway structural steel.
**No. 13** L.I.A. Formula 9-2. A single Red Lead Primer for Rusted, Weathered or New Galvanized Steel.
**No. 14** Describes the formulation of red lead-coumarone primer for seawater immersion — ship hulls, fixed marine installations.

**FEDERAL SPECIFICATION FOR PAINT: RED-LEAD-BASE, READY-MIXED TT-P-86a**
Covers four types of red-lead-base paints including two fast drying formulations. Many intended applications listed.

**N. Y. TRANSIT AUTHORITY PAINTS**
Evaluates experiences and best formulations found by the New York Transit Authority for maintaining subways, elevateds. Reprinted from "Mass Transportation," March 1959.

### NEW LITERATURE

**MATERIALS of CONSTRUCTION REVIEWS**
Lead and lead alloys in design and construction research, engineering and technological applications. With bibliography, 1959, 1958, 1957 and 1956 reviews (editions are not cumulative) are available. Reprinted from "Industrial and Engineering Chemistry," September, 1959, 1958, 1957 and 1956.

**LEAD-ASBESTOS PAD FOR VIBRATION**
Gives specification, drawings, and reviews recent applications of lead-asbestos anti-vibration pads for buildings.

**CORROSION DATA — LEAD & ALLOYS**
Chart form presentation of the corrosion resistance of lead and its alloys to 188 common chemical materials over the normal temperature range. Reprinted from "Chemical Engineering," February 1953.

**BETTER LEAD TANK LININGS**
Sketch and description of an improved method for lining wooden tanks with sheet lead. Reprinted from "Chemical Engineering," September 1959.

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