NEW MARKETS . . . NEW OPPORTUNITIES FOR LEAD

On the surface, it may seem strange that the lead industry, which for the last several years has been enjoying a reassuring period of increased consumption, should be seeking additional markets. Yet, that's exactly what's happening. And the search is likely to result in new opportunities for marketing of lead.

The reason for the current stepped-up market development activities stems from lead's heavy dependence on a single market—the automotive industry. In this prime sales area, lead is being phased out of gasoline in the United States. As a result, the lead industry must seek new markets for the lead formerly used in antiknock additives. There is also the need to create new markets for the lead used in automobile storage batteries as new competitive storage battery systems emerge. In the U.S., antiknock additives required 194,000 short tons and storage batteries 960,000 short tons out of a grand total of 1,547,000 short tons of lead consumed in 1978.

The logical way for the lead industry to overcome its present market dependence on gasoline-powered automobiles is to develop new uses and markets for batteries. A most promising new application for batteries is to power what many people believe to be the next generation of vehicles—electric cars. The lead industry and the federal government have committed millions of dollars for research and development of improved lead batteries to power electric vehicles and hybrid vehicles, the latter powered by batteries and another power source. Many thousands of these vehicles are expected to be in use on the nation's streets and highways in the next five years.

The lead industry also is taking a hard look at other battery markets that might be expanded. One such market is in the electric utility industry where opportunities exist for large numbers of batteries for load-leveling purposes.

Another exciting area which should provide a potential growth market for lead batteries is the solar electric energy industry. As this industry grows there could be a large-scale need for lead batteries to store solar generated electric power in remote locations and eventually for use in homes and commercial establishments.

Last, but not least, lead with its superb sound-barrier characteristics, should find wider use in reducing noise pollution.

While the problem of the heavy dependence on the automotive market should not be underestimated, recent activities by the lead industry show that it is determined to solve its problems by finding new and expanded outlets for this important, strategic metal.

W. T. Meyer

W. T. Meyer
President
Lead Industries Association, Inc.

Acoustical curtains come down on noise

Gates Learjet Corporation has installed lead impregnated curtains at its Wichita, Kansas plant to muffle the noise from riveting operations. The company was concerned about the effect of high noise levels from splice plate riveting on jet aircraft assembly personnel at the plant.

The area of concern centered on the manufacturing location where aircraft wing sections are assembled. The production sequence in which splice plates join wing sections through pneumatic riveting operations creates noise levels ranging from 118 to 122 dBA.

Noise levels generated within the machine shop and wing final assembly areas were less than 80 dBA (time weighted average). However, the higher noise levels produced by the splice plate operations overlapped into these areas.

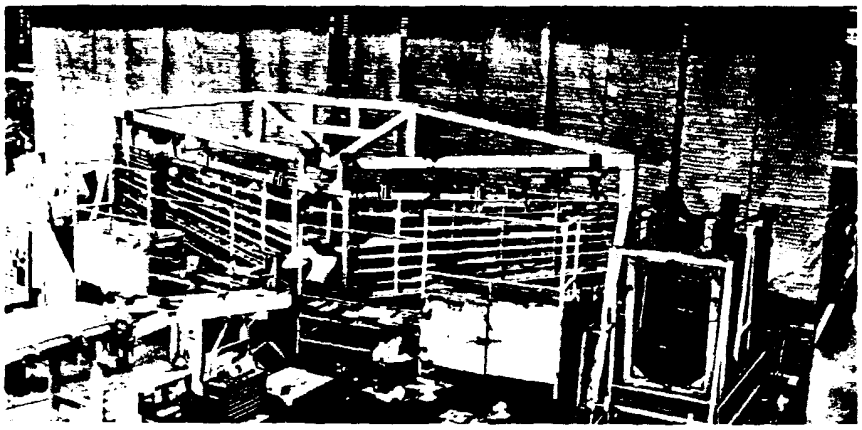
Frank Gagne, Jr., supervisor, Safety & Industrial Hygiene, at Gates Learjet, said high noise levels created morale and fatigue conditions which reduced effectiveness of workers in the adjacent areas. Although personal protective equipment (P.P.E.) was being used by these employees. Federal Safety Regulations require engineering controls be exhausted before P.P.E. can be utilized for compliance purposes.

Because noise containment and vibration dampening are essentially the only engineering controls available for pneumatic riveting operations, the company chose to install Quil/Teez® acoustically-insulated panels around the wing shop area. These panels, manufactured by Noise Control Associates, Inc., Montclair, N.J., combined lead and fiberglass enveloped in an aluminized glass cloth to act simultaneously as a noise barrier and a noise absorber—the fiberglass absorbs noise energy while the lead septum acts as a transmission barrier.

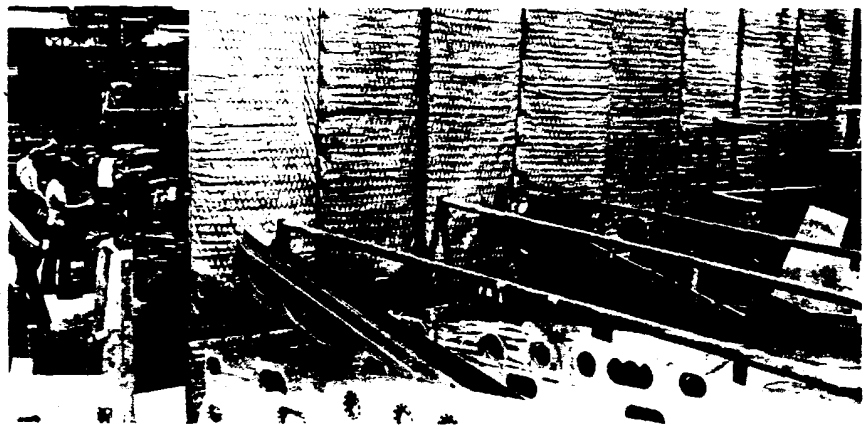
A pair of 20-foot x 30-foot Quil/Teez curtains were hung on reinforced grommets and bolted to an overhead track. One particular section of the wing was selected for the evaluation of the curtain's effectiveness to insure that constant sound pressure levels were being surveyed.

Readings were taken using a sound level meter and graphic level recorder. The meter was positioned in the machine shop (12 feet from the noise source) and readings were taken—first with the curtains open and then with the curtains closed. The reductions achieved through the use of the noise attenuating/absorbing curtains was 10-12 dBA.

According to Frank Gagne, the installation of the acoustical curtains "has improved employee morale, eliminated the need for hearing protection in adjacent areas, and, hopefully, will increase production, reduce fatigue and errors in the machine shop and wing final assembly areas." He points out: "Lead is an excellent choice for noise attenuation for problems similar to ours." He also adds that bags filled with lead shot or sand and used as vibration dampening devices can help to obtain as much as a 7 dBA reduction in sound pressure levels in certain operations.



Wing Shop Area. With leaded acoustical curtains closed, workers in the adjacent areas of the wing final assembly and the machine shop are protected from extremely high noise levels from pneumatic riveters used in this location.



Acoustical lead barrier curtains protect workers in the machine shop (left) from high noise levels.

Splice plates being riveted. Acoustical curtain in background prevents high noise levels from overlapping into the machine shop and wing final assembly areas.

Battery-powered industrial trucks prove out under extreme material handling conditions

A random tour of industrial plants throughout the United States would reveal an increasing dependence on lead battery-powered trucks to handle large daily volumes of material and/or heavy loads. Electrics are performing these tasks as efficiently and reliably as their engine-powered counterparts, while providing energy and maintenance savings and quiet, fume-free operation in the process.

The fume-free aspect of battery-powered trucks, as well as their quieter operation, have boosted employee morale at the Weatherhead Co.'s Columbia City, Ind. plant. The switch to an all-electric lift truck fleet was made a number of years ago to help improve plant conditions.

According to a company spokesman, the decision to convert to electrics was a simple one. "We felt that battery-powered trucks could do the same jobs as other types and at the same time make a significant contribution to our plant environment in terms of reduced emissions and noise."

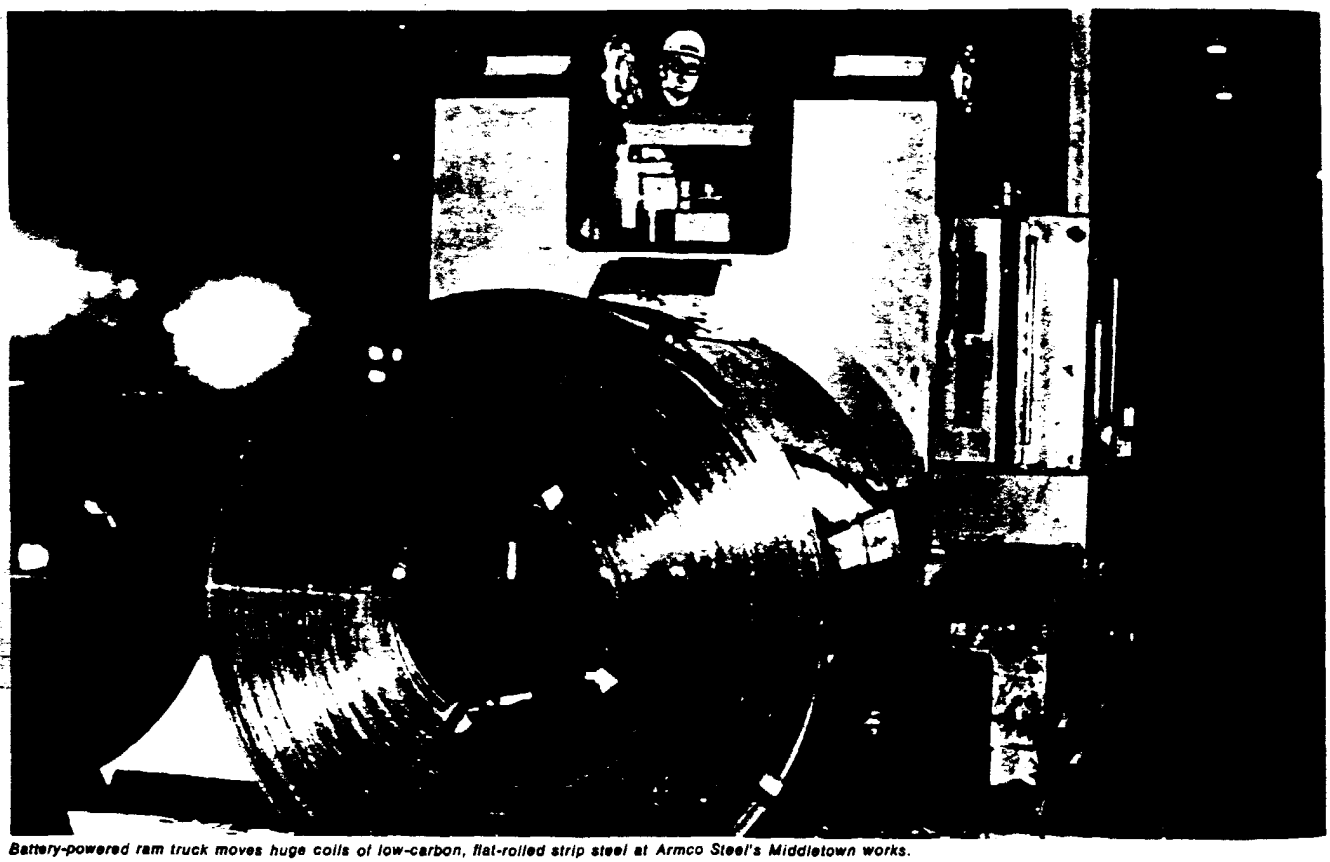
Weatherhead, which manufactures hydraulic components, processes a million pounds of steel and almost a million pounds of brass each month. The material arrives in long bars which are handled by overhead cranes. After the bars have been cut, electric fork lifts take over the material handling operations throughout the plant.

At Armco Steel Corp.'s Middletown, Ohio works, approximately 190,000 tons of strip steel are produced in an average month. Production of this size requires the use of material handling equipment capable of moving large loads dependably. One part of the material handling process incorporates electric ram trucks for moving coils of low-carbon, flat-rolled strip steel for automotive use.

The largest truck uses a single ram to lift coils from the temper mill conveyor and carry them to shipping, shearing or rewind lines. The 60-in. ram can be lowered to 14-in. above the floor for picking up scrap coils, or raised to 100-in. for handling full 75,000-lb. coils.

Armco has used lift trucks in this department for over 30 years and has found that battery-powered trucks meet its requirements for pollution-free operation, easy changeover and charging of batteries and sufficient lifting capacity. During peak activity, the trucks can be expected to run for 20 eight-hour shifts per week.

At Niles, Mich., Western Electric's Materials Management Center handles an average of 1.5 million pounds of telephone supplies every day. Prominently



Battery-powered ram truck moves huge coils of low-carbon, flat-rolled strip steel at Armco Steel's Middletown works.

involved in the efficient movement of all this material are 22 electric fork lift trucks.

The 600,000 sq. ft. facility supplies four A.T.&T. operating companies. A variety of automated, semi-automated and manually controlled equipment moves the supplies in and out of high-density storage racks and bins. But from the receiving doors to the storage input areas and from storage out put to shipping, the 2,750-lb. capacity fork lifts handle the job. The trucks work a full 18-hour day and Western Electric reports that they are maneuverable, dependable and productive.

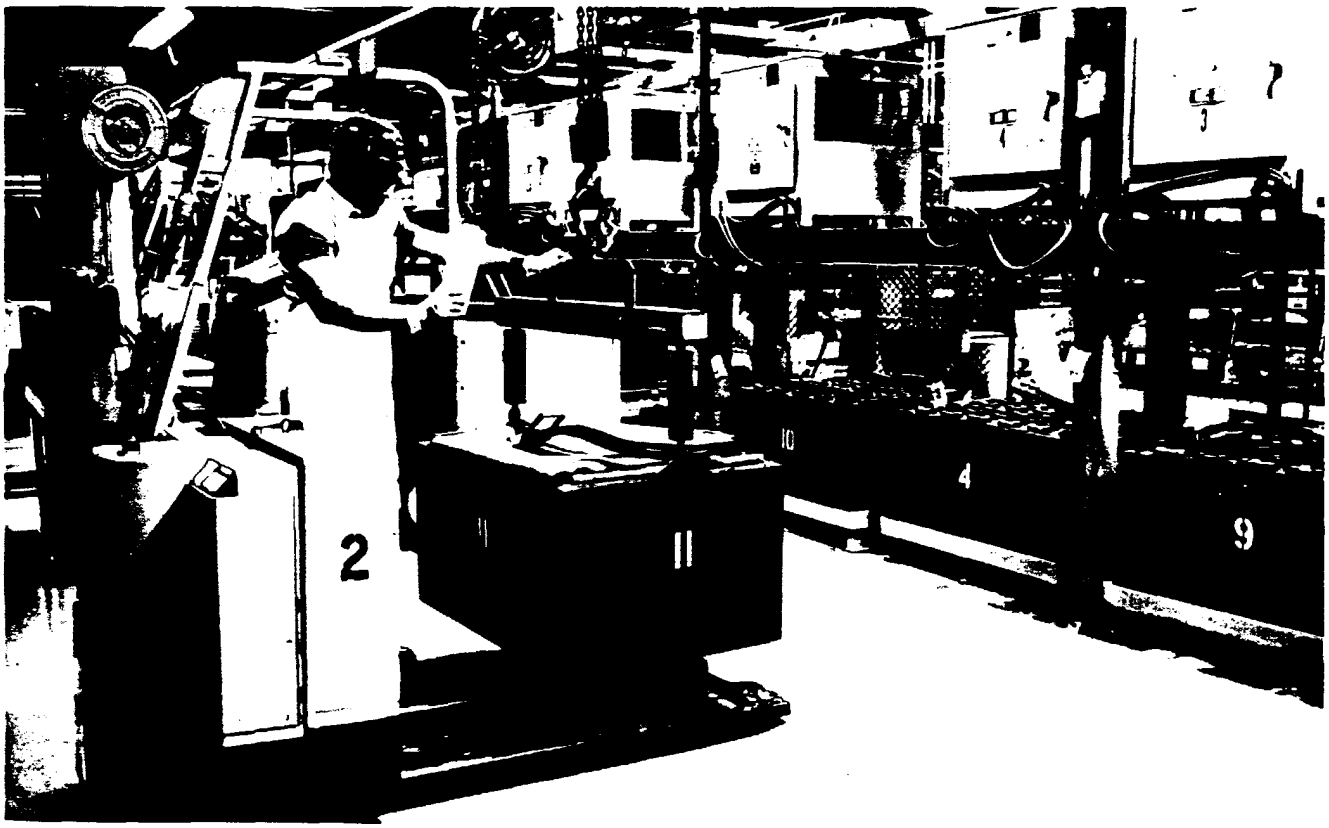
At Bradenton, Fla., Tropicana Products, Inc., uses electric fork lift trucks to handle 170-lb. blocks of frozen orange juice in 14-degree below zero conditions. The trucks work 15 to 18 hours a day, up to seven days a week.

During the July to December harvest, juice for use during the summer and fall months goes into a bulk freezing system. Frozen blocks of juice are hand stacked on 36-in. by 72-in. pallets, 26 blocks to a pallet, covered with polyethylene, strapped and conveyed by 5000-lb. electrics into cold storage rooms. In the retrieval process, the battery-powered trucks move the pallet loads into ambient temperature where the load is put through a crusher and a heat exchanger that brings it up to 55 degrees. The block then goes through the process that produces single-strength orange juice.

R.T. French is using battery-powered trucks to meet the three-pronged requirement of 16-hour work days, reliability and non-pollution in its food-processing facility at Souderton, Pa. Here, mustard produced in the morning is shipped in the afternoon, and the afternoon's production leaves the plant the next morning. Add to this the plant's output of sauces, spices, gravies and pet food, and the need for reliable material handling equipment is apparent. And with food as the end product, the fume-free operation of the electrics is essential.

Seven battery-powered fork lifts carry 75 percent of the goods. The trucks do not operate continuously during the plant's two eight-hour shifts, but rather in spurts, coping with two-ton pallet loads. Two of the seven trucks supply ingredients and empty containers to production and take packaged goods from production to shipping. The other five load and unload at shipping/receiving docks for trucks and railway cars, handle warehousing tasks and help transport goods to and from staging areas.

Telephone supplies are moved in and out of high-density storage racks by battery-powered fork lifts at Western Electric's material management center in Niles, Mich. An average of 1.5 million pounds of material is handled daily.



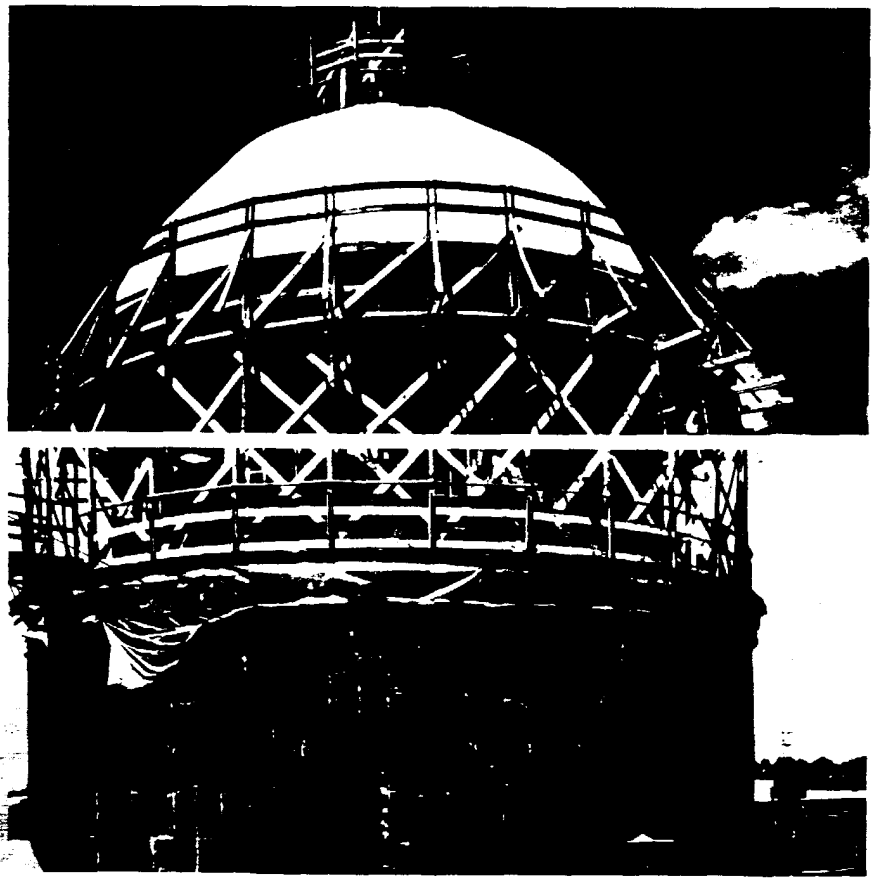
The battery/truck/maintenance/charging area at R. T. French's Souderton, Pa. facility includes an overhead hoist for safe removal of batteries for charging from the company's electric lift truck fleet.

128-year-old terne doesn't show its age

When States Roofing & Metal Co. recently started to restore the dome, vertical supporting surfaces and circumferential walkway atop the Alabama State Capitol they found much of the original terne-coated steel roofing to be as good as when it was installed, some 128 years ago.

Terne-coated steel combines the strength of steel with lead's superb corrosion resistance, solderability and paintability. Terne is generally mild steel coated with a lead alloy containing about 6 percent tin. The coating is applied to the steel based on the weight of the tin/lead alloy per square foot. For roofing purposes, a 40-lb. coating is usually specified.

Alabama's State Capitol in Montgomery is one of the most impressive in the country. Much of the terne-coated steel on dome, promenade and supporting drum remains in excellent condition today, 128 years after its installation.



Scaffolding encircles Alabama State Capitol dome to enable roofers to partially replace 128-year-old terne metal. Circular drum (Below) which constitutes base of Capitol dome, also received new "skin" of terne-coated steel.

Since the lead coating on the steel is not all that thick, periodic painting is required for protective purposes. Consequently the terne metal roof on the State Capitol in Montgomery, Ala., had been subjected to numerous coats of paint in its 128-year existence. Then a few years ago one painting contractor sandblasted a number of areas to remove the old paint. This also removed the terne coating and areas of rust developed. However, the terne in other areas retained its excellent condition.

Because of terne's remarkable service record, and because state officials wanted to restore the Capitol building to its original beauty, States Roofing applied a similar flat-lock seam roof on the dome, as well as on the circular drum (or support structure) below the promenade. In addition, terne-coated stainless steel was used in many of the flashing areas between the dome and drum section.

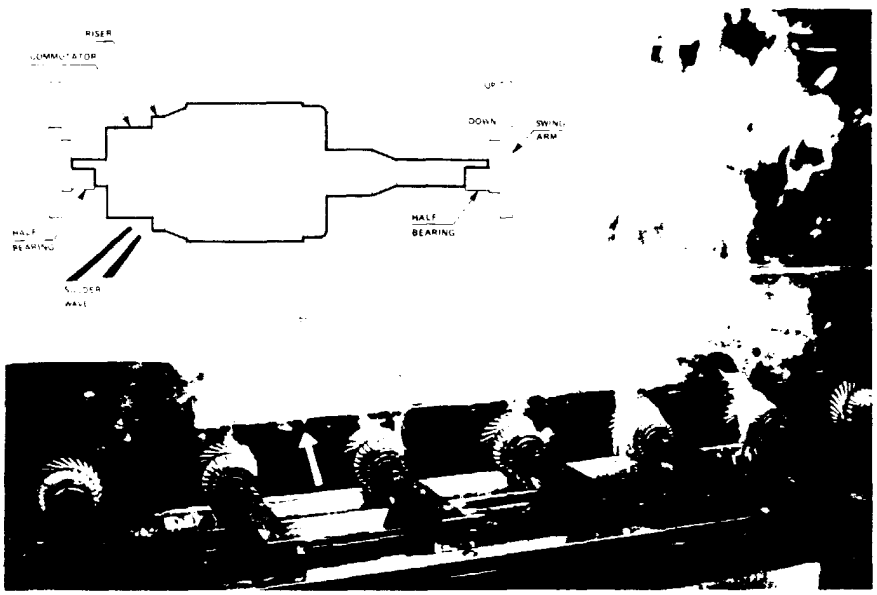
The terne coating for the stainless, supplied by Follansbee Steel Corp., Follansbee, W.Va., is composed of an 80 percent lead and 20 percent tin alloy. The Type 304 chrome-nickel stainless steel used is produced in a condition known as "dead soft." This makes it easy to form with no springback, an advantage in fabricating such architectural components as flashing and fascias. And, unlike terne-coated carbon steel, the TCS does not require painting. This is a benefit in hard-to-reach areas.

The reroofing work on the dome and related areas was a hazardous undertaking for States Roofing. A wood scaffolding had to be erected around the entire dome to allow access and safe working conditions for the removal of old materials and preparations of the surfaces for restoration.

The work on the dome area of the State Capitol was the first step in a complete restoration of the structure, now designated as a national historical landmark. Well-known restoration architect Nicholas H. Holmes Jr., FAIA, is in charge of the project.

Some of our most distinguished architects have, in their time, specified terne for finishing building exteriors. Frank Lloyd Wright, for one, observed that he "found terne superior to other roofing metals in economy, color adherence, heat reflection, permanence, workability and low coefficient of expansion." In addition to the advantages specified by Wright, terne is a highly ductile material which needs no pretreatment for soldering and is just about the lightest satisfactory roofing metal known.

Wave soldering of motor armatures provides increased productivity and improved quality



Schematic shows position of commutator armature in hall-bearings and its relation to the rotator and solder wave. Closeup photo shows starter rotor commutator being heated and then soldered by edge-shaped solder wave. As armatures are conveyed, caterpillar-treaded belt (arrow) continually and uniformly rotates them.

The use of automatic wave soldering to join the components of starter motor armatures has enabled automotive manufacturers to realize increased productivity and improved quality control.

The joining of the terminals of the windings to the commutators of armatures for automotive starter motors was usually accomplished by hand or dip soldering. The latter method, most often preferred for high volume operations, involves automatic lowering of the armature into a solder bath.

Although faster than manual soldering, certain drawbacks have been experienced with the dip method. Excessive heatsink of the armature when dipped in the solder sometimes requires the use of higher temperatures (up to 932°F), combined with fast copper contamination and the inconvenient use of inorganic fluxes. And the actual joints—wire ends and risers—being the last to enter the dip pot, are the last to reach the soldering temperature. And, paradoxically, despite the higher temperature applied, actual soldering of the wire ends and risers occurs at the lowest temperature because the armature has to be removed quickly to avoid overheating.

In addition, the commutator surface often picks up excessive solder unless costly precautions such as application of solder resist are taken. And finally, the production rate and reliability of the soldered joint are highly dependent on the operator's skill.

Now most major car manufacturers in the United States, as well as Fiat in Italy, are employing a three-step integrated wave soldering system supplied by Electrovert, Inc., Mount Vernon, N.Y. The system is a straightline, conveyorized operation that includes fluxing, soldering and cooling stations. A wave of molten solder is pumped through an orifice from a tank, forming a pre-determined shape. In the case of commutator armatures, an edge-shaped wave is used.

The area to be soldered is pin-pointed with a minimum of tin lead solder to form a mechanically strong and electrically reliable joint in seconds. Since the molten solder is continuously circulated, a stable consistent solder temperature (650°F) and homogeneous composition are maintained. Pre-heating is accomplished by the solder wave itself, so only that part of the armature being soldered is exposed to the heat.

A caterpillar-treated belt device directly above the processing line rotates the armature for uniform exposure of all joints to both flux and solder. Rosin base or organic acid base type fluxes are used and solder ratios tend to the high lead containing alloys. Capacity of each wave soldering system ranges from 600 to 800 armatures per hour.

Automatic wave soldering is also being substituted for the dip method at Brevel Motors in Carlstadt, N.J., where squirrel cage armatures are soldered and assembled for use in fractional hp motors. In this case, however, the system operates on a carousel type, adjustable speed conveyor, and a flat wave is used to solder the copper rods of the armatures.

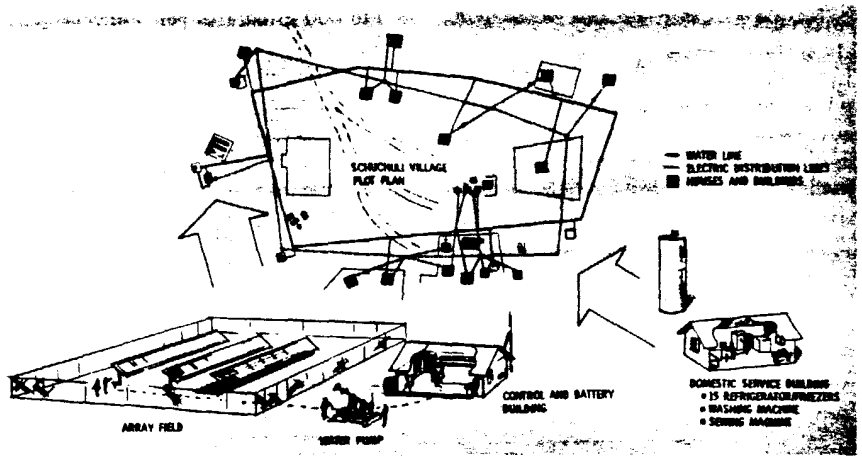
An operator places the assembly to be soldered on overhanging pins. The assembly is then automatically conveyed horizontally through fluxing, soldering, spinning, cooling, cleaning and unloading stations. The depth of solder immersion is precisely controlled to prevent the solder from entering the center hole of the armature. This eliminates hole reaming which was often necessary when the armatures were dip soldered. Brevel has reportedly achieved production rates of up to 1800 armatures an hour with this method.

3rd U.S. solder forum on West Coast

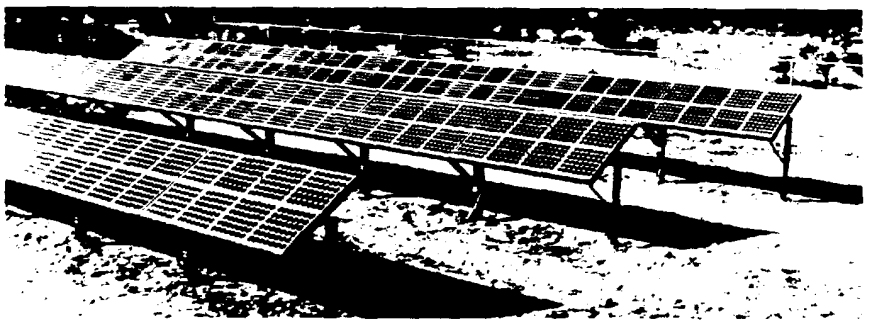
The 3rd U.S. Solder Forum, sponsored by the Solder Manufacturers Committee of the Lead Industries Association, Inc., is scheduled for November 12 and 13 at San Diego, Calif. This is the first program of its kind to be held on the West Coast. The event is designed to provide a setting for an interchange of ideas and technology among individuals representing various industries that use soldering as a joining method. As before, the program will feature addresses by recognized experts in solder application and technology. One portion will be devoted to new developments in soldering. The Forum is being supported by the Tin Research Institute, Inc., and the American Welding Society.

A copy of the program may be obtained from Lead Industries Association, Inc., 292 Madison Avenue, New York, N.Y. 10017.

Solar-power brings electric conveniences to remote Indian village



The Papago Indian Village, Schuchuli, AZ, is the site of the world's first solar electric village power system.



This 3.5-kw solar array is providing sufficient electricity to meet the basic energy needs of the Village's 96 residents.

Lead batteries store excess electricity until it is needed.

Because of the remote location, power lines have not yet reached many American Indian villages throughout the United States. A solution to this problem may be solar cell lead-battery powered electric systems. One such system was introduced last year in the Papago Indian village of Schuchuli, AZ.

The 3.5-kW solar electric power system is providing sufficient electricity to power 15 refrigerator-freezers (4.7-cubic-foot), a washing machine, a sewing machine, the village water pump, and lights for the village's 15 homes, a church and feast house. The resultant improvement in living conditions is a dramatic contrast to the quality of life that existed before the system was introduced.

Without electricity, village residents relied on kerosene lamps for light; laundry was either washed by hand or taken 20 miles to the nearest commercial facility; and perishable foods and medicines could not be stored. Water for domestic use and for stock was pumped by Diesel engine, which because of the cost of maintenance and fuel, was a drain on the financial resources of the community.

The solar system consists of solar panels containing photovoltaic cells. These cells convert the sun's energy directly into electricity. Lead acid batteries are being used to store excess electricity until it is needed. The batteries have the storage capacity to operate the system for up to 11 times the daily requirements. The storage battery has 2380 AH at 120 volts.

The Schuchuli Village Photovoltaic Power Project was funded by the U.S. Department of Energy (DOE). The project is managed by the National Aeronautics and Space Administration's (NASA) Lewis Research Center, Cleveland, OH as part of DOE's National Photovoltaic Conversion Program.

Under terms of the Schuchuli cooperative agreement, NASA-Lewis furnished all materials and technical assistance necessary for the installation of the power system's equipment and supporting facilities.

The Papago Construction Company, an arm of the Papago Tribal Council, erected the solar arrays and installed all power system equipment. Papago workmen also constructed a new domestic services building which houses the village's solar-powered appliances, and an electrical equipment building which contains the system's instrumentation, controls and storage batteries. An electrical distribution network, including all wiring exclusive of the actual power system equipment was provided by the Tribal Utility Authority.

Dr. Louis Rosenblum, Chief of the Solar and Electrochemistry Division at NASA-Lewis Research Center in Cleveland believes that the application of solar electric technology in the Arizona desert has worldwide implications. "There are more than three million villages without electrical power in the world today, mainly in the less developed countries," he says. "The success of our experiments at Schuchuli is bound to influence the direction taken by developing countries to satisfy the pressing energy needs of their large and rural population."

Forest lookout towers operate on solar energy

Solar energy is providing complete electrical power for the first two of a new generation of forest lookout towers that may replace older structures throughout the country's National Forest System in the future.

The new, two-story, six-sided structures are located on Antelope Peak, 7,600 feet above California's Lassen National Forest, and atop Pilot Peak in the Plumas National Forest, about 55 miles south of the Antelope Peak site. Both towers operate on a 300-watt solar cell system that provides power for their refrigerators, water pumps, lights, radio communications and other small appliances.

The system consists of 576, 3-in.-dia. photovoltaic cells mounted on 8, 2-ft. x 4-ft. panels. Generated electricity charges eighteen 12-volt lead-acid battery cells which were specifically designed for solar applications. This battery can store up to 36-kW hrs. of electric energy and can supply the tower's normal electrical needs for nearly a month before requiring a recharge.

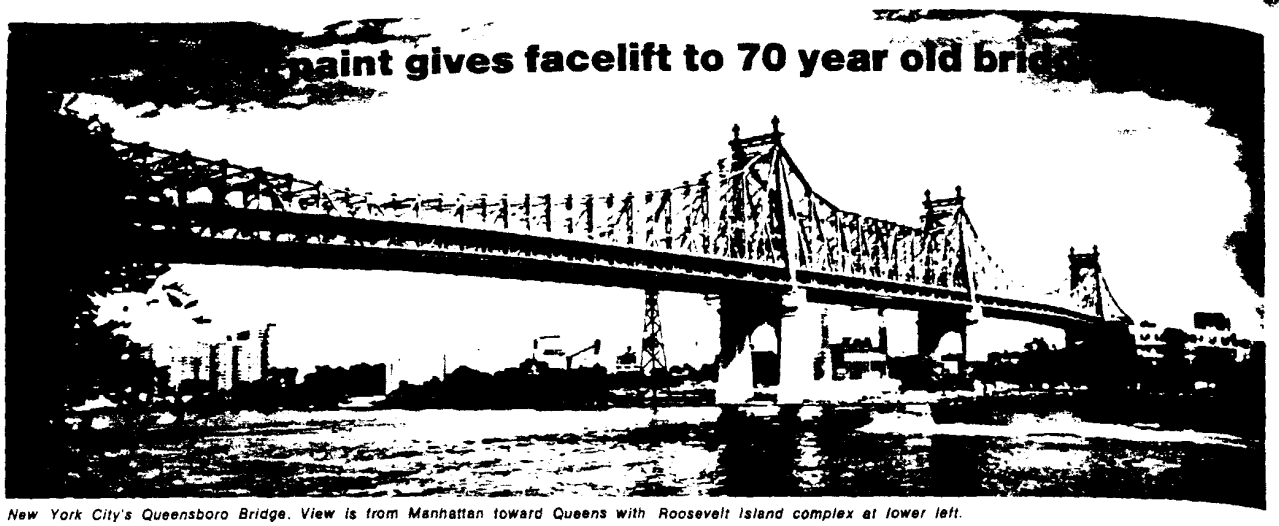
As a result of the solar energy system, both the living and working conditions of the fire lookouts, who man the tower on a 24-hour basis, will be improved. In the old tower, lookouts relied upon Forest Service supply trucks to provide propane for the lamps and refrigerator, while the forest-net radio operated on batteries and water had to be raised by hand.

Funded by the Department of Energy (DOE), the solar electric power systems at Antelope Peak and Pilot Peak were provided by the NASA Lewis Research Center through the Tests and Applications Project it manages as part of the DOE's Photovoltaic Conversion Program.

A 330-watt solar cell system, backed by lead-acid batteries, provides power for the towers' refrigerators, water pumps, lights, radio communications and other small appliances.

One of the two new forest lookout towers that operate on solar energy.

paint gives facelift to 70 year old brid



New York City's Queensboro Bridge. View is from Manhattan toward Queens with Roosevelt Island complex at lower left.

It is called the 59th Street Bridge by most New Yorkers although its name is officially the Queensboro. As its name implies, the structure connects the New York City borough of Queens with Manhattan.

Spanning the City's East River, the Queensboro Bridge passes over Roosevelt Island, situated in the middle of the River. When it was completed in 1909 the bridge was the largest, longest and heaviest cantilevered bridge ever built, and it remains one of the largest of its type today. Originally designed to carry pedestrians and the Second Avenue elevated subway as well as trolley cars—both transportation systems are no longer in use—the bridge carries 144,000 vehicles per 24-hour period, making it one of the busiest of the City's no-toll spans.

The Bridge is currently being repainted, a task that will take two years and 40 full-time painters. Since the Queensboro has been designated as a New York City Landmark, the final color scheme had to be coordinated between the City's Landmark Commission and the Department of Transportation (DOT). The structure's steelwork will be a tan while its four towers will be painted brown. A brown horizontal stripe will also adorn the bridge.

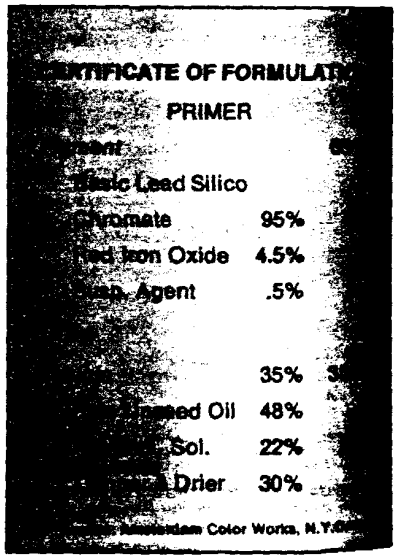
About 64,000 gallons of lead-based paint will be used in two coats to cover the bridge. A key element of the primer is the basic lead silico chromate anticorrosive weather-resistant protective pigment. It is the lead pigment that provides a durable and compatible paint that offers superior corrosion protection.

DOT reports that lead-based paints have been used on New York City bridges since they were constructed because these paints provide the durability and weatherability required for steel structures. Following the application of the primer an alkyd finish or top coat, also containing the basic lead silico chromate, will be applied.

Prior to painting, old paint, rust and dirt had to be removed. Power-driven chippers and wire brushes were used to remove rust and rust scale. Hand chippers, scrapers and wire brushes were utilized to remove pitted paint, dirt, cement stains and deposits, and oil and grease which had accumulated over the years. Inaccessible areas, large accumulations of oil, rust and grease around expansion joints and all other areas were cleaned by a brush-off blast cleaning method.

Lead-based paint is applied to steel structure of Queensboro Bridge. About 64,000 gallons will be required to protect the Bridge from corrosion.

Workmen remove old paint and rust prior to application of anticorrosive lead paint.



Electric vehicles make hit with U.S. mayors

More than 5,000 of the nation's city officials and mayors attending the 1978 Congress of Cities Convention in St. Louis last November were given a first-hand look at some of the electric vehicles that are expected to be in service throughout the country in the near future. Nearly a dozen electrics provided a variety of transportation services for those attending the event, an annual function of the National League of Cities, U.S. Conference of Mayors.

The electric vehicles were provided by a consortium of interested businesses in conjunction with Future Transportation Models of St. Louis, Inc. (FTM), a non-profit corporation which operates the only private electric vehicle shuttle service in the country.

Powered by advanced lead batteries, the electrics provided a number of services for Convention attendees: as an on-call shuttle for shoppers; for tours of downtown St. Louis; and for the transportation of VIPs to a dinner at St. Louis' Gateway Arch.

The latter service enabled 150 mayors, city officials and their spouses to avoid a ¼-mile walk in icy rain and reach their destination dry and warm. A fleet of chartered buses carried the group to the parking lot adjacent to the Arch. At this point 10 electric vehicles were employed to shuttle the guests over the narrow Arch pathways from the parking lot to the Arch's North leg. This was the first time that many of the VIPs had ever ridden in an electric vehicle.

Vehicles included: the Endura, a four-passenger automobile from Globe-Union, Milwaukee, WI; a converted Dodge passenger van and three small four-passenger Electra-Vans from Jet Industries, Inc., Austin, TX; and six 10-passenger trams from Centron Systems, Inc., St. Louis. Globe-Union's new Maxima station wagon was on permanent display at the main lobby entrance of the Cervantes Convention Center where the Congress of Cities Convention met. An electric vehicle information booth was also located at the Center. Here related literature was disseminated to Congress of Cities' participants and questions were answered by representatives of Lead Industries Association, Inc. (LIA), Globe-Union and FTM.

The success of the electric vehicle demonstration during the Convention was due to the financial support FTM received from a number of corporations that are interested in the development of electric vehicles as a viable means of transportation.

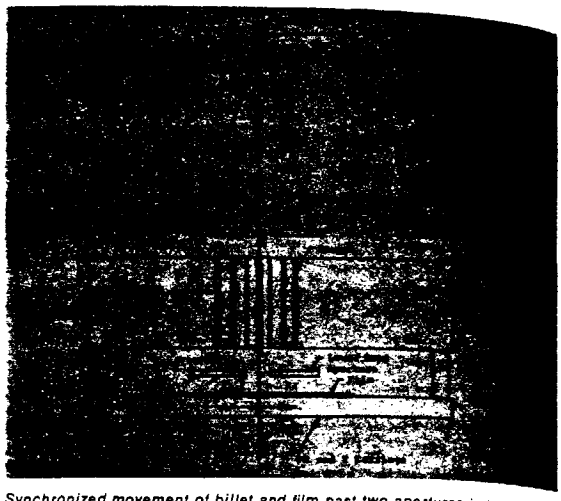
In a separate event, members of the St. Louis business and civic community also had the opportunity to learn about the role of electric vehicles in an urban setting at a special reception hosted by FTM at the Convention Center. The reception provided attendees with the opportunity to discuss the role of electrics in urban areas and to take demonstration rides in the same vehicles that operated during the Congress of Cities Convention.

James F. Conway, Mayor of St. Louis (Left) was among the distinguished visitors to view electric vehicles during the 1978 Congress of Cities Convention in that city.

City official visiting 1978 Congress of Cities Convention in St. Louis prepares to take demonstration ride in Globe-Union's Endura electric vehicle.

Lead plates guide x-ray of new aerospace material

Collimated scanning radiography provides sharp images when inspecting carbon-carbon composite materials. Cabinet has 1/16-in.-thick lead lining to protect operator.



Synchronized movement of billet and film past two apertures in lead plates permits sharp definition over entire film area.

Lead is playing an important role in the development of new aerospace materials designed to withstand intense heat, prolonged exposure to sub-zero temperatures and the shock of rapid thermal changes during launching and re-entry.

For example, lead is employed to focus X-rays used to conduct non-destructive quality control tests of carbon-carbon composites, one of the newest and most exotic aerospace materials.

Carbon-carbon composites are replacing polycrystalline forms of graphite that have been traditional materials for highly sensitive areas of space vehicle nose cones, ballistic missile nose tips and rocket booster interiors. Polycrystalline graphite has suffered from low tensile strength and only adequate thermal shock resistance. The newer carbon-carbon composites, on the other hand, are as strong as mild steel and have very good thermal shock resistance.

Because these materials perform highly critical service, it is vitally necessary to insure they are produced exactly to specification. In the case of carbon-carbon composites, production steps are highly sophisticated and the end-result is a highly complex structure that might be compared to a plaid design in fabric.

The carbon yarn space frames form the plaid design. The frames, or preforms as they are called, are filled with coal tar pitch under pressure and converted to carbon at elevated temperatures. This process is repeated until all the preforms are filled to the required density. The final product is a skeleton of yarns technically called a three-dimensional carbon-carbon composite.

Properties of this composite material are dominated by the carbon yarns that form the skeleton. They are much stiffer and stronger than the carefully applied, thermally cured carbon matrix. Because the carbon yarns are subjected to possible damage during weaving of the preform, as well as during the carbon matrix build-up cycles, it is desirable to inspect them for structural integrity. This is accomplished during production and in the final form of material, which is called a billet.

While destructive testing of the material employs standard techniques, the traditional non-destructive testing method was not adequate. Standard X-ray techniques required too much time and effort to achieve a comprehensive view of the combination of materials, their arrangement in the composite, the condition of the carbon yarns, or the position and amount of thermally applied carbon in each area. Since only a small area in the center of the X-ray was in focus, the readout was difficult to analyze. Areas to the left and right of center were too hazy to obtain a desired reading.

A new X-ray technique called collimated scanning radiography overcomes the shortcomings of standard radiography in non-destructive testing of carbon-carbon composites. Developed by Southern Research Institute, Birmingham, Ala., the new device uses a very narrow, cone-shaped X-ray beam to pass through the carbon-carbon composite, thus providing a sharp, clear image over a finely defined area.

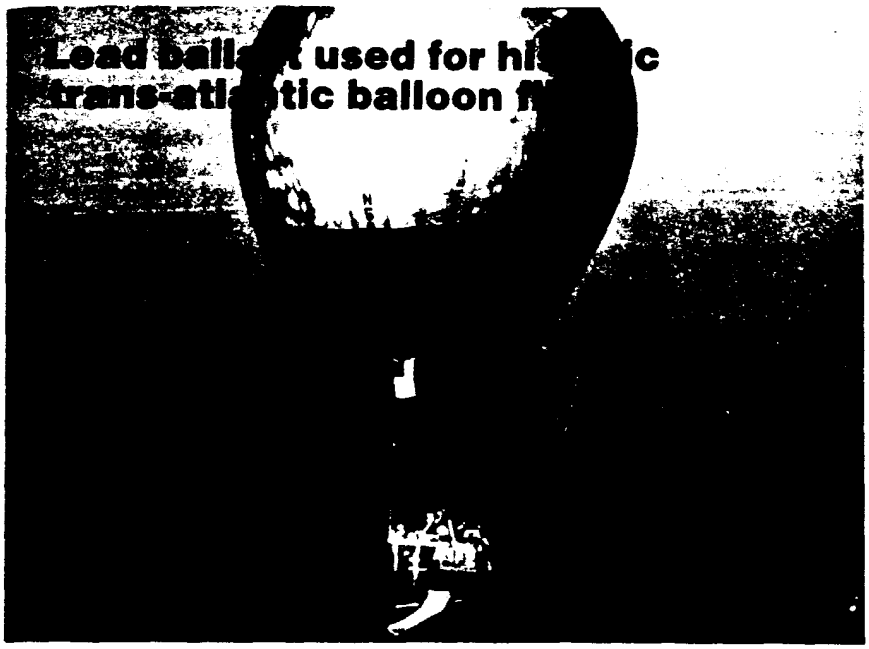
The new device consists of an X-ray source, a collimating system of two lead plates with small apertures, and a motorized carriage to transport the material to be inspected, as well as the X-ray film. Each of the lead plates measures 6-in. by 6-in. by ¼-in. thick. The apertures in the plates are aligned with the center of the X-ray beam, thus restricting it to a very narrow angle as it passes through the material. The carriage transports the composite material and X-ray film so they are continuously scanned by the narrow beam.

The beam, actually in the shape of a cone with the apex being the X-ray source, traverses the length of the carbon-carbon billet, then automatically indexes to the next location and transverses the billet again. This procedure is repeated several times until the entire surface of the face has been scanned. After finishing one surface, the billet is rotated and the process is repeated until the second face has been scanned. The result is a clearly defined profile of the entire billet, revealing missing yarns and other flaws in the fiber structure.

According to the Southern Research Institute, lead plays an important role in the new X-ray inspection technique. The upper lead plate aperture blocks unwanted X-rays from passing through the billet. The lower lead plate aperture stops unwanted scattered radiation from reaching the X-ray film to cause distortion and blurred images.

In addition to the lead plates, the X-ray beams are encompassed in a cylindrical lead shield ¼-in. thick. A secondary lead shield, 1/16-in. thick, lines the cabinet. Both shielding applications protect the operator from radiation.

Lead ballast used for hi[illegible]c trans-atl[illegible]tic balloon f[illegible]



The $70,000 Double Eagle II's black and silver nylon envelope, filled with 160,000 cubic feet of helium, stood 11 stories high.

For more than 100 years, attempts have been made to cross the Atlantic Ocean by balloon. Three Americans accomplished that goal in August, 1978 in a balloon known as Double Eagle II. Taking off from Presque Isle, Maine, they landed in a grain field in Miserey, France over 137 hours later.

Maxie Anderson and Ben Abruzzo, the two experienced members of the balloon's crew, had made a previous unsuccessful attempt to cross the Atlantic in Double Eagle I. Larry Newman, an aircraft pilot, was added to the crew for the second flight because of his experience in weather forecasting.

Lead also played an important role in setting the trans-Atlantic record crossing by balloon. About 750-lb. of the metal was used for ballast to keep the Double Eagle II aloft during the trip.

Without adequate ballast, the balloon couldn't have made the trip. To understand this, some knowledge of the basic fundamentals of ballooning is necessary. To change altitude, the balloonists depended partly on the gas in the balloon and partly on the ballast being carried. Some helium gas was released when it became necessary to descend in search of westerly currents. The ballast was used when a higher altitude was needed.

In both cases the flight was shortened since each loss of helium or ballast leaves less for future up and down maneuvers. This was a critical factor in the case of the Double Eagle II's flight since it was vitally important to have enough ballast to get through sunsets, when sudden cooling causes a balloon to lose altitude.

To make Double Eagle II as airworthy as possible, the crew used a balloon of high-strength nylon combined with neoprene, a synthetic rubber that resists oil, heat and light. Filled with 160,000 cu. ft. of helium, the balloon was 11 stories high. The upper portion was painted silver to reflect the sun and stabilize the expanding helium as it heated. The bottom portion was painted black to absorb heat from the ocean during the night, when water is warmer than air. This prevented rapid descent.

According to Ben Abruzzo, lead also played an important secondary role in the flight. The 8x6-ft. gondola where the crew lived was designed to be converted into a twin-hulled catamaran-like sailing vessel in the event that the balloon was forced to make an ocean landing. A 15-ft. mast and an 800-sq. ft. sail would provide the power, and the lead ballast would act as a keel for the hull of the craft. Abruzzo says the lead ballast was in the form of BB size lead shot stored in 25-lb. bags.

As an interesting sidelight, Maxie Anderson, the other experienced balloonist on the flight, was recently named the 1979 Copper Club Man of the Year. As President of Ranchers Exploration & Development Corp. in Albuquerque, N.M., Anderson has become well-known in the copper industry for his innovative technological feats in mining and marketing natural resources.

One-man submarine applies lead's power and weight

Submarine's single passenger prepares to close hatch and descend. Lead batteries supply power and lead weights are used for ballast.

If you are not claustrophobic, have $12,000 and a strong desire to explore the ocean depths, a personal one-man submarine could be the answer.

Up in Warren, Maine, George Kittredge, a retired U.S. Navy Captain, has been building these submarines off and on for the last ten years. Kittredge, who is also responsible for the vessel's design, calls it "the most maneuverable small submarine available." The basic model is 12-ft. long, weighs about 2,500-lb., and can submerge to depths of up to 250-ft. A more elaborate version, which sells for $16,000, can dive 350-ft.

Power for both models is derived from 12-volt lead batteries. According to Kittredge, while heavier deep discharge batteries would be more efficient, they are less desirable because of the sub's small size. The smaller vessel is equipped with three 12-volt batteries, while the larger craft has eight batteries. In addition, both submarines employ lead weights for ballast purposes.

Submerging and surfacing of the submarine are controlled by three tanks that are filled with water or air to descend or rise. The batteries power two rotating thruster motors which allow the vessel to move in various directions at speeds of two to four miles an hour. Air supply is replenished by surfacing every hour or so.

Important safety features have been built into the submarine in the event that a problem develops underwater. Filling of any of the vessel's three tanks with air would cause it to surface. Failing that, 190-lb. of lead weights can be released to make it float to the surface. If the craft is entangled and unable to surface, the operator can open the hatch and escape with scuba gear, including an emergency air tank, which is part of the sub's standard equipment.

Beveled glass—A new idea from an ancient art

Leaded and hand-beveled glass door and side panels create flawless prism effect and add distinctive look to a home.

The ancient art of stained glass has been updated through the use of beveled glass arranged in a variety of designs, all joined by lead. The shaped glass pieces are joined using lead cames, or H-shaped strips, with each joint overlapping the glass and soldered on both sides of the panel.

Beveled Glass Industries, Los Angeles, CA, is typical of several companies that specialize in producing beveled glass. With showrooms in New York and Los Angeles, the company has earned a reputation for high quality beveled glass products. They include doors, windows, tables and architectural accents.

According to the company, the increased interest in beveled glass is due to the fact that today people want the look of handcrafted objects rather than the artificial look of many materials that currently are found in homes and offices. Beveled glass is hand-set in much the same manner as stained glass. The highly artistic designs are not only beautiful, but they are less expensive than stained glass.

The first step is to bevel ¼-in. or ½-in. thick clear glass in the design that will be required for each production piece. The bevels create prisms so that light refraction creates eye appeal rather than color, as in stained glass. All beveling is done by hand, and a number of time-consuming steps are required for the beveling operation.

After the glass sheets are cut into various shapes and hand-beveled, they are laid on a piece of paper that serves as the pattern for the design. The pieces are assembled somewhat in the same manner as a jigsaw puzzle. One section becomes the foundation for another section.

After the beveled glass segments have been placed on the pattern, the individual pieces are joined by lead caming. The caming forms the channel for the glass in much the same manner as a window frame holds glass.

When all the pieces have been fitted, the lead cames are soldered to tie the joints together. The completed piece is then put into a temporary frame, ready for shipping.

At Beveled Glass Industries, more than 500 specially-trained artisans work together, thus increasing productivity. Each worker is responsible for completing a separate operation.

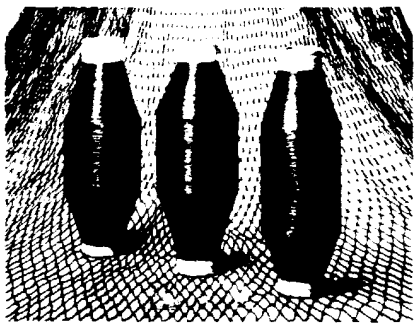
The operation has been designed to save time and effort. For example, it has been estimated that if one man were to create a 22-½-in. x 66-½-in. door piece from beginning to end, it would take approximately three weeks to complete. At Beveled Glass, the mass production technique accomplishes the task quickly and efficiently in such a manner that many pieces can be finished in one day.

Encapsulated lead improves fishing net performance

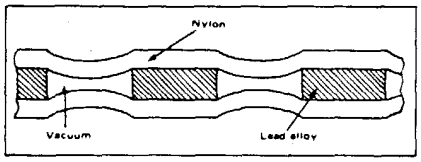
The use of a lead-cored nylon yarn has significantly improved the performance of Japanese fishing nets. The new yarn provides the heaviness, softness and water resistance required for efficient net operation.

In order to snare fish effectively, a net should hang as deeply as possible in the water, and show minimal change in angle with tide and current. This is usually accomplished with the use of weights. However, this makes the nets difficult to manipulate and the weights are often lost. And since the introduction of lighter plastic nets, the problem of maintaining a suitable fishing angle has increased.

One Japanese company, Mitsui Mining & Smelting, discovered that net yarn composed of a lead core plastic monofilament would achieve the desired effectiveness. The monofilament is produced by simultaneously extruding nylon and molten lead alloy through a spinning equipment nozzle. The extruded product is then drawn to produce the final configuration shown in the accompanying diagram. The lead alloy segments are enclosed in a continuous nylon sheath with vacuum spaces in between. These spaces are formed between the lead alloy segments during the drawing process.



Lead-cored nylon yarn has improved Japanese fishing net performance.



Structure of Lead Core Monofilament

Dr. Y. Yamanouchi, who heads Mitsui's research activities, reports that successful tests were conducted with set nets made of the new material. These nets are anchored in place in relatively shallow water (about 30 meters). According to Yamanouchi, the new nets trapped up to eight times as many fish as the conventional type.

The Lead Industries Association is a non-profit trade association representing the lead industry in the United States and Canada. Its membership includes representative firms from all segments of industry and all parts of the world.

The Association neither produces nor sells lead, but collects and distributes information relative to the uses of the metal.

The services, publications and films of the Lead Industries Association are available without charge to anyone interested in the use of lead and lead products.

LEAD INDUSTRIES ASSOCIATION MEMBER COMPANIES

Allied Lead, Inc.
Alpha Metals, Inc.
Amax Lead & Zinc, Inc.
Ames Metal Products Co.
ASARCO Incorporated
*Australian Min. & Smelt. Ltd.
The G.A. Avril Company
Lead Products Division

Baltimore Lead Burning Corp.
Bow Solder Products, Inc.
Brass & Bronze Ingot Institute
The Broken Hill Associated
Smelters Pty, Ltd.
The Bunker Hill Company

C & D Batteries Division
Eltra Corporation
*Canada Metal Co. Ltd.
M. C. Canfield Sons
Chloride Inc.
Cominco American Inc.

Daelco Inc.
Day Mines, Inc.
Delco-Remy Division
General Motors Corp.
Division Lead Company
Dixie Metals Company
Dresser Minerals Div.
Dresser Industries, Inc.
M. W. Dunton Company

E. I. du Pont de Nemours & Co.
Eagle-Picher Industries, Inc.
Chemicals & Fibers Division

East Penn Manufacturing Co., Inc.
ESB Ray-O-Vac Management Corp.
Ethyl Corporation

Federal Alloys Corporation
Federated Metals Corporation
Aaron Ferer & Sons Company

Gardiner Metal Company
General Battery Corporation
Globe-Union Inc.
Gould Inc.

Hammond Lead Products, Inc.
Homestake Lead Co. of Missouri
Houston Lead Company

Indium Corporation of America
Industrial Minera Mexico, S.A.
Industrial Smelting Company
Inland Metals Refining Co.
Interstate Lead Company

Johnson Manufacturing Company

KW Battery Company
O. G. Kelley & Company, Inc.
Kester Solder Company

Lukens Metal Company

Metallurgical Resources, Inc.
Mincon Corp.
Minerals Reclamation Corp.

Nalco Chemical Company
National Smelting & Refining Co.
NL Industries, Inc.
Norada Sales Corporation Ltd.

Oatey Company
Oxide & Chemical Corporation
Ozark Lead Company

*Penarroya
*Phelps Dodge Corporation
Pittsburgh Graphic
Products Corp.
Powerlab Inc.
PPG Industries, Inc, Chemicals
Precise Alloys, Inc.
Price Metals, Inc.

Quenell Enterprises, Inc.

Refined Metals Corporation
Republic Metals Co., Inc.
RSR Corporation

St. Joe Minerals Corp.
Schuylkill Metals Corp.
Sub: Arrow Electronics, Inc
Seitzinger's Inc.

Tonolli Canada Ltd.

U.S.S. Lead Refinery, Inc.

The Victory White Metal Company
Hyman Viener & Sons
Vulcan Lead Products Company

Willard Lead Produdcts Company

*Associate member

☐ FOR CHANGE OF ADDRESS AND DELETION PLEASE ATTACH OLD LABEL. ☐ ADD ME TO YOUR MAILING LIST

(please check one)

ATTACH MAILING LABEL HERE

To Name, Title _____

Company _____ Street _____

City, state, zip code _____

PLEASE CHECK INTEREST

- ☐ Painting
- ☐ Health & Safety
- ☐ Architectural & Building
- ☐ Design & Radiation Engineers
- ☐ Ceramics
- ☐ Chemical Engrs.
- ☐ Battery Power
- ☐ Miscellaneous

LIA26867

LEAD

LIBRARY OF TECHNICAL INFORMATION

The following publications and materials are available free of charge unless otherwise noted. Send request to the

LEAD INDUSTRIES ASSOCIATION,
292 Madison Avenue, New York, N.Y. 10017

ARCHITECTURAL

Lead Roofing and Flashing

Detailed instructions on the simplest and most usual methods for forming or joining lead for roofing and flashing applications. Complete specifications. Diagrammatic drawings. Sixteen pages. A-5

Lead in Building

A four-part data sheet containing information on waterproofing, sound barriers, roofing and flashing and anti-vibration application. A-13

CERAMICS

Facts about Lead Glazes for Art Potters and Hobbyists

Detailed information on the proper formulation, firing techniques, handling, etc. of lead fluxed glazes used by art potters and hobby ceramists. Illustrated. Sixteen pages. B-11

Proceedings of First International Conference on Ceramic Foodware Safety

Top international experts in ceramics, Food and Drug agency officials, and the international lead research community met in Geneva in November, 1974 to discuss heavy metal release from glazed ceramic foodware. Full proceedings—speeches as well as question and answer dialog—were taped, translated and transcribed. 272 pages. B-13

PAINTS

Lead Pigments Bulletin

Brochure, 12-pages, describes the advantages and varieties of lead pigments in anti-corrosion paints. Covers red lead, dibasic lead phopshite, basic silicate white lead, basic lead phosphosilicate, basic lead chromasilicate, basic lead silico chromate. Lists major suppliers. F-7

CHEMICAL CONSTRUCTION & CORROSION PROTECTION

Lead for Corrosion Resistant Applications

Soft cover book, 156-pages, designed to familiarize engineers and engineering students with the corrosion resistance, design and fabrication data on lead and lead-based equipment. Defines plumbum series and corrosion resistance of series. H-6

Lead Chemicals

Soft cover book, 334-pages, is designed as a working manual for the chemist or chemical engineer engaged in applied technology or pure research. Covers organolead compounds, oxides and hydroxides, sulfides and tellurides, halides binary compounds, lead salts, lead chelates, safety in handling compounds. Purchasing price: $3.00. H-7

SOLDERING AND WELDING

Solders and Soldering

New 16-page booklet filled with basic information on soldering and the selection of the right solder alloy for the application. Data is presented on a variety of tin lead as well as other solder alloys. Several case history treatments of typical soldering applications are included. I-6

"Solder Puts It All Together for Manufacturer of Zippo Lighters"

Two-page reprint from Production Magazine details production soldering of lighters at Zippo Mfg. Co. I-7

Soldering of Electronic Products

Booklet covers the use of tin lead solder as a highly reliable joining method in the electronics industry. It includes information on the control of electronic assembly components for solderability, fluxes and flux residue removal, solder alloys and soldering methods. I-8

SOUND BARRIERS

Directory of Acoustic Specialties

Summary of available materials for sound insulation by barrier, damping and absorption methods. Sixteen page list of materials by brand name and manufacturer. Eighteen pages. J-4

Lead a Major Factor in New Machinery Noise Suppression Systems

Description of techniques used to lower machinery noise levels with lead and lead composites. Lists machines that normally exceed noise level allowed by Walsh-Healey Public Contracts Act. Two pages. J-9

Lead Proves a Heavy Favorite as Sound Control Material

A reprint of a feature from Product Engineering illustrating lead's usefulness in sound attenuation to help meet OSHA noise requirements in factories and also on [redacted] and trains. J-17

Specifying Lead for Noise Control

Eight-page reprint contains guidelines to help architects and engineers fully utilize the advantages of lead as a noise control material. A number of case histories are included to show how some of these guidelines were used to solve a variety of commercial, industrial and residential noise problems. J-18

The Use of Absorber/Barrier Materials for Noise Control Enclosures

Four-page reprint is concerned with noise abatement applications within the 10 to 15 dB range. It describes an installation using a quilted absorber/barrier enclosure suitable for achieving these reductions, and presents the advantages of this material. Acoustical, economic, operational and maintenance aspects are considered. J-19

Take a Fresh Look at Noise Control

Two-page reprint from Modern Stores & Offices explains the usefulness of sheet lead plenum barriers for office space noise control. A case history illustrates the needs for an acoustical treatment and cost savings realized. J-20

Modern Uses of Lead in the Construction Industry

This 20-page booklet covers significant uses of lead in construction applications. It deals briefly with lead for plumbing, waterproofing, roofing and flashing, anti-vibration and sound barriers. J-21

Why Everyone's Shouting About Noise Control

Reprinted feature from Iron Age discusses the use of sound absorbing materials such as lead to meet increasingly stringent noise control standards in industry. Included are simple rules on lead's use to insure successful application. J-22

Lead: A Vital Tool For Industrial Noise Control

This 28-page booklet focuses on the use of lead as a barrier to block sound paths and for dampening structures and surfaces to reduce vibration and radiation of airborne sound. It deals with applications of lead sound attenuation materials and offers practical solutions to noise control problems. J-23

Lead For Radiation Protection

This 26-page guide provides radiation shielding properties, design and fabrication information on lead and lead-based products. Basic applications for lead shielding are outlined and current construction materials and techniques of applying lead as part of a radiation protection system are described and illustrated. K-3

BATTERIES

A Primer on the Lead-Acid Battery

A condensed story of the principles of the lead-acid battery and its chemistry, including some of the fundamentals and definitions of direct-current electric energy. Two pages. L-6

Electric Work Vehicles

A 12-page folder describing battery-powered short-haul delivery vehicles and comparing their economics to internal combustion delivery trucks. L-19

Saving Battery Dollars—What You Need to Know

Three-part reprint from Modern Materials Handling deals with proper procedure in picking the right battery for the truck and job. It also discusses considerations in battery charger selection. The third part offers guidelines for planning an efficient battery charging-room layout. L-23

Electric Vehicles: State-of-the-Art 1978

New 24-page booklet contains latest data on electric trucks, buses and passenger cars around the world. Case histories describe EV's in a variety of work applications. Other sections cover energy crisis and pollution problems and their effect on EV's; and the role of lead batteries in EV development. L-24

GENERAL

Primary Lead Production Areas in the U.S.

For schools, libraries. 11"x14" map showing locations in U.S. of most lead smelters and refineries, and lead mines. M-11

The U.S. Lead Industry

An annual review of activity within the industry that contains a general summary for the year and a series of charts and tables giving current statistics on lead production and consumption. M-14

Lead—a Modern Design Material

Summary of properties and available forms of lead for radiation control, sound/vibration control, electrical energy sources, soldering and ceramics. Eight pages. M-15

Ecology in the New Lead Belt

Reprint describes cooperation of industry and environmentalists in developing southern Missouri lead mines. Four pages. M-23

Leaded Grades: Answer to Free-Machining Needs

Reprint reports on benefits derived from using leaded steels for free machining. Case histories are employed to demonstrate that these grades can enable partsmakers to raise production of quality components with efficiency and economy. M-32

Lead and Zinc Outlook 1976-1980

Booklet examines demand prospects and production for lead and zinc over the next four years. Current markets and growth applications are also discussed. 16-pages. M-33

Occupational Lead Poisoning . . . It Needn't Be . . . A Manual for Managers

Contains information of use to the industrial manager on the safe handling of lead and lead products in industry. Types and permissible levels of occupational lead exposure are discussed. Some practical controls and safeguards are suggested. 16 pages, bibliography. M-34

Lead and Your Health

Brochure contains advice on occupational protection against over exposure to lead. A checklist of good health practices is included. M-35

Old Paints and Rural Lead Poisoning

Booklet discusses the incidence of lead poisoning among children in small towns and rural areas, a problem usually associated with big cities. The need for lead screening programs to detect and correct the problem is emphasized. M-36

Directory of Lead Casters

Booklet lists 58 companies throughout the U.S. that produce lead products for industry. Data on each firm includes type of casting method, products produced and auxiliary services offered. A contact name at each company is provided. M-37

FILMS

Lead in Motion

A 21-min., 16mm color film. Lead's properties and its potential for unlimited future applications are explored from the viewpoint that an atom of lead—like all elemental matter—is an arrangement of energy—part of a universal system. To order specify desired show date and one alternate date. No charge to borrow; viewer pays only return postage. N-2

Occupational Lead Poisoning . . . It Needn't Be

A 16mm, 15 min., sound color film. Narrated by the environmental health experts of international calibre, the film introduces the basic principles of a health program for the lead industry. The intention is to motivate the cooperation of both management and employees in developing an effective health program for their particular operation. To order, specify desired show date and allow one alternate date. Allow at least five weeks for delivery. No charge to borrow; viewer pays only return postage. N-3

Lead For Noise Control

Audio visual presentation covers lead-based materials available to control noise in an industrial environment. Actual case histories included to document effectiveness of these materials. Available as a cassette with slides or a continuous loop 16mm film strip with magnetic audio tape for $15.

Printed in U.S.A.

PLEASE SEND ME THE PUBLICATIONS MARKED BELOW

▼

WRITE IN CODE NO.

_____
_____
_____
_____
_____
_____
_____

NAME, TITLE _____

COMPANY _____

STREET _____

CITY, STATE, ZIP CODE _____

←TO REQUEST LITERATURE

MAIL TO:
LEAD INDUSTRIES ASSN. INC.
292 MADISON AVE
NEW YORK, N.Y. 100

LIA26868