

A BRIEF HISTORY OF THE OLD DUTCH PROCESS OF CORRODING LEAD
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The method employed in England and in the United States in the production of white lead, except for a limited amount, is that known as the "Dutch Process" In other words the Dutch are generally credited with the discovery of this successful method though this contention is disputed by many. For instance, in an old Roman work written about 300 B.C., we find the following, "Lead is placed in earthen vessels over sharp vinegar, and after it has acquired some thickness of a sort of rust, which it does in about ten days, they open the vessel and scrape it off." There are many references which could be quoted to show that lead was manufactured in many other countries of Europe prior to the period usually referred to for the establishment of the industry in Holland, i. e., the sixteenth century.

When metallic lead is exposed to the action of the air and moisture it becomes covered with a white substance composed of carbonate and hydrated protoxide of lead, which is the white lead of commerce. By the Dutch process white lead is produced by artificially creating these conditions and submitting metallic lead to the corroding effects of a warm atmosphere loaded with the vapors of carbon dioxide (carbonic acid gas) of acetic acid and of steam. The indications are that the chemical process in the corrosion of lead by the Dutch process involves at the start the oxidation of the lead and the formation of basic lead acetate; that is, basic lead acetate is decomposed by the carbon dioxide present, the basic lead being precipitated as white lead, and the neutral acetate again acting on more metallic lead is changed into the basic form ready to be acted upon again by the carbon dioxide, and so continuing as long as all the conditions requisite are present. Let this suffice for the chemical process which is undergone by the metallic lead and pass on to the method of handling the lead in the corroding stacks.

Quoting from an old work, we have the following as the method used in Rotterdam and Amsterdam: "The lead was first cast in thin sheets, which were rolled in a spiral and placed in earthen pots seven to eight inches high and four to five inches in diameter, made wider at the top than at the bottom. To prevent the lead from falling to the bottom they placed inside the pot, and at about one-third of its depth, a piece of wood cut the length of the diameter of the pot. This was the Rotterdam method. At Amsterdam the manufacturers had moulded in the inside of the pot, and at about one-third its height, three little points which served instead of the wood to support the lead. The stacks were built in one range of four, each being fifteen feet square. After the pots had been filled up to an indicated point with vinegar, and the spiral lead placed in position in each pot, they were arranged in rows in the stack upon a bed of dung four feet thick; the pots were placed together as closely as possible, and when the bed was covered with the pots, plates of lead were laid upon them and the whole layer covered with boards. These boards were then covered with dung and another tier of pots placed as before, filled with vinegar and lead and covered in the same manner. This was repeated until five tiers or layers were built up. The lead was left in the stacks from four to five weeks, according, Jars says, "to the season and the quality of the dung." This method, in so far as corroding is concerned, is virtually the same as is in use today, except that spent tanbark (bark which has been used in tanning operations) is used in place of manure, a flat lead plate (called a buckle) instead of a rolled sheet, and the further fact that the thermometer and ventilating pipe play an important part in the handling of the stacks of today.

The process of today is as follows: A bed of tanbark of say fourteen inches depth is spread in what is called a stack. Upon this bed of bark are set in even rows hundreds of corroding pots. In the bottom of each pot is placed about a pint of $2\frac{1}{2}\%$ acetic acid. The pot is then filled to the top with lead buckles, each of which weighs about three-quarters of a pound. When the entire space is filled, except for a tan wall on four

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sides, a ventilating pipe with a two-inch hole in the top is placed in position at or about the center and the whole surface is covered with a layer of boards. Upon the boards is placed another layer of tanbark, then more pots, acid and lead, and so on until the stack is filled to its limit, and the stack is then finished and ready to be manipulated by the corroder. The hole in the top of each vent pipe is provided with a small pear-shaped button, which is used to regulate the flow of the vapor from each bed, as the temperature is indicated by the thermometer and as the judgment of the corroder indicates. When the beds are closed, heat is generated by slow combustion in the tanbark, and at the same time oxidation takes place. The heat also evaporates the acetic acid, which attacks the lead oxide and forms a basic acetate of lead, which, when combined with the carbonic acid gas generated by the ~~fast~~ combustion in the tanbark, forms what is known as the white lead of commerce. The process requires approximately one hundred and twenty days from start to finish, or from the time of starting to put the lead in until it has all been taken out.

The results as to the percentage of lead corroded and the percentage of increase in weight vary in nearly every stack. The former is likely to be anywhere from 70 to 100 per cent, and I venture to say that year in and year out the average of all factories will not show over an 80 per cent corrosion. The increase does not vary greatly and it will be found that for every one hundred pounds of metal corroded there will be taken out from one hundred and twenty-four to one hundred and twenty-six pounds, or an increase of 24 to 26 per cent.

This ends the first step in the process, and all that remains is to put the lead in proper shape for the market. To do this the lead is first passed through a system of screens and rolls so that all metallic lead may be taken out; it then passes over to where it is put into water in order to pass it on to the mills to be ground to a proper degree of fineness and then pumped to a washing and floating system. The lead must be thoroughly washed to take out the acetic acid which remains in the lead from the process of corrosion. There then remains only to take out any tanbark which may have dropped in with the lead, settle out the coarse parts to be reground and float on the fine particles to the settling system, from whence it is pumped on to dry pans and the water evaporated. We then have our strictly pure dry white lead, ready to be pulverized, packed in barrels and sent to our various plants or ground in oil and sent into the market.