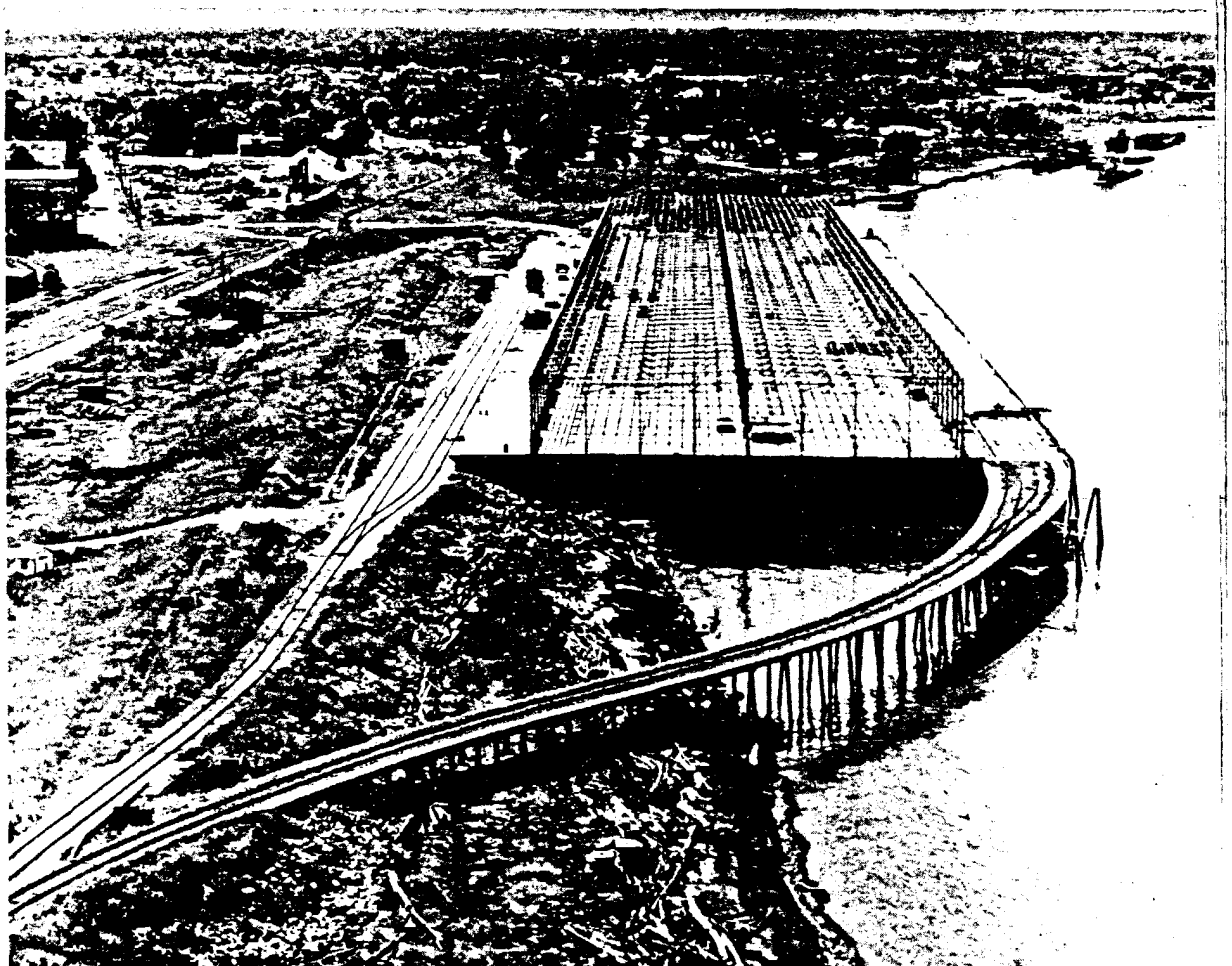
Lead

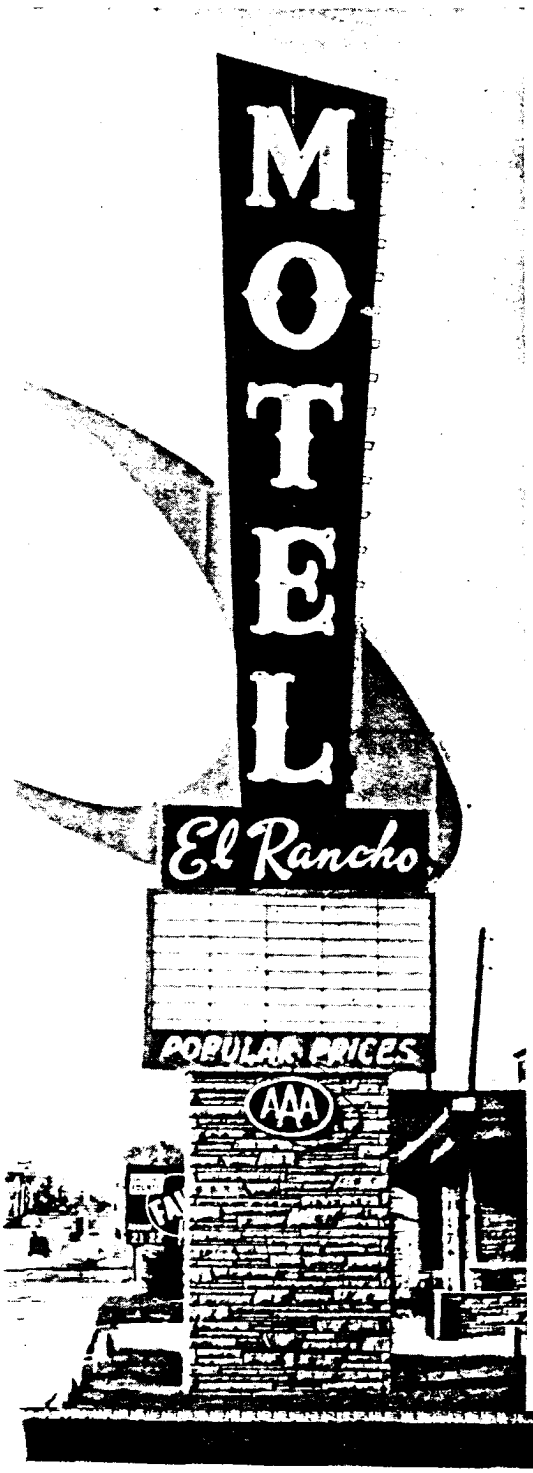
VOLUME TWENTY-THREE 1959 NUMBER TWO



This deepwater wharf and shed, one of eight new port structures, is part of the 8.5 million square foot expansion of port facilities now nearing completion at New Orleans. Most of the steel structure of the new wharves, sheds, and warehouses is protected against corrosion by red lead paints. See story on page 7.

INDUSTRIES ASSOCIATION
NEW YORK N. Y.
N 1088

THE SIGNS POINT TO LEA... ON ALUMINUM...



The advent and development of lead-bearing low-temperature enamels has opened new horizons in the lifetime surface finishing field. The Marveon Company of Ogden, Utah, used these enamels in the manufacture of porcelain enameled aluminum and aluminized steel signs, electrical sign faces and structural products some of which are shown in the accompanying illustrations. A full range of colors is available, and Marveon has been able to produce most any of the textures and degrees of matte or gloss finishes now popular in enamels fired at higher temperatures. The finished signs have the advantages of lifetime beauty that can only be obtained with a vitreous porcelain enamel finish.

The use of porcelain enameled aluminum offers two main advantages over other porcelain enameled products, i.e. light weight and the ease with which it can be fabricated after enameling. The light weight of porcelain enameled aluminum results in considerable savings where shipping is required. Due to the fact that aluminum enamels are ground finer than those employed on steel, thinner coats are adequate to give desired opaqueness or thickness of finish. Thus, the enamel coat is so thin that the finished panel can be sawed, cut, sheared, drilled or punched with little or no exposure of the base metal. The advantages of porcelain enameled aluminum over organic or paint finishes are obvious — porcelain enameled aluminum is a true vitreous finish and consequently is harder, has higher abrasion and scratch resistance and superior weathering resistance providing a surface with long life at the very lowest maintenance cost.

The availability of aluminum enamels has greatly simplified the art of porcelain enameling products which lend themselves to flat or extruded surfaces. Metal preparation for the pure aluminum involves only cleaning and pre-firing to remove grease, oil and finger marks prior to the application of the lead-bearing enamels. According to D. Sawyer, General Manager of Marveon, "from a porcelain enameler's and sign manufacturer's viewpoint . . . this new product has given us many advantages over anything before known in the enameling of sign and structural products."

The use of aluminum enamels on aluminized steel creates another useful product which although not so light as aluminum, has other advantages. Inasmuch as the product is processed at around 1000° F., which is well below the transformation point of steel, aluminized steel can be enameled without creating pillowing or other objectionable distortions commonly suffered in the high temperature processes. In fact, structural panels emerge from the furnace almost as flat as when they enter. The lack of distortion at 1000° F. and over makes it possible to process 24 gauge aluminized steel and aluminum successfully and the Marveon Company now uses and recommends that weight for sign faces. This in itself is a boon to the electrical sign industry as heretofore it has been necessary to use 18 gauge and heavier stock for sign faces due to the distortion hazards in higher temperature enameling processes. Marveon, in addition to manufacturing porcelain enameled aluminum and aluminized steel products, has produced for its own use an economical furnace. They have made this furnace available to other sign companies and enamelers with proven success in many parts of the country.

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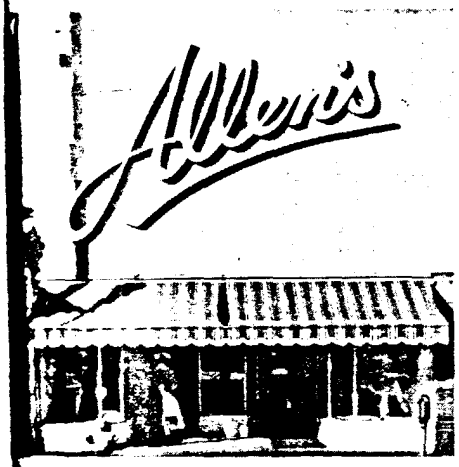
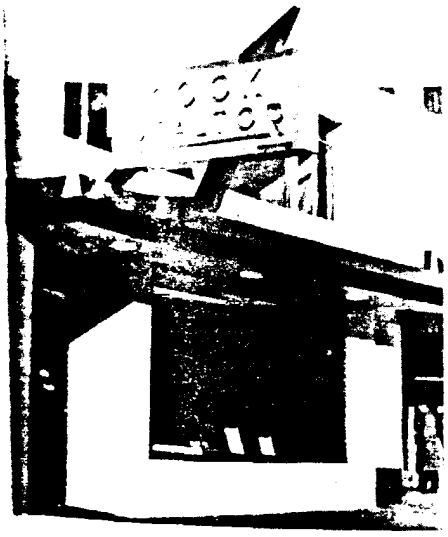
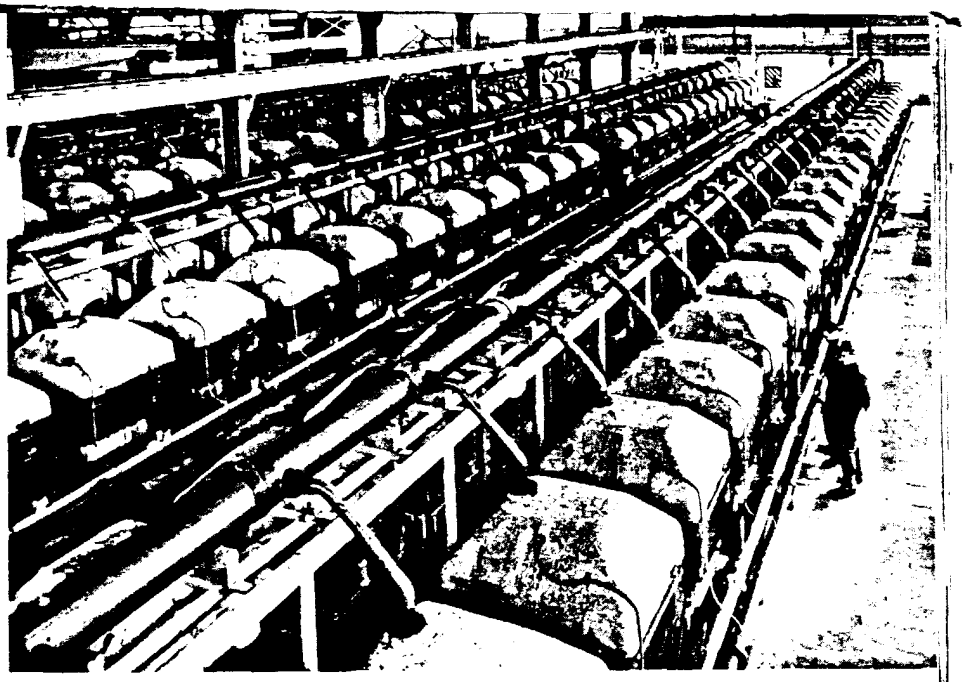
LEARING ENAMELS
NURANELS



Aluminum enamels normally contain 30 to 50 per cent lead oxide. The properties that the enamel must have in order to bond successfully to aluminum alloys are high coefficient of expansion, high chemical resistance and low maturing temperature. Lead is an important flux imparting workability to the enamels and providing a relatively wide firing range at the required low maturing temperatures.





Hooker Electrolytic Cells

Practically all of the caustic soda and chlorine manufactured in the United States is made by the electrolysis of sodium chloride brine. Hooker type diaphragm cells, developed by Hooker Chemical Corporation, Niagara Falls, N. Y. account for over 35 per cent of this production. This margin of popularity is attributed to the high efficiency of the Hooker cell combined with its over-all simplicity of design.

As is apparent from the sketch (next page), the Hooker cell is roughly cubical in shape and consists of three major sections. The bottom section contains graphite blades cast in a lead matrix which is set in a concrete shell for support, electrical insulation and containment of the electrolyte. The center section or cathode consists of a steel shell supporting wire mesh fingers which project into the center of the cell between the rows of graphite blades. An asbestos diaphragm deposited on the fingers prevents interaction of the chlorine gas formed on the graphite anode surface, and the caustic soda formed within the cathode fingers. The concrete top section confines the electrolytic reaction and provides a means for removing the chlorine cell gas. Concentrated brine is fed into the cell continuously and the cell products, weak caustic, chlorine and hydrogen, are removed continuously. Hooker cells are operated in series circuits comprised of 25 to as many as 100 or 200 cells.

At the extremely high currents used in electrolytic cells, often in the order of 25,000 to 30,000 amperes, even a small voltage drop which does not contribute energy to the cell reaction represents wasted power and increased operating costs. Thus the method of securing the graphite anode blades and conducting high currents to them is very important in order to preclude appreciable power losses. In the Hooker cell a very unique and efficient coupling between the graphite blades and copper conductors of the anode section of the cell has been provided by the use of lead. During the construction of the cell anode, the graphite blades are held in their proper relative positions by a jig. The jig assembly is lowered into a cast iron mold containing previously positioned copper conductors. Molten lead is permitted to flow around the graphite and over the copper conductors to a depth of about 2½ in. After cooling.

LIA26174

Source-Detector unit on top mounted telescoping bracket for gaging cold rolled steel. Courtesy U. S. Steel.

Lead Helps Beta Gage Make Precise Measurements

Cost and quality factors of industrial processes can, in many ways be phenomenally improved by continuous measurement and control of the intermediate and finished product. One of the most effective ways of making these measurements is by instrumentation based on the radiations from radioactive substances. The material to be measured is placed in a radiation field from a radioactive source. The effect that this material has on the radiation field is then detected and amplified electrically. Radioactive sources have permitted instruments to be designed of great accuracy, lower cost and with improved reliability. These latter instruments will also perform measurements which were not possible with x-rays, such as beta radiation measurement of coating thicknesses of one material on another.

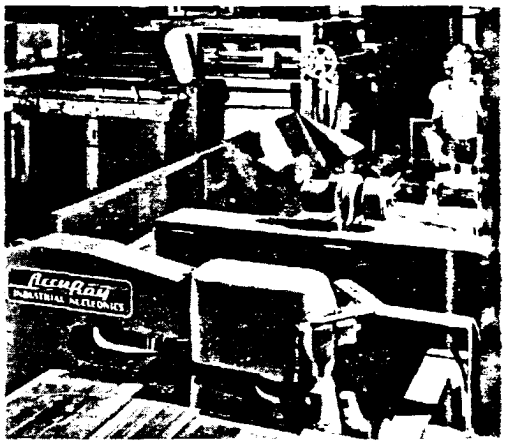
Instruments based on these principles have been intensively developed by Industrial Nucleonics Corporation, of Columbus, Ohio, during its relatively short eight year history. Instruments are now installed on a wide variety of processes, including the following:

MEASUREMENT OF:

Weight of tin coating on steel
Weight of zinc coating on steel
Basis weight of paper
Weight of coating on paper
Per cent impregnation of resin in paper
Thickness of plastic film
Weight of dough in crackers
Density of mud in well drilling
Slurry consistency
Weight of tobacco in cigarettes, etc.
Weight of rubber in tires
Density of hydrocarbons
Uniformity of textiles

Lead is used in almost all of these designs in three ways.

1. It is used as a shielding material. Supported lead sections have been very effective in reducing the intensity of stray radiation on the external sur-

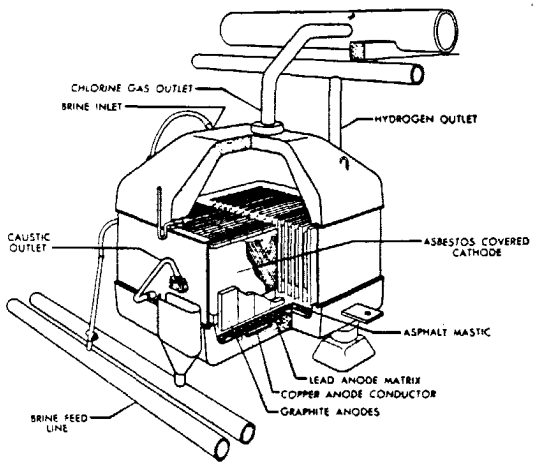


Radiation Gage on steel sheet reclassifying li

Hooker

(continued from preceding page)

Cutaway of the Hooker caustic-chlorine cell shows lead matrix at base holding and making electrical contact with graphite anodes.



the jig and mold are removed and the cast assembly placed in the concrete bottom shell. All exposed lead is covered with a coating of asphalt mastic. The electrical conductivity of the resulting lead-copper matrix is such that the voltage drop at the high amperages mentioned previously result in very nominal losses measured in hundredths of a volt. The quality of the lead plays an important role in obtaining the necessary dimensional stability and an efficient graphite-lead joint. For this reason, chemical lead containing less than 1 per cent antimony is requisite.

The use of lead affords another very important advantage. Since the matrix material is not used up in the cell reaction and represents an appreciable monetary investment, it is important that a material be used which is easily recoverable. With lead this is very simple. The spent anode is removed from the concrete shell and the matrix placed in a furnace where most of the 2,500 lb. of lead used in each cell is recovered.

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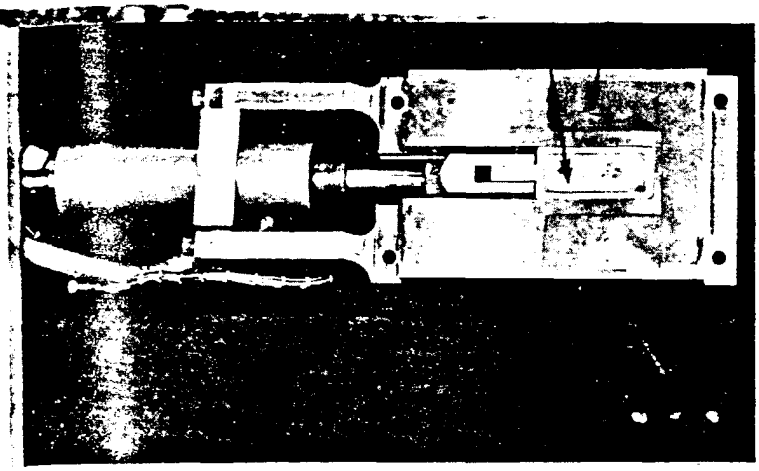
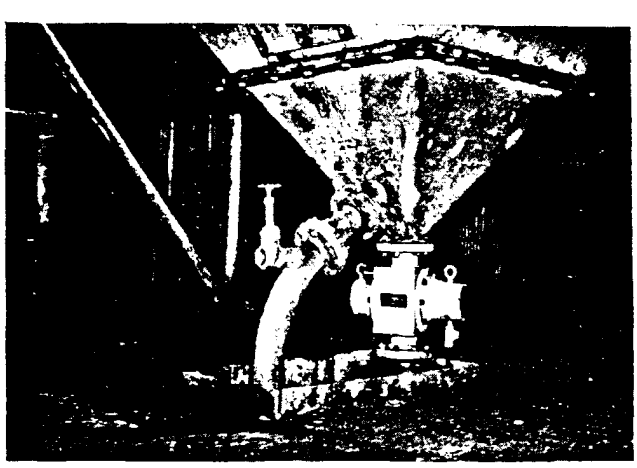


Source shutter assembly showing lead filled sections (arrows.)



Density Cell applied to coal separation. Courtesy Clinchfield Coal Co.

faces of the radiation source housings of these measuring devices. These generally take the form of a steel shell into which is poured the necessary amount of lead. Assemblies of this type are widely used in radiation shutter devices which cut off external radiation when desired. By such means, external radiation fields are kept well below the minimums prescribed for safety in routine industrial plant use of radiation devices.

2. Lead is also used as a radiation beam collimator. Narrowing the beam of radiation within selected areas not only reduces external scattered radiation, but also makes possible efficient operation of the gaging equipment.

3. A further unusual use of lead in gaging equipment employing radioactive materials which emit beta radiation (i.e. electrons) is its use as a "target" in generating a secondary type of radiation. In an x-ray tube, the radiation is generated by the sudden deceleration of the electrons which had been emitted from the filament of the tube and accelerated across the space toward the anode by an externally applied high voltage. In a source of radiation emitting beta particles, both the electron source and the accelerating force are already present. The addition of a "target" which the electrons are permitted to strike will result in the generation of a type of x-radiation. This technique has been widely used in the measurement of thick steel sections in vigorous competition with x-ray technology. Lead is a commonly used target material in this technique.

A particularly promising field of application of radioisotope gaging techniques is the petroleum, chemical and petrochemical fields. Here there are many instances of fluids flowing unseen through pipes of relatively thick wall section. The radioisotope has permitted development of instruments which will continuously monitor the density, slurry consistency, and to some extent, the chemical composition of these fluids at various points in the piping systems. These instruments employ considerable quantities of lead because the radiation energies selected result in radiations of considerable penetrating power.

As the techniques of employing radioisotopes are developed further, it seems certain that lead will continue to expand its role as a partner in atomic progress.

From Small Homes to Luxury Hotel: Lead is First Choice

The homes of the Carey Carnation Development in Aurora, Colo. are medium priced single-family ranch types. Lead fixture connections and waste lines were used here as they were in . . .

LEAD Plumbing for new building projects continues to be the first choice of architects, engineering consultants and others concerned with sound planning and well-built dwellings. Two of the most recent examples of this are widely separated building projects: a new luxury hotel in Florida and a housing development in suburban Denver.

The 44 one-family ranch homes of the Carey Carnation development in Aurora, Colo., a few miles east of Denver, were all equipped with lead traps and waste pipes installed by the Louis Cook Plumbing Company of Denver

. . . Jacksonville's new 550-room luxury hotel, the Robert Meyer. The new hotel also uses lead pans under showers.

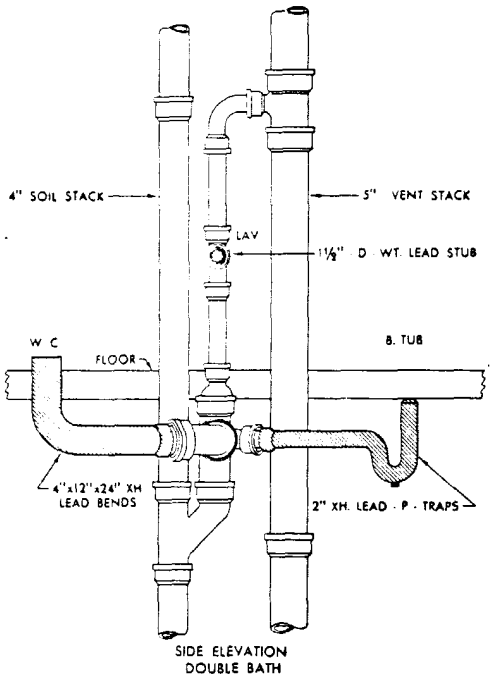
LIA26176

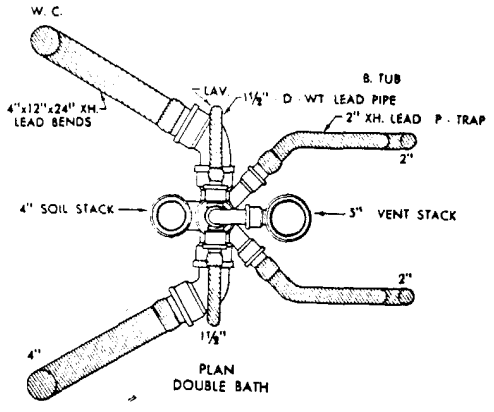
to the specifications of architect Robert Huston, Denver, Colo.

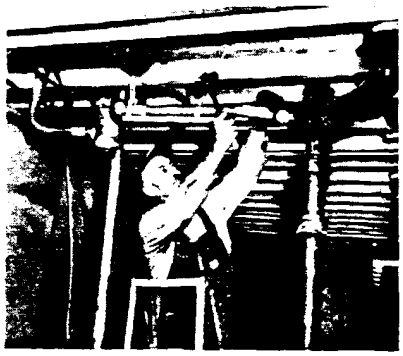
In Jacksonville, Florida, the new 550-room Robert Meyer Hotel is also using lead pipe for fixture waste connections. The Henley and Beckwith Co., Inc., Jacksonville, plumbing contractor for the hotel construction, has followed specifications laid down by architect William B. Tabler and engineering consultants Slocum and Fuller, both of New York, in installing lead bends and stubs for 550 water closets, lead wastes for the same number of lavatories, and lead P-traps and waste lines for 504 bathtubs.

In addition, the new hotel uses lead waste pipe for its twenty drinking fountains, 22 urinals, and eight pans of 6 lb. sheet lead under shower baths in the building. Asphaltum is used between the pans and the fresh concrete to protect the lead from the alkaline reaction of the green concrete. After six months to two years the concrete is completely cured and aged and the lead no longer requires any such protection.

Plan and elevation of a typical two-bathroom (back to back) waste system in Jacksonville's new Robert Meyer Hotel. Lavatory drain is 1½" D-wt. lead pipe, bathtub P-trap is 2" XH lead, and 4 x 12 x 24" XH lead bends connect to the water closets. (Lead pipe and connections shown shaded.)







Caulking the final joint in a bathtub waste line of 1½" lead pipe in one of the Carey homes in Denver's new housing development. An inverted drum trap was used in these lines.

The reasons that flexible lead piping is so widely accepted in all types of building construction and in all localities of the United States are many. First, the flexibility of the lead connections: This flexibility permits adjustment of slight inaccuracies in construction and allows for settling or subsequent adjustments without setting up stresses in the piping. Second, lead's extreme durability: Under normal service conditions it cannot rust or corrode. Finally, lead pipe connections meet or surpass building code requirements.

Lead Controls Vi

The "White Noise Room" of Minneapolis-Honeywell Regulator Co.'s Inertial Guidance Center at St. Petersburg, Fla., affords an example of lead's utility in controlling vibration and noise. White noise is so named because it contains several frequencies of the noise spectrum, just as white light is a blend of several frequencies of the light spectrum. Research investigation of the effects of vibration on the drift rate of gyros and accelerometers required the specially designed facility in which 25 tons of lead were employed as a damping mass. The vibration excited in this room can generate any frequency from two to 2,000 cycles per second, or prescribed mixtures of any or all frequencies within this range. Also it is possible to take a tape recording of the actual vibrations produced by a missile or space ship, insert this tape in the compensation console which drives the vibration exciter and duplicate the actual vibrations or mechanical noise encountered.

When such vibrations are generated, they are confined to the test area by the lead mass which acts to dissipate the energy. The 592 lead slabs, which are each about a foot square and one inch thick, are carried on a cradle which is balanced on a knife edge so that it may swing free on a composite aluminum beam.

Lead has a number of advantages in this installation. It is heavy and an excellent internal damping material, its anelastic behavior closely approximating classic viscoelasticity. The high specific gravity of lead permitted design of the mass within the height limitations imposed by the distance between the floor level and ground line. Lead's contribution to a low structural center of gravity also minimized the effect of force couples, spurious vibrations, etc., induced by vibrating equipment mounted on the assembly. Lead is nonferromagnetic. Magnetic field disturbances could adversely affect the conduct of other work in the area.

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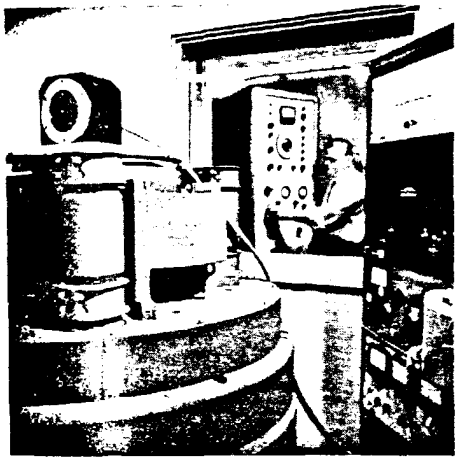
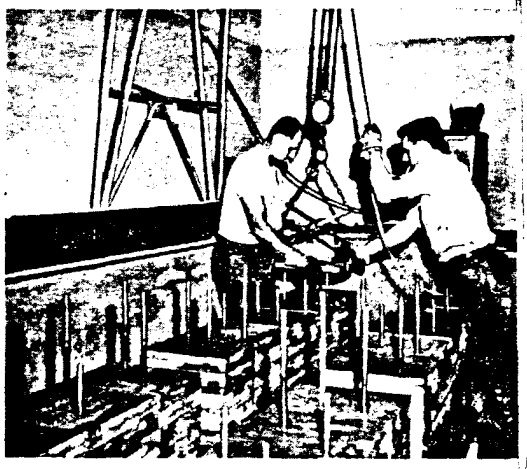
·ols Vi ation in Inertial Guidance Laboratory

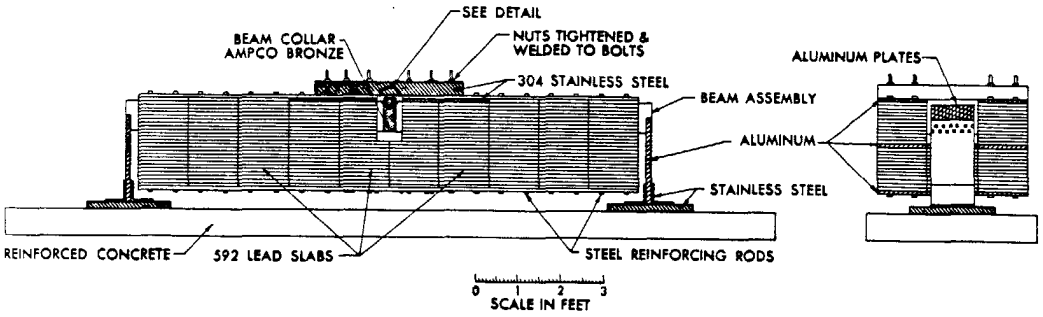


Vibration equipment mounted on 25-ton lead mass is ready for use in testing a new Honeywell inertial guidance gyroscope. Test engineer views completed setup through thick-glass triple-pane window from room wall of electronic control and monitoring equipment.

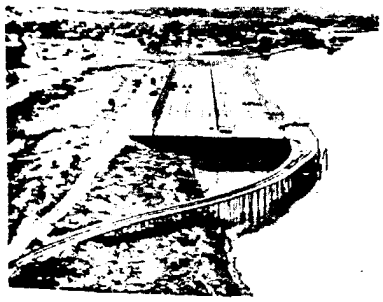
Lamellar lead construction contributes self-support. This effect is laid to the frictional "interlayer" forces which act to give uniform load distribution and flexure strength and "mechanical" internal damping. The mass was also kept within practical handling limits by bolted slab construction, and the slabs themselves permitted necessary static balancing, their locale determined by the position of the steel support rods and accommodating holes in the numbered and weighed units.



Workmen assembling the 25-ton lead mass in Minneapolis-Honeywell's white noise room. The lead slabs, individually balanced, are approximately a foot square, an inch thick, and weigh 75 lb. each.



THE COVER PICTURE



Steel structural members above and below deck level are protected with red lead primer. This aerial photo shows the Perry Street wharf during construction.

The NEW New Orleans Port —Red Lead Protected

For almost two-and-a-half centuries New Orleans has been a major port for ships from all nations of the world. Today, alongside the historic sites and traditional Old World flavor of the city there is springing up a bustling complex of new port facilities—among them no less than eight new wharf and warehouse structures built or now under construction. In contrast to the wooden wharfs of a century past, these new structures are modern, durable steel supported buildings. And to keep them in first-class condition, red lead paints are being used on both internal and external structural members.

The need for expanded dock and warehouse facilities in New Orleans is a product of the general industrial boom in the area. Existing facilities

(continued on next page)

LIA26178

have allowed the port to handle more than 4000 sailings a year, berth 200 deep water ships at once along its 13 miles of existing dock, and ship and receive $2 billion worth of commodities a year. New Orleans now ranks first among U. S. ports in importing sugar, molasses, and burlap, and first in exporting corn, cotton, soy beans, and wheat flour. But since 1950, heavy industry has been building manufacturing plants at a rate of a million dollars per working day and the port is enlarging its facilities to also handle the growing flood of chemicals, aluminum, building materials and petroleum products in production and to be produced in these new plants.

First of the new facilities to be completed, four new wharves were erected in 1957. Four more were started the same year, among them the $4 million Perry Street public general cargo wharf. Its location is on the west bank of the Mississippi just 1,000 feet upstream from the new Mississippi River bridge.

Together, these new wharves will provide more than a mile of dockage and will represent an investment of about $14,000,000.

With such a large investment at stake, the Engineering Department of the Port of New Orleans sought the best type of protection for their 8.5 million square feet of wharf and shed area. Steel structural members are used not only for interior framing of the wharf sheds, but wharf deck supports. Pilings and other exterior portions of the facilities are of steel or steel and concrete.

Except for a few limited and specific applications, a single red lead primer has been used throughout this construction. This paint is a 100 per cent red lead in a linseed oil vehicle and conforms to Federal Specification TT-P-86a, Type I. This primer is generally recommended for use on bridges, docks, and other steel structures. Suitable for priming in the shop or field and for intermediate field coats, it provides good resistance to atmospheric corrosion and high moisture conditions — particularly under coastal conditions. The high linseed oil content of the vehicle aids in wetting the metal surface and obtaining an intimate bond despite limited amounts of surface corrosion which cannot be removed before painting. Red lead in an alkyd vehicle is also being used in the construction. It conforms to Federal Specification TT-P-86a, Type III.

For much of the painting below the wharf deck, steel pilings, and for other locations of severe exposure, two coats of red lead (one is a shop coat) have been followed by two coats of a finish paint. For interior use, the schedule calls for two coats of red lead and a single finish coat.

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.

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

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.

INSPECTING LEAD LININGS
Latest methods of testing and inspecting sheet lead and bonded lead linings used in the chemical process industries are described. Reprinted from "Chemical Engineering," November, 1956.

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.

PORTABLE RADIATION-SHIELDING MATERIALS
A special report on commercially available shielding forms that can be used to build readily assembled, hand stacked shielding walls. Prepared by the editors of "Nucleonics," May, 1955.

LEAD WORK FOR MODERN PLUMBING
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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
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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
Specification for Lead Waste Connections for Plumbing Fixtures with Integral Traps (Water Closets—Pedestal Urinals —Service Sinks).

FEDERAL SPECIFICATION WW-P-325
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 WELDING
An informative as well as practical guide to lead welding. Reprinted from the "Welding Handbook, Third Edition" published by the American Welding Society.

LEAD FOR MODERN PLUMBING
Preferred installation method for lead pipe and fittings in the plumbing systems of today's industrial and residential structures. Detailed drawings are included. Reprinted from "Sweet's Catalog," 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.

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.

NEW LITERATURE

LEAD BRICK FOR ACID HANDLING
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.

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

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.

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