The Sperry Electrolytic White Lead Process

A TECHNICAL DESCRIPTION

THE Sperry electrolytic cell as operated to produce white lead consists of a concrete cell in which are suspended lead anodes and insoluble iron cathodes. The cathodes are encased in porous fabric envelopes which act as diaphragms, separating the electrodes. Through the compartment formed by the fabric envelope surrounding the cathode is circulated the catholyte. This electrolyte contains sodium acetate and a large amount of sodium carbonate. The cell tank is filled with the anolyte which circulates around the submerged anodes and the outer surface of the diaphragm.

The anolyte contains sodium acetate and only a trace of sodium carbonate. Each electrolyte is maintained in rapid circulation about its electrode. The circulation systems of the two electrolytes are entirely independent, and no communication exists between the catholyte and anolyte save through the diaphragm of the cell.

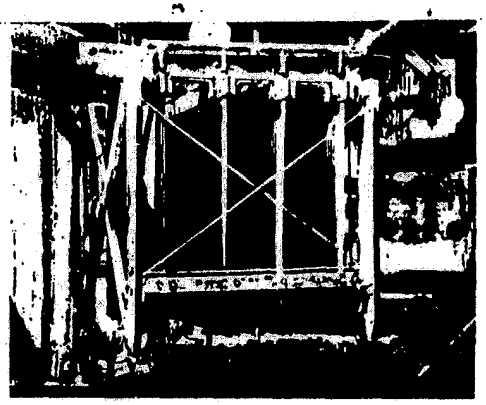
The cell is placed in operation by passing direct current through the cell. Carbonate and hydroxide ions migrate under the influence of the current from the catholyte through the diaphragm to the anolyte; at the same time electrochemical equivalent amounts of lead ions dissolve from the surface of the lead anodes and pass momentarily into solution in the anolyte. Since the anions are more mobile than the cations the plane in which the ions meet is quite close to the surface of the anode. In this plane precipitation takes place, and white lead is formed. Due to a slight seepage of catholyte through the diaphragm the anions are transferred to the anolyte in amounts in excess of the reaction requirements. This results in complete precipitation of the lead ions dissolved from the anode.

The continuous flow of anolyte removes the white lead from the cell as fast as it is formed. From the cell the anolyte flows to a settler where the white lead is removed and the clean overflow from the settlers is returned continuously to the cell. The catholyte in its circulation external to the cell is carbonated to replenish the carbonate ions and neutralize excessive hydroxide ions formed at surface of the cathode.

The settled white lead is removed continuously from the bottom of the settler to a filter where it passes through a countercurrent washing cycle to remove and recover the anolyte solution. The washed white lead pulp is dried, ground and air floated, and is then barrelled in a dry pulverent form.

A study of the cell reactions indicates that the formula for white lead should be written $Pb(CO_3PbOH)_2$ and that this compound is formed through the reactions of the intermediate compounds $Pb(CO_3H)_2$ and $Pb(OH)_2$. The outstanding characteristics of electrolytic white lead—exceptional purity, brilliant whiteness and uniformity—are due to the ease with which cell reactions can be controlled and to the fact that in the cell only the lead is dissolved from the surface of the lead anode, other metals remaining on the anode surface in the form of a slime.

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Remaining chemicals are washed out on a suction filter.

The removal of impurities by the Sperry process described, explains why only Anaconda offers the trade a white lead pigment, pure white in color. Such a white pigment, when mixed with colors gives true tones of the basic color; hence, brilliant colors that please.

The white lead is settled out and washed on a suction filter. The wash solutions are pulled through the mass of white lead which adheres to the filter leaves.

This vacuum washing completely removes the chemicals used in making the white lead and leaves what is called a washed pulp.

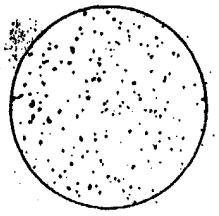


Photo-micrograph of Anaconda White Lead showing extreme uniformity of particles.



Loaded suction filter.



This rotary filter completes the washing and removes most of the water.

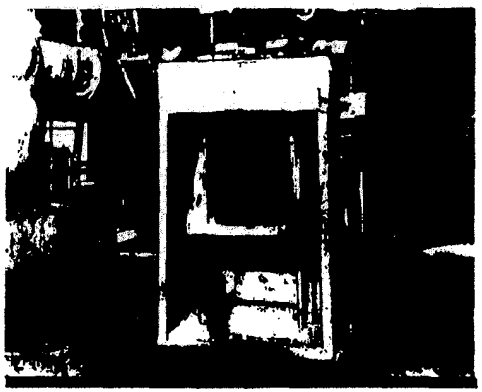
Being precipitated chemically, the white lead is extremely fine. Anaconda White Lead is so fine that 99% will pass through a 325 mesh screen, leaving less than 1% on the surface. A rotary filter completes the washing and removes all but 30% of the water. The filter cake is now in the form of a very sticky mass much like a heavy wet clay.

To maintain its whiteness and protect it from contamination by dirt in the air, it is dried beneath a hood on a metal hearth plate heated by steam.

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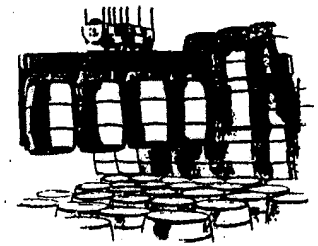
To maintain purity and whiteness, the white lead is dried on covered, heated hearth plates. Left: Discharge end. Right: Feed end.



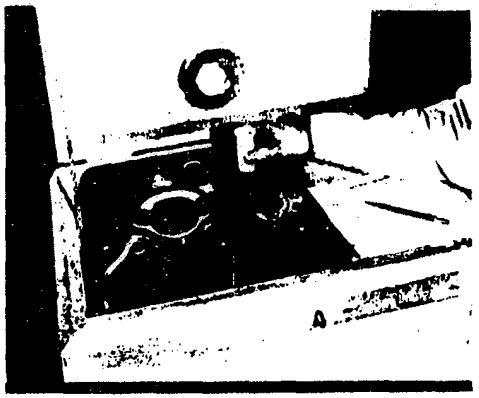
Ground to a fine powder, the white lead is immediately barrelled.

The mass is moved along, broken up and stirred by a rabble mechanism that finally discharges it dry after an hour or so of treatment.

In order to break up the lumps that form in drying, the product is put through a grinding process that crushes it to a fine powder and lifts the dust formed in an air stream some 18 feet high, thus insuring a product both uniform and very fine.



Barrels are placed in storage four at a time.

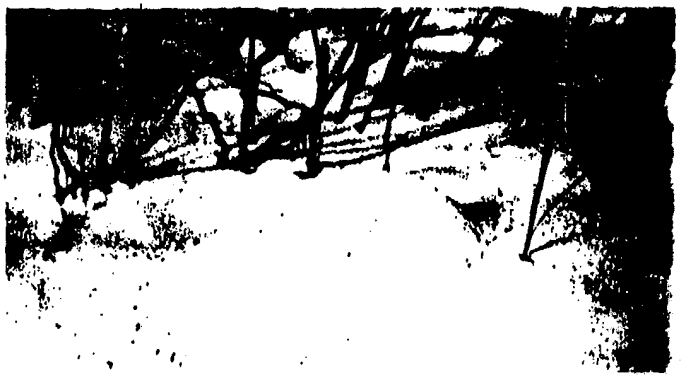


Testing the dryness of Anaconda White Lead.

ANACONDA WHITE LEAD *is dried to three-tenths of one* percent, practically all moisture having been eliminated before grinding. The product is then barrelled.

This is the dry white lead of commerce used in the manufacture of high-grade mixed paints and also ground into Anaconda *Lead-in-Oil.*

Unretouched photo of the relative whiteness of Anaconda White Lead and new-fallen snow.



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Dry white lead is being mixed with pure linseed oil—

Anaconda Lead-In-Oil

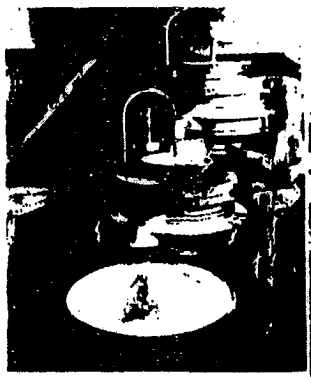
Dry white lead is mixed with pure linseed oil of the very finest quality and double ground between stone wheels to insure the incorporation of all of the white lead in the oil. Because of the heat generated, the mills are water cooled.

The ground lead-in-oil is then placed in Anaconda's modern containers, weighed and sealed.

Anaconda Lead-In-Oil is easy to mix. No hours of stirring are necessary to mix settled pigments.

The particles in different white leads vary considerably in size and shape. The particles in Anaconda White Lead are properly balanced in size and number to permit perfect incorporation in linseed oil, assuring smooth brushing and good levelling. Fineness makes for better covering and hiding, producing an all-round paint of highest quality.

Due to the absence of impurities, Anaconda produces whiter whites. Anaconda White Lead will actually make a white spot on ordinary white lead.



— and double ground between stone wheels (above).



Right: Sealing the familiar Anaconda White Lead containers.

Its true white color permits cleaner tints that are strikingly brilliant. The pure white base, to which the tint is added, does not have the slightly muddy cast that is present in ordinary lead. Anaconda Lead-In-Oil weathers by a slow chalking process. It produces a film that will last for years and one that washes itself clean as it ages.

Inside or out, Anaconda White Lead surpasses as a decorative medium, yet costs no more.

Employ a good painter. He knows the different woods and how to treat the surface before applying paint. Then insist that he use Anaconda White Lead-In-Oil.

Anaconda White Lead-In-Oil is sold by leading paint and hardware stores and lumber yards. When you select paint, be sure to specify Anaconda.

INTERNATIONAL SMELTING AND REFINING COMPANY

PIGMENT DIVISION . . . EAST CHICAGO, IND.

Subsidiary of Anaconda Copper Mining Company

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