BATTERIES
score a clean sweep

Floor machine or money machine? The Du Pont power spray system cleans and polishes floors, but it found $84,000 at an electronic plant.

Did you ever find a dime lying near your feet? In the past year the maintenance supervisor of a large West Coast electronics firm found $84,000 on the floors of his company's labs and offices. It wasn't in dimes—it was in savings on what had been a $170,000 annual floor cleaning and polishing bill.

Central feature of the floor maintenance system that saved the $84,000 is a floor machine equipped with a power spray unit which dispenses specially prepared cleaning and polishing solutions, then does the muscle work of putting them to use. Both line-powered and battery-powered versions are available. The battery type is powered by two 12-volt industrial batteries and it rolls easily on non-marking rubber tires and despite the husky torque it develops at the 19-inch rotary brush, it doesn't wrestle with the operator as conventional floor machines do.

Top view clearly shows the absence of a power cord.

Batteries ideal for job

Battery power has fitted ideally into the design of the machine. In the first place it frees the machine from power cords while it is running. This means that the operator is untethered and can cover his ground without hindrance in the order which is fastest for him. In the second place, the whole unit is silent, foolproof, and powerful. A single battery charge easily does all the work required in a typical eight-hour shift.

The use of a novel combination cleaner and polymer finishing material developed by Du Pont is the trick that makes possible the huge savings piled up by the system.

Conventional floor care calls for sweeping up dirt and solid debris, spreading a cleaning solution, scrubbing, rinsing, and drying. At this point the repair coating can be applied and buffed. With the new floor care solution—Power Spray Cleaner and Finish—the operator simply pours it into the dispenser, pressurizes it with a propellent capsule, and taps a button that sprays a fine mist on the worn spot. He passes the machine over the area two or three times. Then, using a clean pad, he buffs the floor to a scuff-resistant gloss.

The machine, the power spray attachment and cleaner-polish are products of E. I. du Pont de Nemours and Company (Inc.), Wilmington 98, Del.

Power for an eight-hour shift is stored in these 12-volt leod-acid batteries.

General view of batten layout with work progressing on roof sheets in foreground. Note hard copper cleats on battens.

For those cold, Canadian winters—

General view of Metal Working Shop adioining main laboratory and office unit.

LEAD LABORATORY ROOF

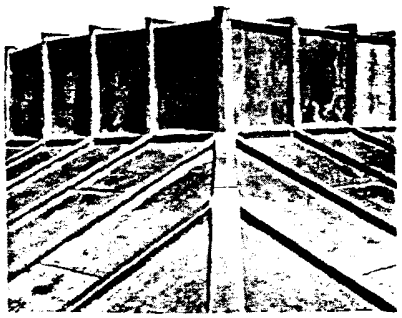
Where would a company find a better place for applied research on building materials than its own laboratory. And where, at the same time, would it find a better showcase illustrating the utilitarian suitability of these materials. In the case of the Consolidated Mining and Smelting Company of Canada (Cominco) the laboratory is its new Product Research Center in the Sheridan Park Research Community near Toronto. The basic materials are lead and zinc and, among the more than 200 applications of these metals demonstrated by example is the most prominent: a lead roof on the Metal Working Shop.

This is a material whose "applied research" dates back a thousand years or so but whose usefulness for waterproofing, sound and vibration insulation, corrosion resistance and decorative uses has expanded with each age to keep it in the forefront in the development of new and better uses for building materials. A 3 pound hard lead sheet provides a durable, low maintenance covering for the roof of the Metal Working Shop. Cominco, in collaboration with their architects: Shore & Moffat and Partners of Toronto chose a batten seam type of roof because it is easier to install and generally better than standing seams. Battens impart rigidity and provide better means for movement of the metal sheets.

Three-pound hard lead is the preferred material for roofing of this sort. It is an alloy containing a small amount of antimony and it has ample strength and durability for all usual roofing constructions. Since it is only approximately 3/64 of an inch thick it is quite easy to work. Unlike other metal roofing, lead shows no tendency to "spring back" when bent.

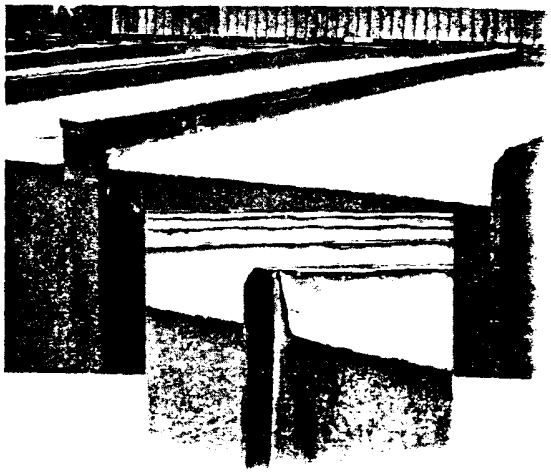
The roof substrate is precast insulating concrete to which nominal 2" x 2" wood battens are bolted about 16 inches on centers. In the other direction, at right angles to the slope of the roof, sheets are limited to about four feet lengths by flat seams which in turn are staggered on either side of battens. The problem of housing certain exhaust and intake mechanisms necessitated vertical bulkheads housing an exhaust plenum along the roof ridge. The vertical lead panels resulting from this construction were easily supported by the battens placed vertically and were another reason for their choice. Finally a contribution to the overall design concept of the roof results from the pleasing continuity afforded by the run of batten from gutter line to top of plenum.

Detail photographs illustrate clearly the use of batten caps folded onto roofing sheets brought to either side of continuous wood battens and secured by 16 ounce copper cleats nailed to battens on about 24 inch centers and folded into the seam. A total of 12 tons of 3 pound hard lead sheet was used by Heather and Little, Toronto, who were roofing contractors handling the installation.



Detail of plenum housing showing batten system used to fasten 3 lb. hard lead roofing.

Closeup of intersecting battens before placement of cap sheets. Inset shows wrap around of cap sheet at intersection of vertical with horizontal batten.



BARGAINS Battery and POWER

Order being filled with electronically controlled truck. Note control box carried by operator at waist. Truck can be maneuvered from any reasonable distance.

"*Food Is A Bargain*", motto of the industry, is certainly subscribed to by The Fleming Company, Topeka, Kansas. Operating in eight south central states, the company distributes more than 5000 items through six modern food distribution centers to more than 900 retailers.

In the spaciousness of the mid-continent area, Fleming is utilizing one-floor operations and their flow plan for receiving, stocking, and shipping products is smooth and uninterrupted. Long lines of freight cars roll into the distribution center, are unloaded, and contents palletized. Then by tugger and lift, walkie and rider, the myriad of items are stacked or racked to await the order picker. A roving supervisor untangles knots and gets action on rush orders by means of a battery scooter. He seems to be everywhere.

Reminiscent of super-marketing housewives, but motorized, the order pickers wind their way up and down the aisles, choosing a package here, a carton there, checking their lists as they go. Some ride, controlling manually, stepping on and off; others walk along guiding remotely by electronics.

"The flexibility and versatility of the wide range of models available in battery powered trucks is a very significant factor in keeping our costs down," says Don Block, Fleming Manager of Warehousing and Trucking. "Whether our customer needs a trailer load, or only a dozen items, having the right handling equipment at the right place at the right time means dollars saved for the ultimate consumer."

Frozen products being stacked in sub-zero (minus 10° F) room. This truck has been operating full shifts in this room for more than eight years.

Look Ahead with Lead

Walkie and Rider being used to unload freight car at receiving dock. Van (right) is loaded at shipping dock. Note various size orders standing on skids awaiting loading.

LIA26391

The sign read, "COOPERATIVE HUNTING AREA"—and that spells good hunting for these two sportsmen.

A PLACE TO HUNT*

"One step . . . two . . . suddenly, a foot from the dog's nose, a woodcock bounced into the air. My gun came up, and when the muzzle blotted out its target I pulled the trigger. The quiet morning air was shattered, and I saw the timberdoodle fold and plummet to the ground as Babe bounded in to make the retrieve. We had been hunting just five minutes.

"'I like this,' I told Bill, shoving a load of No. 8 shot into the lower chamber.

"'You and a lot of other people,' he replied. 'But you haven't seen anything yet. We've still got 6999 acres to go.'"

Conservation worker checks to make sure this hunter has his special one-day pass which limits the number of hunters on the tract.

The quote is from Ted Janes' article in *Outdoor Life*. The place is the 7000 acre hunting cooperative in Dutchess County, N. Y., just 85 miles from Manhattan. The idea is to provide good hunting to hard-pressed metropolitan residents under the New York State Fish and Wildlife Management Act of 1958.

Under this act, three such cooperatives have been set up. In addition to the 7000 acres at Dutchess there is a 4400-acre tract in Long Island's Suffolk County and an 11,000-acre co-op in Putnam County just north of Brewster.

In all three of these areas, state conservation people have worked with the land owners' permission to improve the hunting prospects and police the hunters. Cooperating land owners are protected against vandalism and trespassing. for example, without the trouble and expense of fences, posting, or extra hired help.

The number of hunters in each area is regulated by permitting hunting only under a special one-day pass which can be had by any licensed hunter by simply depositing his license for the day. His return to pick up the license insures that he has not violated the bag limit.

The concentration of hunters throughout the tract is controlled by permitting hunting only in areas adjacent to marked parking areas. Each area accommodates a maximum of one, two, or three cars. The result has been the opening up of areas previously 90 to 100 per cent posted without introducing stocking or artificiality.

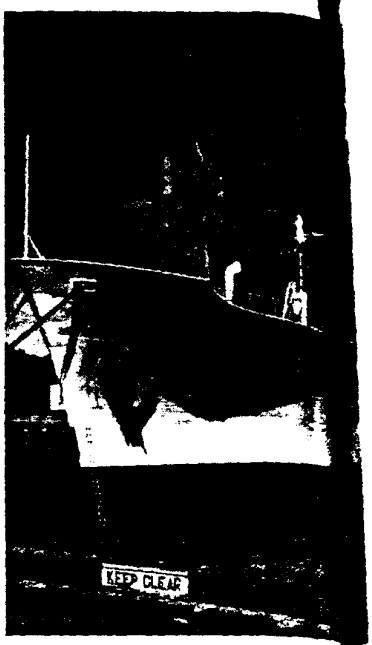
During the 1962 season 3641 hunters visited the Dutchess tract. Records at the Putnam County co-op, typical of the program to date, show that 7000 hunters used the tract in 1959, 3000 of them only once and the balance returning as many as 17 times. An average weekend at Dutchess finds 130 to 150 people getting back to nature and even on the average weekday 50 hunters range the 7000 acres.

Like the millions of Americans now flocking to public shooting ranges, these hunters are finding books and TV paltry substitutes for the wonder of being in the woods and the satisfaction of the real and tangible.

Babe brings back the bird.

* Condensed, by permission, from OUTDOOR LIFE, October 1964.

STOPPING SHIP HULL CORROSION

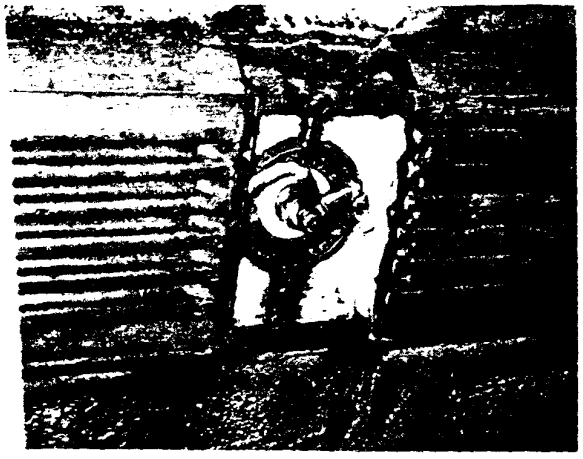


S.S. *Angelo Petri*, the first commercial vessel to be equipped with Lockheed Aircraft Service Company's lead-platinum anode corrosion system.

According to current estimates, the U. S. marine industry spends $185 million to repair damage caused by corrosion. One of the most advanced systems designed to prevent such damage has recently been installed on the modified tanker, *S.S. Angelo Petri*, owned by United Vintners, Inc.

Cost of this installation was under $10,000 according to the Marine Services Division of Lockheed Aircraft Service Company, Ontario, Calif., (a Division of Lockheed Aircraft Corp., Ontario, Calif.) who designed and produced the system. Marine engineers estimate the system will pay for itself within two years through elimination of normal corrosion repair costs.

Corrugated lead-platinum anodes installed on the hull exterior. The anodes are attached to the through-hull connector before encapsulation.



Key elements of the system are anodes constructed of lead with platinum inserts and a patented automatic control system that maintains the ship's hull and fittings at an electrical potential where corrosion does not occur.

The unusual anodes, constructed of lead containing platinum nails, are not sacrificed in the corrosion prevention process and therefore do not need replacing. In operation, a surface layer of lead dioxide quickly forms. This material is a very good electrical conductor and can operate at low electrical potentials because of the ease with which it can discharge oxygen and chlorine. This is partly due to the very large true surface area which the porous yet strong lead dioxide layer possesses.

In addition, should the face of the anode be damaged from scraping or gouging, the underlying lead is able to deform without fracture and the damaged lead dioxide layer will reform within a few hours. Accordingly, such a system is able to tolerate extremes of rough treatment without detriment or interruption of cathodic protection.

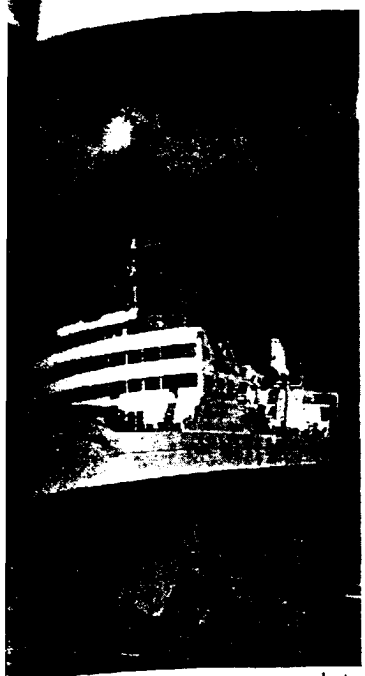
Anodes may be flush-mounted within a ship's hull or, as on the *Angelo Petri*, mounted in a very low profile configuration on the hull s face without impairing the sh hydrodynamic characteristics.

Generally, to obtain complete p tection, anodes have to be placed f and aft and midships. The latter not always essential on small shi On the Petri the 16 low profile anod (1.5-in. high) are mounted to t hull with the necessary electrical co nections made through a small h accommodating a through-hull gla assembly. This construction is said reduce the installation costs appre ably.

The control equipment of the Loc heed system consists of (1) sensi cells (silver/silver-chloride ele trode), (2) magnetic amplifiers, (3 saturable power reactors, (4) ste down power transformers and rec fier assemblies.

An important feature of the sy tem is the patented reference ele trode circuit which causes the si ver/silver-chloride cell to be auto matically rejuvenated. This mean that its potential, and therefore tha of the hull, is always maintained a an exact predetermined level. Ther are no moving parts; the entire con trol system is solid state. Once th system has been installed and set, n adjustments whatever are required.

As a result of the tremendous cur rent carrying capability at very low potentials (240 amp at 4 v) of the

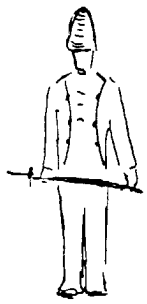


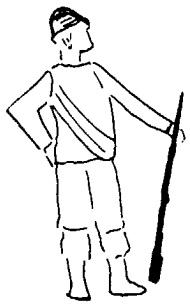
Food Processing photo

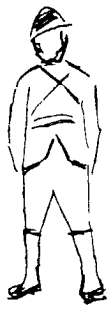
stem, it is possible to protect the ire wetted surface of the hull in- ding screw and rudder and re- ed areas. Even in the absence of int (particularly on the bottom of ips which are frequently grounded) mplete corrosion prevention is as- red.

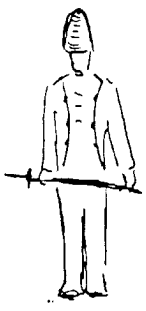
Although the installation aboard e *S.S. Angelo Petri* is the first on commercial vessel, the system has peatedly proved itself on naval ssels and a variety of shoreside in- allations such as dredges, lock gates, ran towers and docks, and similar ilities since 1961.

nufacturing the lead-platinum anodes. anode and its lead is being mounted in steel box which will fasten directly to the p hull.









New York Times photo

Grownups admit it too—

LEAD SOLDIERS ARE FUN

A recent article in the *New York Times* claims that "adults who once sheepishly collected lead soldiers, built backyard battlefields and played elaborate war games have been emerging from clandestiny in the New York suburbs."

Whatever the reason for the increasing boldness on the part of this underground movement, the fact remains that the appeal of lead soldiers has never been confined to small boys.

The hobby, as practiced by adults is necessarily much more sophisticated than the grade-school version. For example, it can be expensive. Each soldier must be a microscopically accurate replica of a historic uniformed figure, handpainted accurately down to epaulettes, braid and buttons.

There is a hierarchy among lead soldier makers too. For example, says the *Times*, a figure molded and painted by Stadden of London might be worth $90; the same mold painted by someone else might be worth as little as $10.

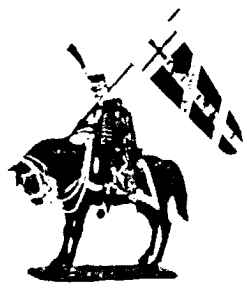
Contemporary collectors number their troops in the thousands and have miniature Romans, barbarians, Napoleonic troops, desert camel troops and commandos from World War II.

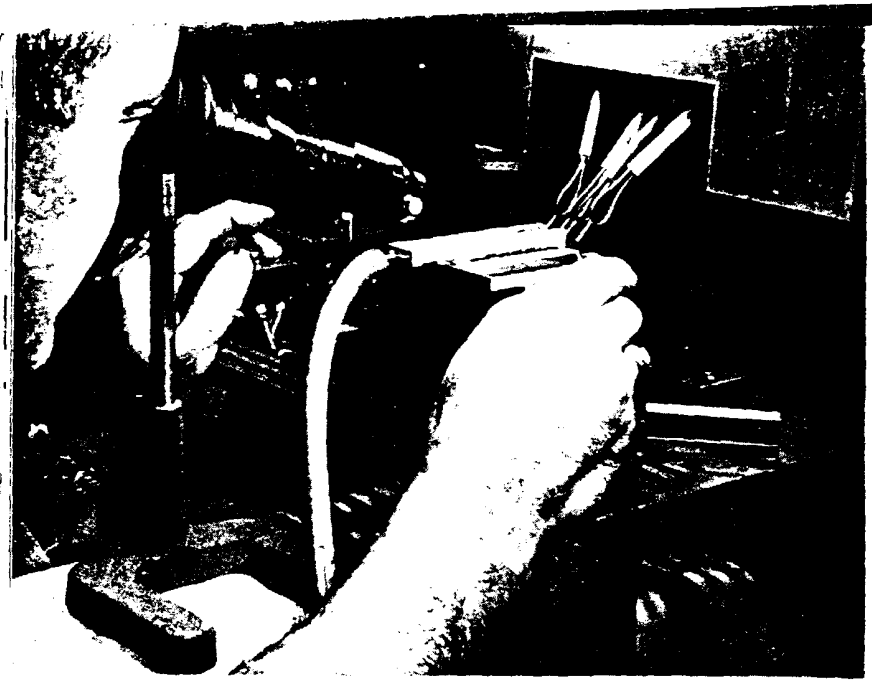
Antique soldiers are the undisputed aristocrats of the field. Some museum pieces date back as far as the 18th Century and bring $200 or more in auctions. Naturally, sets of these vintage warriors are highly prized and are virtually impossible to find.

When lead soldiers were first made, lead was the only inexpensive material that could be cast without losing fine detail and be reworked if necessary. And lead has remained the favorite with serious collectors of historically accurate replicas even though plastics seem to have captured the greasy kid stuff market.

The chief reasons for lead's domination in this hobby is its durability and adaptability. Skilled hobbiests will carve, solder, paint and otherwise alter a relatively common molded figure into a likeness of another soldier, often with a completely different uniform. For a description of this process, see LEAD, Vol. 26 No. 1, 1962.

There is apparently no end to the variety of military games that can be played with the two-inch high troopers. Elaborate reenactment of historical battles is one approach. Such games, with complex ground rules, can last for several days and there is no guarantee that the miniature battle will end like its historic prototype.





Four jets of hot gas (700°F) enable operator to complete 250 eighty-joint microelectronic packages per day. Thickness of the solder coating preplated on the boards is 0.003 in. An indication of how small the jets are can be gained from the fact that little more than 1 cu. ft. of gas passes through each orifice per hour.

20,000 JOINTS PER DAY WITH A NEW VEST-POCKET SOLDERING PROCESS

Ask any military electronics contractor. Integrated microcircuits are revolutionizing the military electronics business. These tiny silicon wafers are the equivalent of diodes, transistors, capacitors and resistors—all wrapped in the molecular structure of one device.

The revolution has come in the form of reducing the size and weight of complex electronic gadgets. An example is a new radio-navigation receiver produced by the Sperry Gyroscope Company of Great Neck, N. Y. The receiver is 20% its former size —and three times more reliable than sets using conventional circuitry.

But, while these wafers represent a great advance, their tiny size has created monumental problems in joining them to the sub-assembly cards that make up the guts of electronic "black boxes." Depending upon end use, as many as 100 of these wafers must be attached to a sub-assembly card; and thousands of cards might then be needed for one device. To do the soldering by hand would prove so costly as to be out of the question.

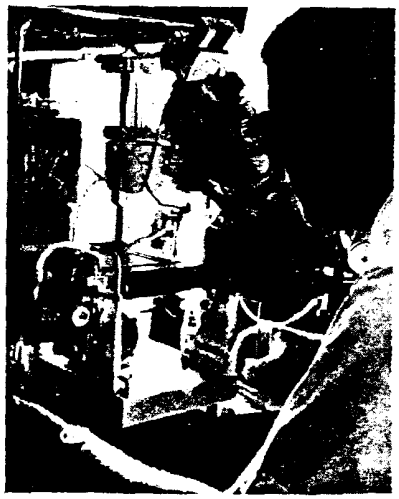
Now the job can be done at 1/100th the cost of hand assembly! Engineers at the Sperry Gyroscope Company have developed a hot gas soldering unit that automatically solders 20,000 joints per day—and they believe it can be easily scaled up to 500,000 joints per day.

The versatility of lead alloy solder is the key to this highly reliable yet economical development. As adaptable to automated assembly as it is to hand joining, solder is today as modern an adhesive as the material it joins. For example, rather than lay solder down on the leads of each microcircuit, Sperry *plates* the solder onto the sub-assembly cards in a presoldering operation. Next, the operator places a network of microcircuits on a sub-assembly card which is moved at a uniform rate under a jet of hydrogen gas hot enough to melt the solder without damaging the card or the microcircuits. Hydrogen is used for several reasons, the most important being its high thermal conductivity—which means that much of the heat gets into the solder where it's wanted.

Of course, the use of gas is ingenious because it allows the operator to visually inspect each joint *as it is being made*. It also eliminates the possibility of passing flux contaminants from joint to joint. An additional plus in using hydrogen is that each joint is enveloped in a non-oxidizing atmosphere during formation. This assures good bond and electrical conductivity.

Sperry has predicted that development of this machine will speed the day when integrated microcircuits will replace transistors much as transistors have replaced the vacuum tube in commercial applications.

Pilot study of automatic microcircuit soldering was done on this commercially available machine at Sperry Gyroscope Company recently. Besides being fast, Sperry claims the process is ideal for high-reliability equipment. Soldering with this technique demands no special skills.



Only lead can do it!

Feeding cable into duct while workman on the right applies lubricant.

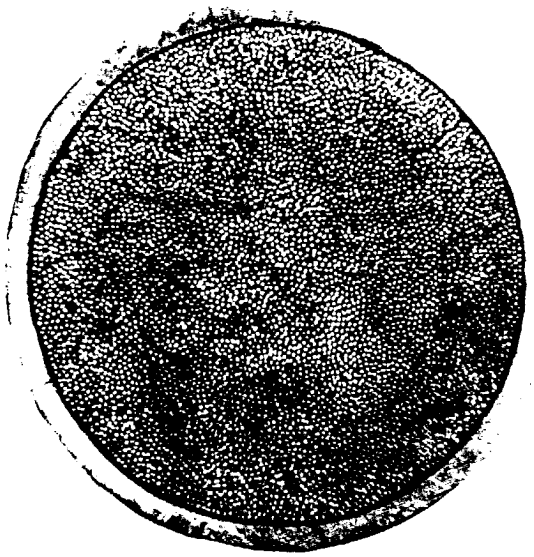
3,000 Phone Calls In a 3-Inch Cable

The world's largest lead sheathed telephone cable is being installed in North Ridgeville, Ohio. This cable, 2400 ft. long, uses a lead sheath to crowd 6,060 conductors into a minimum overall diameter. These are more conductors than are used in any other lead sheathed cable.

According to Harmon Gay, chief engineer, Mid-Continent Telephone System: "We used lead sheathed cable on the job because of its unquestioned reliability, and also, because of the small diameter of the existing conduit. No other sheath material would permit 3,030 pairs of wires to be contained within a 3-inch diameter cable. This diameter was essential if we were to use existing conduit that is four inches inside."

Completion of the cable project will enable the Elyria Telephone Company, a Mid-Continent affiliate, to offer simultaneous private service to 3,000 additional subscribers.

Previously a relatively rural territory, the area (near Cleveland) has been growing in population. Requests for private line telephones rather than party-line service have been increasing, stated a telephone company spokesman.



Cross section of the 3030-pair cable. These are more conductors than are used in any other lead-sheathed cable.

6,060,000 Feet

According to Anaconda Wire & Cable Co., suppliers of the cable, the cable contains 6,060,000 feet of copper conductor concentrated in each 1000 feet. This adds up to over 4800 lb. of copper per thousand feet; with lead and insulation, total weight is increased to nearly 11,000 lb.

The cable's internal design consists of 30 individual paper-wrapped compartmentized sections each of which contains 101 pairs of conductors. The number of conductors in each section and the manner in which the sections are patterned are determined by the type, size and function of the cable. The cable conductors are insulated with an overall wrapping of paper then sheathed in a 125 mil thick lead sheath.

The cable is being supplied in lengths ranging from 160 to 810 ft., designed to fit the various distances between connecting manholes along its route.

SOMETHING DIFFERENT | in leaded porcelain enamel

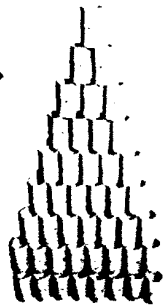
"Best in Queens Borough for 1963" said the *New York Times* . . . and, because the bright yellow wall panels (inset) are made of leaded porcelain enameled aluminum it'll be equally good in 1973. Color uniformity and durability are prime features that distinguish this inorganic finish from all others. More than 12,000 sq. ft. of porcelain enameled aluminum sheets were used in construction of the Social Sciences Building and Lecture Hall at Queens College of the City University of N. Y.

Porcelain enameling of aluminum is nothing new to Porce-Len, Incorporated of Hamden, Connecticut. "Over the past 10 years several million square feet of porcelain enameled panels and extrusions have gone through our furnaces" says Mr. Robert Goodman, executive vice president at Porce-Len. But it is not too often that a really new and different application comes along to fully challenge the versatility and workability of the medium—here are a few that did. All were done at Porce-Len, Inc. and all have been highly successful in use.

Panels of leaded porcelain on aluminum were created to perfectly match glazed brick used in another part of the same building at Queens College. An unusual dip coating process (it's generally sprayed) was utilized in making a solar screen, and embossed sheet was used in another job, all adding up to something different.

Elliptical airfoils (upper right), in two shades of stippled gray leaded porcelain on aluminum form an attractive sun louver for Hamot Hospital, Erie, Pennsylvania. About 10 feet long, the foils were installed in frames by Construction Specialties of Cranford, New Jersey. Nearly 15,000 square feet of leaded porcelain enamel was permanently fused to these aluminum shapes without serious warpage.

Solar Screen . . . lightweight, attractive and durable. Over 25,000 porcelain enameled aluminum cylinders 5 inches long and 3 inches in diameter were riveted together to make up an unusual sun canopy for the cafeteria of a building in Heightstown, New Jersey. An attractive blue-green in color, the riveted canisters were framed and installed by McKeon, Incorporated, Glass and Curtainwall contractors of Philadelphia.



Congregation B'Nai Jacob, Woodbridge, Connecticut. Over 5,000 square feet of porcelain enameled light green embossed aluminum sheet was used in this job by Architect Fritz Nathan.

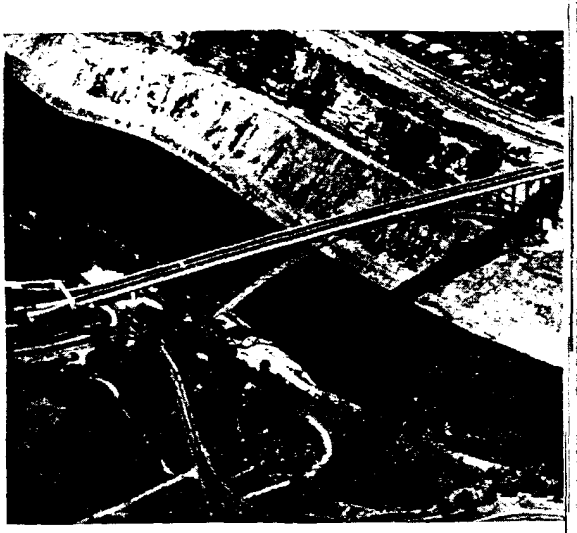
Interesting Odds 'N' Ends about Lead

A small lead coffin found in an excavation in London has been judged to contain the remains of Anne, Dutchess of York, child bride of Richard, one of the doomed "Princes in the Tower". The wedding of Anne, age four and one half and Richard, age

five, so delighted King Edward IV that he created the order of Knights of the Bath. Anne died mysteriously in 1481 at the age of eight. Her remains, along with a linen wrap, were well preserved by the sealed lead coffin.

Looking for a glass lined pipe process? If so, Templet Industries, Inc., 201 East Bethpage Road, Plainview, N. Y. is looking for you. Templet recently acquired the rights to license United States manufacturers for a new process for making impact resistant glass lined metal pipe. The new process consists of inserting a thin glass tube in a metallic pipe using a lead borosilicate binder to unite the glass tube with the metal sleeve. The resulting arrangement is claimed by its Japanese inventors to produce a relatively stress-free glass coating for use in the chemical and allied industries. Couplings may be made by welding or the use of stainless steel fittings. Elbow bends of any angle are made using a portable heater. No cracks or flaws are said to appear in the newly formed section.

Big Bridge Quiz . . . survey shows red lead at the bottom of things. Considerable detective work was necessary, but the results were most gratifying —out of six owners responding to our inquiry on the primer used on new bridges in the American Institute of Steel Construction Prize Bridge Competition, all six used red lead primers. Shown here is one of the six, the *Long Span Prize Bridge* for 1963, the Lewiston-Queenston Bridge, over the Niagara River between Lewiston, New York and Queenston, Ontario. The owner is the Niagara Falls Bridge Commission, and the fabricator was Bethlehem Steel Company. Painting specifications called for two coats of red lead-



iron oxide primer meeting Steel Structures Painting Council Paint Specification #2.

Thirty Years Ago

A white lead undercoat was an essential preparatory step in gilding the large bronze statues in New York's recently completed Rockefeller Center according to an article in a 1934 issue of LEAD. Reasons for the coat: lead provides a better bond for the leaf and the paint serves to fill irregularities in the surface and make a neater finished job. The paint also provides a protective coating to prevent the base metal from weathering and discoloring the statue at any thin spots in the gold leaf.

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lead

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