UNITED STATES PATENT OFFICE.

GEORGE HAND SMITH, OF ROCHESTER, NEW YORK.

MANUFACTURE OF WHITE LEAD.

SPECIFICATION forming part of Letters Patent No. 303,278, dated August 12, 1884.

Application filed June 3, 1884. (No specimens.)

To all whom it may concern:

Be it known that I, GEORGE HAND SMITH, of Rochester, in the county of Monroe, in the State of New York, a citizen of the United States of America, temporarily residing at London, in the county of Middlesex, England, doctor of medicine, have invented certain new and useful Improvements in the Manufacture of White Lead; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in the manufacture of white lead of commerce by which I am enabled to effect a more efficient treatment of the constituent elements by keeping them under better control and to effect their more effectual combination with the aid of suitable apparatus adapted to facilitate such chemical action with more rapid production of white lead of a good marketable quality, like in character to that produced by the well-known Dutch or Anglo-Dutch process.

The object of the improvements is to obtain as nearly as may be those conditions most favorable to combination of the elements conducive to the production of the white lead which exist in the aforesaid Dutch process, while avoiding or dispensing with the employment of the objectionable and uncertain bark, spent tan, or other decomposing heap or stack of material employed in that process for generating the moisture, heat, and carbonic acid employed in the reaction. This I effect by conducting the improved operation on the lead in a suitable chamber or vessel or chambers or vessels in which such lead in the "blue" or metallic state with the other elements necessary to effecting the combination desired, are brought in contact, and thereby effect the corrosion or decomposition of that metallic lead which shall result in the production of the white lead.

In carrying out the improvements, I take metallic lead which has previously been perforated, or formed into sheets with perforations, or other suitable forms, or disintegrated in any suitable manner best adapted to facilitate superficial exposure of the metallic or blue lead to the action of the corrosive agents, and this lead I then arrange in layers or series permitting of free circulation of the gaseous and vaporous elements throughout them, so as to favor combination within a chamber or vessel made of non-conducting materials or otherwise so constructed as to prevent radiation or conduction away, and consequent loss of heat, from the same, as far as possible. By constructing this chamber with non-conducting inclosing-casing I am enabled to maintain therein with greater certainty and economy any desired temperature for a prolonged period. Into this chamber or vessel so constructed, and containing the metallic lead to be treated arranged in suitable layers, I introduce a mixture of air and carbonic-acid gas, in suitable proportions relatively, for effecting the desired corrosion or decomposition of the lead. This mixture of air and gas is, before being introduced to the chamber containing the lead, first heated by any convenient means to a suitable temperature, and then passed next through a vessel, which I call a "saturator" also heated by the heating means which heats the operating-chamber, and containing and adapted to give off liquid to such mixture in the form of vapor; and, finally, this mixture of air and gas, now charged or saturated with aqueous vapor and acetic acid also provided in this chamber when required, is conducted into the operating-chamber to act on the lead therein. The temperature at which this operation may be effected can be varied within a considerable range; but I have had good results when employing a temperature of from about 120° to 140° Fahrenheit. If desired, the acetic acid, diluted with water, may be introduced into the corroding-chambers by means of a tray or other suitable containing-vessel. Under these conditions white lead is produced; but I find in practice that, by first supplying these gases thus saturated at a slight but definite pressure before introduction into the lead-operating chamber, and then permitting them to expand therein, whereby these gases are more effectually saturated with moisture when within the chamber or vessel in the presence of the lead, a greatly-increased chemical action is set up, resulting in an increased production of white lead.

I employ any suitable method of production

of carbonic-acid gas—such as by the action of hydrochloric acid upon chalk, or by the combustion of coke, or of a mixture of coke and chalk, and subsequent purification, or other well-known agency may be employed.

The resulting gas or mixture of gases mixed with the proper proportion of air may be stored in a suitable reservoir or gasometer, and then supplied to and caused to pass through a suitable saturator kept at a heat of a desired temperature, so as to cause such gaseous mixture to become saturated or charged with moisture from liquid contained in that saturator, consisting of water or water and acetic acid.

Pumps or other suitable forcing means may be employed to cause the flow of the gaseous mixture through the apparatus, and pressure and heat may be given to the said gases in the saturator, and to be maintained until the same is permitted to enter the lead-containing chamber, by means of suitable conduits. The moisture-laden gaseous mixture on entering the operating-chamber becomes released from pressure, inducing a condition of such atmosphere most favorable to the production of the white lead.

One form of saturator which I employ consists of a shallow, oblong, closed box or chamber of copper or other suitable material adapted to resist corrosion, provided with inlet and outlet pipes at opposite ends, or so arranged as to insure the fullest possible saturating action of the moisture from the contained water or water and acetic acid, the dispersion thereof into the passing air and gas being aided by a series of diaphragms or sheets of porous material—such as cotton cloth or other suitable substance—adapted to hold suspended the liquid, while offering little resistance to the flow of the gaseous fluid through them in a heated state favorable to such absorption.

Steam may be employed for the saturation of the gases, but care should be taken to prevent the admission into the lead-containing chamber of excessive condensed moisture, to the detriment of satisfactory action.

The lead containing chamber I form of metal or other suitable material capable of being heated to and maintained at the same temperature as that of the gases issuing from the saturator, and conveyed to such lead-chamber. Radiation or loss of heat from these chambers where the operation upon the lead, and also those employed for effecting the saturation, may be prevented; or the heat therein may be efficiently controlled by inclosing those chambers with other surrounding walls, or with intervening cells or spaces, so that air or gaseous fluid or vapor heated to the desired temperature may be supplied to and retained in them.

According to another modification, I employ chambers or vessels made of non-conducting materials—such as wood or wood and felt or other heat-retaining medium.

The heat for the lead-containing chamber may be obtained by the passage therethrough of heated gases; or this heat may be supplied by means of a water bath deriving its heat in turn from gas-jets or other source of heat; or the heat from the passing gases in that chamber may be supplemented by the aid of steam-pipes or hot-air tubes or other suitable means.

The time of treatment required will necessarily depend upon the thickness or relative surface exposed of a given quantity of lead operated upon, and the strength of the acetic-acid solution may also vary somewhat; but I have obtained good results when using acetic acid in the saturator mixed with water in the proportion of seventy-five one-hundredths per cent. of acetic acid; but when used in the lead-operating chamber, the strength of that solution may be somewhat greater.

The air and the carbonic acid gas employed may be saturated separately with the required vapor and acetic acid, and then allowed to mix in the operating-chamber or corroding-vessel. When preferred, dilute nitric acid may be employed instead of acetic acid; or dilute nitric acid mixed with acetic acid may be so employed.

It will be perceived from the above, that my method of manufacture is under very different conditions from the ordinary methods, as I do not introduce any spray or jets.

I claim—

The process, substantially as described, of manufacturing white-lead, consisting in submitting metallic or blue lead while in a closed chamber to the corroding action of acid, vapor, and air introduced in regulated quantity and proportions under the conditions of temature and of outside pressure, as set forth, whereby uniformity in said proportions, temperature, and pressure may be sustained.

In testimony whereof I affix my signature in the presence of two witnesses.

GEORGE HAND SMITH.

Witnesses:
E. MEIGS SMITH,
ALFRED DONNISON.