LEAD

Published by Lead Industries Association

VOLUME TWELVE MARCH, 1942 NUMBER TW

EWING GALLOWAY

Representative of a wide variety of war machines to which the lead-acid storage battery contributes so materially is the rapidly moving, heavily armored tank

420 Lexington Ave. **Lead Industries Association** New York, N. Y.

Lead-Acid Storage Batteries are a Power Behind Defense

WHEN you step on the starter button of your automobile in the morning you initiate certain chemical reactions which release sufficient electrical energy to start the motor of your car. These chemical reactions take place between lead grids pasted with certain oxides of lead and sulfuric acid. Reduced to the simplest terms, this is the storage battery which lights the headlights, starts your car on the coldest of mornings, and operates a dozen pieces of equipment designed for your safety and your comfort.

While our most common contact with the storage battery is in automobile service, many other batteries range in size from a vest pocket model for a personal acoustical aid to veritable giants—100 ton units—representing vast reservoirs of sufficient emergency power to operate the telephone systems of large cities, illuminate hospitals, run railroad signals and light airway beacons.

With the storage battery playing such an important role in our everyday lives, it is little wonder that these combinations of lead and sulfuric acid are a major factor in the development of war equipment. Every tank, truck, tractor, and plane relies upon one or more lead-acid storage batteries specifically designed to meet the demand for light, power and radio operation while a considerable part of the average submarine is given over to the vast storage batteries required by underwater propulsion.

When the marine uses, as well as the innumerable industrial uses, of the storage battery are added to this picture, we just begin to realize the major part that lead, in the form of storage batteries, plays in the war picture. The storage battery, which is so largely responsible for keeping

our armed forces rolling and our planes flying, is but one example of the rapidly expanding role which lead plays in the war effort. From time to time we will feature other essential war uses of lead.

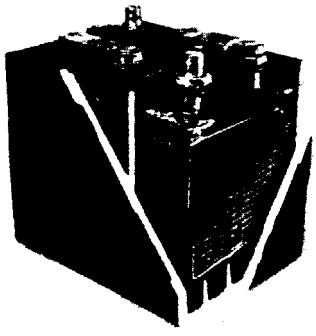
EWING GALLOWAY

← *Lead-acid storage batteries perform essential services in pursuit planes as well as bombers*

→ *Among other uses, submarines rely on storage batteries for underwater propulsion*

EWING GALLOWAY

↓ *Cross section of storage battery exposing lead plates and separators*



A lightweight storage battery specially designed for air transportation. An automatic sealing device prevents leakage during upside down flight ↓

BUY
DEFENSE SAVINGS
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At all Banks, Post Offices, and Savings and Loan Associations

Tin Shortage Demands Thorough Trial of Available Substitute Solders

TIN is an essential metal of war. It has also been an essential ingredient of soft solders for many years. Now war has cut off from America its principle source of tin supplies in the Pacific. The government, as a result, has found it necessary drastically to curtail the use of tin in many products including solder.

Solder manufacturers and users are working diligently to find suitable substitutes employing reduced amounts of tin or no tin at all. The degree of success attained can only be determined by actual use of the new solders under operating conditions. Users, however, should give them every fair chance to do the job and to see if they can not employ tin free or low tin solders. In fact it is an absolute necessity to reduce the tin in solder to the amount permitted by the government. It is a patriotic duty to try to go even farther than the government requires in the conservation of tin.

It is hardly to be expected that one new alloy or group of alloys can be quickly developed to replace the standard tin-lead combinations of the past and to do the variety of work those useful alloys have done. It is quite possible, however, that a number of new alloys can be developed, each of which will prove a suitable substitute for certain soldering operations. It may even be necessary to adapt soldering methods slightly to the new alloys.

As an example, tin-free solders containing small percentages of silver and the balance lead are now available. Users report finding these alloys satisfactory for certain kinds of soldering but have had to modify their methods somewhat. They have a considerably higher melting point than most tin-lead solders, but in many instances this is no disadvantage other than to require hotter irons or higher temperatures. In some cases the higher melting point may even be an advantage. They can not, of course, be very successfully used to join low-melting metals like lead and the plastic range is limited.

Another group consists of various combinations of lead, tin, bismuth, silver and sometimes antimony, the tin content being low. This group of alloys has a much lower melting point than the lead-silver group and a reasonable plastic range. Reports indicate they can be employed successfully for a number of purposes.

In some cases, too, solder manufacturers report that much lower tin content solders are proving satisfactory for some purposes where a higher tin content was formerly thought necessary. For instance an alloy of lead with only about 10 per cent tin and small amounts of phosphorus and other additions is being used for dip soldering operations and for tinning copper.

Study of fluxes is just as important as study of solder alloys. For instance, it will be found that some of the new solders will require different fluxes. Therefore, in trying out new solder compositions, different fluxes should also be tried if those formerly used do not prove satisfactory.

Solder users may also, by close examination of their operations, be able to reduce the amount of solder used per joint and, in some cases, the number of joints. It may be possible to substitute other methods of joining for soldering during the duration, even though this may increase cost or prove somewhat less satisfactory.

Anyone using solder, however, is urged to cooperate with manufacturers to reduce the total amount of tin used. Manufacturers will be more than glad to consult with customers along these lines and help with their particular problems. Since, at least for the present, there seems to be no one solution to all soldering problems, cooperation between manufacturers and users of solder appears to be essential so that the war aims of this country may be advanced.

The table lists some of the solders mentioned in this article and gives some of the properties they are reported to possess.

SOME AVAILABLE LOW-TIN AND TIN-FREE SOLDERS

Composition, Per Cent by Weight					*Liquidus*	*Solidus*	*Tensile Strength*	*Bond Strength of Lapped Joints*	*Spread of ½ Gr.*
Sn	*Pb*	*Ag*	*Bi*	*Sb*	*Deg. C.*	*Deg. C.*	*Lb. per Sq. In.*	*Lb. per Sq. In.*	*Sq. In.*
40	60	.....	.....	.....	238	183	5,660	6,270	1.30
.....	97.5	2.5	.....	.....	304	304	4,980	3,740	0.19
.....	95	5	.....	.....	375	304	4,915	4,340	0.20
10	90	.....	.....	.....	298	183	4,850	4,960	0.27
10	87.75	2.25	.....	.....	290*	.....	4,950	5,000	0.41
20	80	.....	.....	.....	275	183	4,940	5,680	0.37
20	78	2	.....	.....	267*	.....	5,620	5,550	0.57
30	70	.....	.....	.....	257	183	5,390	5,770	0.83
30	69	1	.....	.....	251*	.....	8,810	5,620	0.86
15	78.5	1.5	5	.....	264*	.....	4,960	5,310	0.47
15	77.5	1.5	5	1	258*	.....	8,000	5,090	0.29
20	74.85	1.5	3	0.5	258*	.....	8,120	5,380	0.39

NOTE: Bond and spread tests were made on copper sheet. Tensile tests were made on chill cast strips of the alloys.
* Determined in this investigation from cooling curves—other temperatures from literature.
Above data from Metals & Alloys, March, 1942.

Conventional 40–60 tin-lead solder is included in the table for comparative reasons.

No. 12

Early American Homes Visited by Washington

COLONIAL homes, interesting always as guides to early American culture, take on added meaning when they have been intimately associated with the great men of our nation's history. Most famous are those which were visited by George Washington during his generalship of the Revolutionary Forces or later as the first President of the United States.

Many of these homes used during the Revolution as military headquarters have since been turned into museums and, as such, are widely known. Less generally known are the private homes where Washington visited his friends and refreshed from his strenuous leadership of the American forces. Of this latter group three have been chosen for this month's Portfolio. Protected since the birth of the nation—according to available records—with pure white lead paint, these colonial dwellings have remained virtually unchanged for over a century and a half.

The Tobias Lear House built about 1740 by the grandfather of Colonel Tobias Lear, who was private secretary to General Washington for 16 years. Famous as one of the homes often visited by Washington, this Portsmouth, N. H. residence is now entering the third century, protected by pure white lead paint

DAYTON SNYDER

Built in 1773 at Elizabeth, N. J., Liberty Hall was the home of Colonial Governor William Livingston and later the home of Alexander Hamilton. General and Mrs. Washington were entertained here for the night on their way to the first Presidential Inauguration. Lasting decoration of this historical landmark is furnished by white lead and oil paint

JAMES S. CAWLEY

The Timothy Ball House, Maplewood, N. J., built in 1743 by George Washington's cousins, Timothy and Esther Ball. Of genuine colonial architecture, this house stands today almost exactly as it did two centuries ago, protected from deterioration now as in the past by pure white lead paint. At the time of the Battle of Springfield in 1780, George Washington spent many hours in this house

JAMES S. CAWLEY

THIS IS NO. 12 OF A SERIES REPRESENTATIVE OF THE MANY AMERICAN LANDMARKS IN VARIOUS SECTIONS OF THE COUNTRY THAT ARE PRESERVED FOR THE FUTURE WITH PURE WHITE LEAD AND OIL PAINT. MANY OF THEM HAVE ALWAYS BEEN PROTECTED WITH THIS RELIABLE MATERIAL ACCORDING TO AVAILABLE RECORDS.

Durability of White Lead Paint on Plaster Solves Problems of Interior Decoration

PLASTER is commonly styled with paint, yet its decoration continues to be a source of confusion among architects, painters and home owners alike. This can be largely traced to the failure to appreciate the difficulties associated with plaster mix materials as well as the erroneous conception that just any old paint, applied at any old time, will assure satisfactory results on interior surfaces. The fact is that although interior paint is not directly exposed to weathering, surface preparation and paint quality are just as important to the durability of mural treatments and maintenance economy as on siding, sash and trim. This is particularly true in the case of unseasoned plaster which contains chemicals destructive to an oil paint film as well as where exposure to dirt, grease and similar abuse requires frequent washings to maintain cleanliness and decorative beauty.

White Lead for Durability

Here is where pure white lead paint comes in. The chemical affinity of white lead for linseed oil which results in the most weather resistant film for exterior exposure likewise produces the most economical, durable coating for interior surfaces. The firm, but pliable white lead film not only eliminates the possibility of unsightly chipping and cracking but is impervious as well to dirt, grease, rouge and a myriad of other common causes for mural discoloration encountered under normal living conditions. Consequently, any stains which may result are easily removable by simple washing with soap and water.

Beware Active Alkalis

Since fresh plaster contains active alkalis which are most destructive to an oil paint film, areas to be painted should be allowed to season thoroughly before applying the priming coat. Generally several months are required for the carbon dioxide in the air to neutralize the "live" surface alkalis which not only tend to retard oxidation but also eventually "burn" through to spoil the decorative finish. Care should be taken during this period to see that the plaster is sealed against future penetration of moisture which would only serve to carry unneutralized alkali from the base to contaminate the surface behind the paint film once again. Where the plaster is found to be laid directly to the backside of the sidewall lacking a lath base, check up on all flashings and joints as possible channels for the future seepage of moisture. With normal lath construction an examination of sidewall moisture barriers should suffice to tell the story.

Wash Neutralization Possible

When it is inconvenient to wait the full time required for the "natural" seasoning of plaster, which is invariably the case in defense construction, artificial seasoning is achieved by a wash prepared by dissolving two pounds of zinc sulphate crystals in a gallon of water. Brush the solution on well and then allow the plaster to dry out thoroughly before applying the white lead primer. This may take several days, but the delay is insignificant when compared to the time required for "natural" ageing.

Paint Quality Paramount

Although surface conditioning should rightfully receive considerable emphasis in a general discussion, it is, in the final analysis, the paint itself which determines the durability and consequent economy of any decorative treatment. As a result, it is by far the safest policy to be sure that specifications require that all paint be mixed right on the job from the pure ingredients according to the proved, standard formula for each coat. "On-the-job" preparation alone gives absolute security as to paint quality and correct formulation which pay big dividends in the long run.

Limitless Color Variations

The priming coat which has proved most effective on plaster is composed of 3 parts (by volume) soft paste white lead and 4 parts lead mixing oil or lead reducing oil. Be certain that this initial coat is brushed in well to achieve complete saturation, because, unless the surface is sealed tight, oil will be drawn from the body and finish coats reducing the durability of the decorative finish.

Follow with two coats of equal parts soft paste white lead and one of the above flatting oils, brushing each out smoothly with long, even strokes to eliminate bristle lines. By the simple addition of paste colors-in-oil, a limitless number of colors and tints are readily produced. What is more, this "equal volume" mixture dries out to the dull, velvet-like finish ever popular on interiors. On the other hand, when specifications call for a gloss treatment merely substitute boiled linseed oil for the flatting vehicle in the flat finish coat. Drier is unnecessary with either boiled linseed oil or a flatting vehicle.

Installing Lead Under the New Emergency Plumbing Standards

IT is essential that everyone connected with building construction be thoroughly familiar with the materials and methods prescribed by the new emergency plumbing standards issued by the Defense Housing Coordinator. These standards, it is understood, will apply to all government construction and will be used as a basis for issuance of priorities for private defense construction. Since lead is one of the materials that may be used under the emergency standards, some suggestions are given here on adapting lead to their requirements, keeping in mind that the basic purpose of the standards is to conserve material.

In that connection it should be pointed out that if a complete lead and cast-iron job is done under the emergency standards, the saving in weight of material required may run as high as 8 per cent of that needed for the same layout done in screw pipe. Right there one advantage of using lead may be seen. Because of the flexibility of lead, the layouts may be modified to effect further savings if lead is used.

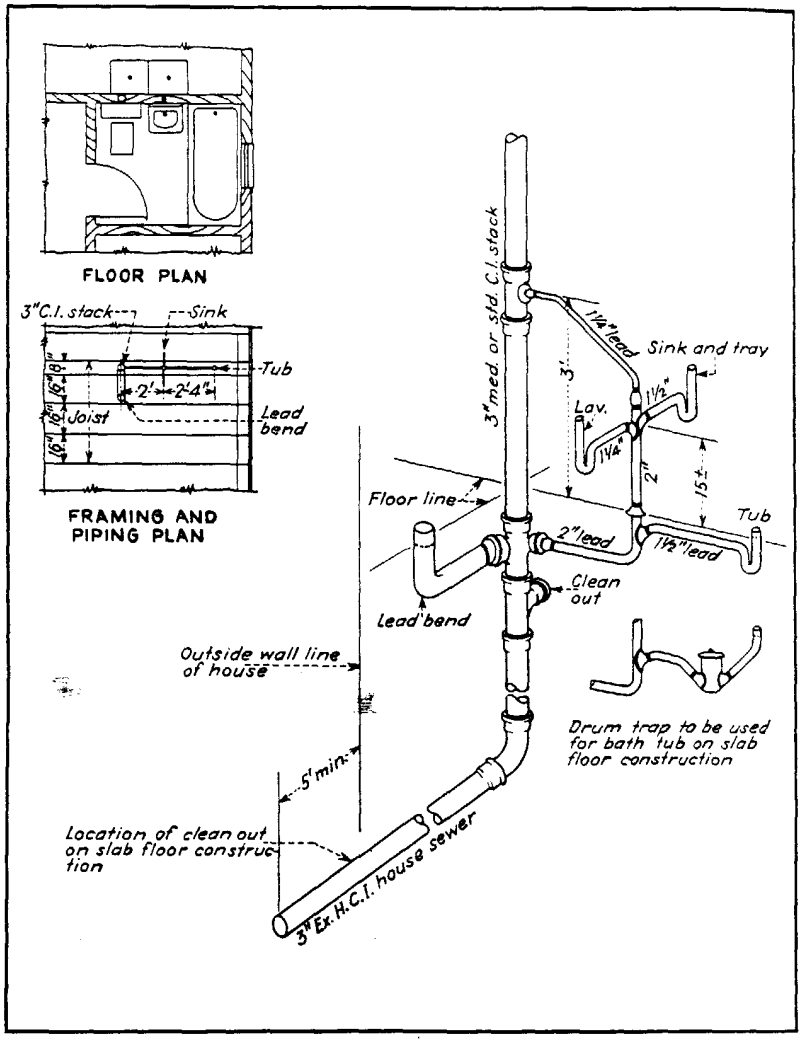
The emergency standards contemplate nine basic layouts ranging from a one-story, one-family dwelling to a three-story, three-family building. In this article the first mentioned only is discussed in full, since the principles remain the same. It is further contemplated that in lead and cast-iron jobs, lead will be used for all branch wastes and vents 2 in. and less in diameter, bends and traps, except that where a 2-in. vent runs from one story to the next, it will be run in cast iron instead of lead to avoid the necessity of additional support against sagging.

Shown in the drawing is the required rough plumbing layout for a one-family, one-story dwelling. In frame construction, to avoid cutting joists, the side outlet sanitary T is placed at a level which permits the lead bend and waste to pass just below the bottom of the joists. If the bearing joists under the partition between which the cast-iron stack passes are spaced 8 in. on centers, the vertical inlet of the lead bend will just clear the next joist when the center of the inlet is roughed in 14 in. from the finished wall. This assumes that joists, except bearing joists, have the customary spacing of 16 in. on centers.

The horizontal lead waste from the lavatory is just below the space between the bearing joists. A long outlet lead P-trap for the tub is wiped to the vertical lavatory waste above the bend, the space between the bearing joists providing room for it. The lead waste and vent, with P-trap, stubs, and ferrules wiped in, is made up on the bench to provide a 2-ft. center to center spacing between the vertical waste and vent and the stack. Thus usually only one stud will have to be bored or notched to permit the passage of the horizontal vent.

The stubs for the lavatory and combination sink and tray are at the same elevation, which is 15 to 16 in. above the finished floor. The stubs should be branched into the vertical waste with a downward sweep. Long outlet lead P-trap is used to rough-in for the bathtub to save a joint.

There are several ways of saving material by using lead on this installation. As the drawing shows, the branch vent may be run directly from



a point just above the fixture to the stack by giving it two 45 deg. bends. This saves 6 or 8 in. of pipe as compared with a vent run all the way up vertically and then horizontally to the stack with a 90 deg. bend. Also instead of using the customary 4-in. lead bend for the water closet with a 3 x 4 x 2-in. side outlet sanitary T, either a 4 x 3-in. lead reducing bend or 3-in. lead bend expanded at the inlet to fit the closet and floor flange by the plumber may be used. This saves cast iron by making a 3 x 3 x 2-in. side outlet sanitary T possible and saves brass by requiring only a 3-in. ferrule. If an expanded 3-in. bend is used, however, the plumber must be extremely careful not to thin the walls.

Although the foregoing discussion has mentioned only the P-trap, lead drum traps may also be used under the new standards.

Paste White Lead Enhances White Oak Desk and Panels

MOST of us are inclined to think of white lead only as a good dependable paint material, serviceable but not very versatile. We use it as a matter of course on the outside of our homes and on the walls of our rooms but when we want to finish a piece of furniture we usually turn to varnishes or lacquers. However, a smart bleached wood effect can be produced by the use of white lead and wax in a very simple process and with no other tools than a brush and a few pieces of rag.

R. Doulton Stott, architect and industrial designer, specializing in plastics, took advantage of the decorative possibilities of wood finished in this manner when he planned his new office in New York. He has made effective use of the texture and color of natural wood as a foil for the sheen and brilliance of plastics and glass. The accompanying photograph shows the reception room of his suite where the furniture and lower wall panels are of riff sawn white oak which have been rubbed down with pure white lead paste. In this case, the white lead has been rather thoroughly rubbed off the surface, leaving only the voids in the grain of the wood showing white where they are filled with the lead. The result is a warm light tan color with the pattern of the grain of the wood showing as a delicate texture. More of a bleached wood effect may be obtained by leaving more white lead on the surface but care must be exercised to keep the color uniform, especially on a large surface. A coat of paste wax completes the process and an occasional waxing and polishing is all that is needed to keep the finish in perfect condition.

Reception alcove in the New York Office of R. Doulton Stott where desk and paneling are treated with paste white lead

While this sort of finish is more striking when used on the more open grain type of hardwoods, it can be used effectively on walnut and birch and especially on mahogany, both true and Philippine.

Of course, using white lead in this manner is more or less a trick but it is a good trick to know and shows what can be done by clever hands with the simple plain materials that are always readily available.

"Waste Not, Want Not" for Lead

"WASTE not, want not" is an old adage that applies particularly in the present critical times and architects, contractors, plumbers and sheet metal workers as well as others dependent upon lead can apply it with benefit to themselves and the country. The supply of lead has been more plentiful in relation to war needs than that of most metals. All war demands are being taken care of and, in addition, a large part of civilian needs. Nevertheless more lead could be used for civilian purposes. For that reason mine production of lead is on the increase. While that is the principal source of lead, a vast tonnage equal to a third or more of the mine production is derived from secondary sources such as old storage batteries, sheathing of removed cables, pipe, solder joints, foil and other lead products that for one reason or another have outlived their usefulness.

Everyone can help to see that this secondary source is maintained at a maximum throughout the war and thus aid builders, plumbers and others who use lead to get enough for their requirements. Architects should specify lead wherever essential to health and secure construction, but should keep in mind, at the same time, supply limitations. Builders, plumbers and sheet metal workers should see that all old lead products for which they have no use are sold to waste material dealers, who in turn return it to the lead refineries where, by proper processing, it can be brought back to the high degree of purity reuired in lead products meeting the Commercial and Lead Industries Association Standards. Every lead craftsman should immediately scour his shop for any such material and dispose of it. He should also see that he doesn't allow such material to collect uselessly in his shop in the future. Every pound of lead should be kept working all the time.

In addition such sources of lead as foil wrappers from cigarette, tea and other packages should be disposed of in the same way. Empty shaving cream and other collapsible tubes are sources of both lead and tin.

There are other things you can do to make the lead supply go as far as possible. While using lead for every purpose for which it is intended, avoid waste as far as possible. Craftsmen, suppliers and dealers in lead and lead products should avoid excessive stocks or "hoarding" of new lead products. They should only stock what they need to keep their businesses running smoothly.

Finally we urge everyone to "waste not, want not" so that all essential lead requirements may be filled. We have suggested here a few ways of helping your country and yourself. The savings you make may seem small, but remember that there are thousands of users and suppliers throughout the country and that in the aggregate they might save many tons of lead. The few pounds of lead you save may make the bullets which save an American life, the storage battery in an American bomber, or the plumbing that will keep a defense worker healthy and happy.

The following articles and reprints contain information, drawings and specifications on the use of lead products helpful to architects, engineers and others in the construction industry. They are available, free of charge, upon request to the Lead Industries Association, 420 Lexington Avenue, New York City.

WHAT TO EXPECT FROM WHITE LEAD PAINT

An attractive 28-page booklet with charts, formulas, and mixing instructions covering some of the problems of painting and how white lead meets these problems.

PAINTING YOUR HOME by Dr. F. L. Browne, Senior Chemist, Forests Products Laboratory, Madison, Wisc.

A discussion of house painting reprinted from American Forests, May, 1939.

SOME PAINTING PROBLEMS AND THE ANSWERS

By Dr. F. L. Browne, Senior Chemist, Forests Products Laboratory, Madison, Wisc.

Reprinted from the National Real Estate Journal, Sept., 1939.

STAMFORD'S DOUBLE LIFETIME HOME

A complete analysis of hard lead flashing, white lead paint, lead plumbing, plywood and red cedar Certigrade shingle details and installation methods. Reprinted from the American Builder, July, 1939.

SHEET LEAD INSTALLATION DETAILS

A detailed analysis of the principles and application of lead flashing and sheet lead work for small homes. Reprinted from Sheet Metal Worker, June, 1939.

BRUSH UP ON YOUR PAINTING

A practical article on the selection and application of paint reprinted from House Beautiful, June, 1941.

LASTING LEADWORK IN MODERN PLUMBING

By T. N. Thompson, Technical Editor, Plumbing and Heating Journal.

Reprinted from Plumbing and Heating Journal, Feb., 1939.

HOW LUMBER AND PAINT KEEP YOUR HOME ALWAYS IN STYLE

A brief digest of the advantages of painted lumber homes with color-styling suggestions and other interesting information.

COMMERCIAL STANDARDS:

Calking Lead, CS94-41
Lead Pipe, CS95-41
Lead Traps and Bends, CS96-41

Official publications by the Government Printing Office of the above Commercial Standards as promulgated by the U. S. Department of Commerce through the National Bureau of Standards, effective June 25, 1941.

NEW SIMPLIFIED STANDARD FOR LEAD TRAPS AND BENDS

File size leaflet with new standards for lead traps and bends as well as existing standards for lead pipe and calking lead, and other informative data.

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BY PUBLISHERS PRINTING COMPANY
NEW YORK CITY