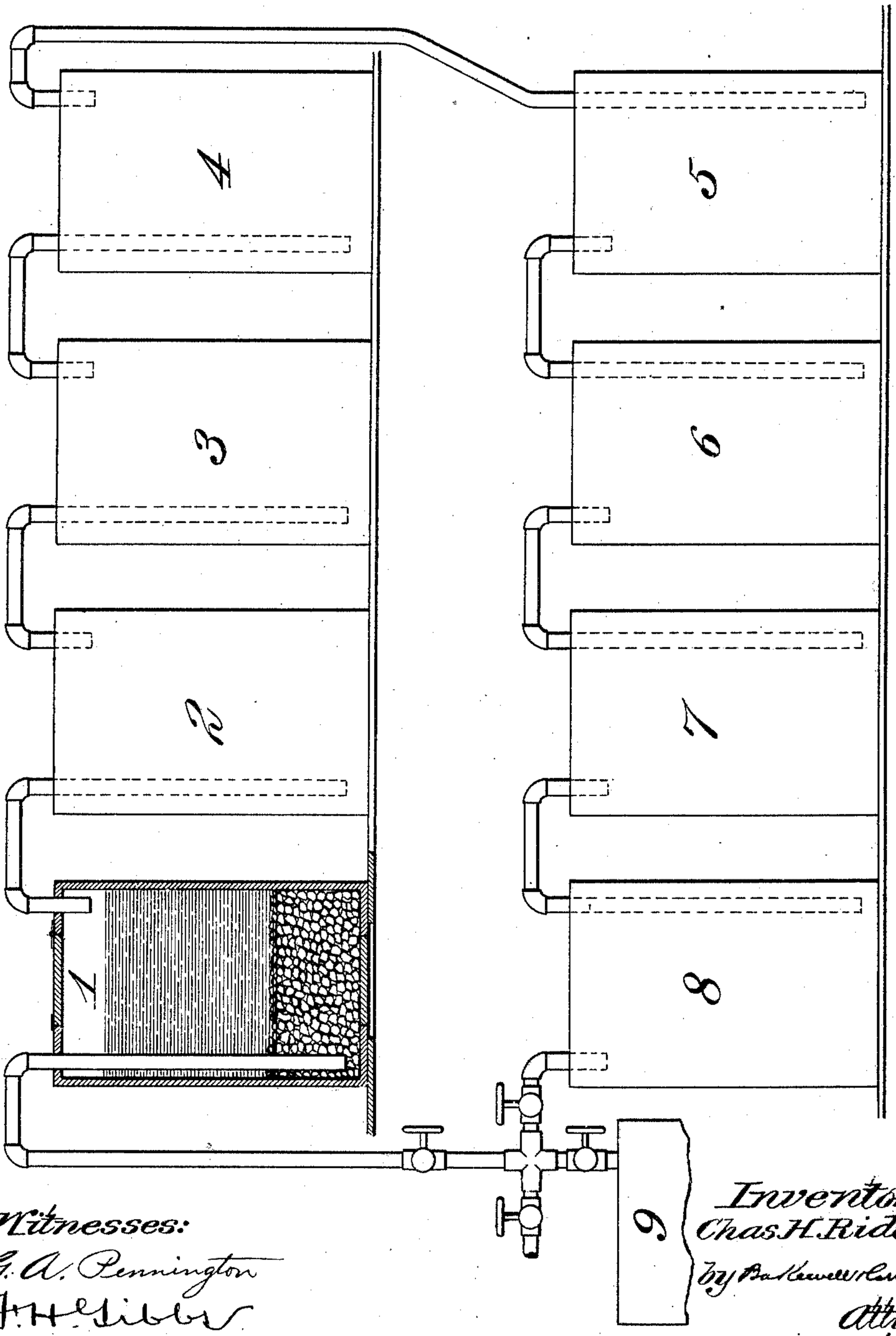
No. 759,192. PATENTED MAY 3, 1904.

C. H. RIDER.

PROCESS OF TREATING LEAD BEARING ORES.

APPLICATION FILED MAR. 19, 1903.

NO MODEL.



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No. 759,192. Patented May 3, 1904.

UNITED STATES PATENT OFFICE.

CHARLES H. RIDER, OF ST. LOUIS, MISSOURI.

PROCESS OF TREATING LEAD-BEARING ORES.

SPECIFICATION forming part of Letters Patent No. 759,192, dated May 3, 1904.

Original application filed May 22, 1902, Serial No. 108,519. Divided and this application filed March 19, 1903. Serial No. 148,571. (No specimens.)

To all whom it may concern:

Be it known that I, CHARLES H. RIDER, a citizen of the United States, residing at St. Louis, Missouri, have invented a certain new and useful Improvement in Processes of Treating Lead-Bearing Ores, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification.

This application is a division from an application filed by me May 22, 1902, Serial No. 108,519, for process of treating ores.

This invention relates to a new and useful process of extracting lead from its ores, the object being to extract such metal in the form of white lead ready for the market; and it consists in the hereinafter-described process wherein the steps necessary to carrying out my invention are specifically enumerated and illustrated in connection with the accompanying drawing, wherein is illustrated an apparatus adapted to the successful operation thereof.

Another object of the improved process is to recover the extracting and precipitating agents for repeated use in carrying on my process.

In the drawing I have shown an apparatus for working my improved process, the same in this instance consisting of eight tanks, numbered, respectively, from 1 to 8, inclusive, said tanks being connected by pipes running from the top of one of them down into the bottom of the next adjacent tank of higher order. These tanks are constructed of wood and made so as to be preferably air-tight by the use of rubber placed under a removable cover arranged in the top wall thereof and a dumping-door being arranged in the bottom thereof. Openings are also provided whereby the resultant liquid in the tanks may be racked or drawn off. In general operation the ore after being finely pulverized is placed in tanks 1 to 4, inclusive, and the dissolving solution added through the opening in the top, said opening being subsequently closed. The action of the chemicals on the pulverized ore causes a steady and rapid flow of gas from the top of one tank to the bottom of the next adjacent tank of higher order, which results in keeping the ore constantly in motion until all the soluble matter is decomposed, which is effected usually in from ten to twelve hours. This agitation of the ore effects a quicker decomposition than would be possible if the ore was permitted to lie in a quiescent state in the bottoms of the several tanks. After the decomposition referred to sufficient time is allowed for the solid matter to settle, and the clear fluid is drawn off and placed in tanks 5 to 8. The residue in tanks 1 to 4 is preferably washed with clear water and allowed to settle, after which the water is transferred to the clear fluid. The residue in tanks 1 to 4 in the form of sulfur, silica, or earthy matter is discharged through the openings in the bottoms of the respective tanks. For the sake of description I will term tanks 5 to 8 the "precipitating-tanks," into which the clear solution from tanks 1 to 4 is placed in following the first step of my process. The second step consists in recharging the first four tanks and repeating the operation above described, the resultant gases produced thereby being carried through the precipitating-tanks for the purpose of agitating the fluid after the proper precipitating reagent has been added thereto. This agitation of the contents in the precipitating-tanks hastens this operation, and in most cases the gases coming over from the decomposing-tanks supply some necessary element or elements required. In this manner the process of manufacturing carbonates, hydrates, &c., is cheapened.

In order to illustrate my improved process as used in the production of white lead, I will assume that the lead ore to be treated is a sulfid ground to pass through a twenty to forty mesh screen. A charge of five hundred pounds is added to each of the tanks 1 to 4 (which we will hereinafter call "ore-tanks") and a solution composed of water, one hundred gallons, and commercial nitric acid, twenty gallons. The covers of tanks 1 to 4 should be closed tightly upon the introduction of this solution, as N_2O_4 gas is generated immediately, and in passing over into the next tank the contents

are kept in constant motion until the metallic elements are completely dissolved. During this first operation tanks 5 to 8, inclusive, should be partly filled with water, and the pipe leading from the end of tank 8 should connect with a gas-receiver 9. During the operation of dissolving the ore the stop-cocks at the left should be adjusted so as to permit all the gas passing out of tank 8 to enter the gas-receiver 9. In ore of the character above described the metallic elements are usually completely dissolved in from ten to twelve hours. After the above operation the water from tanks 5 to 8 should be removed to a proper receptacle. This water is to be used in making the solution containing nitric acid. With a siphon draw off from tanks 1 to 4 the clear solution containing the metallic elements and place in tanks 5 to 8. Add to the residue in tanks 1 to 4 about ten gallons of pure water to each tank. After this solution has become clear remove by siphon and add to corresponding tanks 5 to 8. Remove the residue containing the insoluble matter and the precipitated sulfur through the bottom openings provided for that purpose. Now charge again tanks 1 to 4, as previously described, with the exception of adding the solution. Add to tanks 5 to 8 a saturated solution of sodium carbonate until the precipitate is distinctly visible and which does not redissolve after standing four or five minutes. Close these tanks, then add the dissolving solution, commencing with tank 1, and add as quickly as possible the solution to tanks 1 to 4 successively, closing each tank tightly before proceeding to the next. Adjust the gas-pipe to the gas-receiver 9, as previously described. As soon as the fluids in the tanks have become quiet allow to settle for from two to three hours or until such time as the solution becomes clear, which may be ascertained by carefully closing the pipe leading to the gas-receiver and opening tank 8. If the solution in tank 8 is found to be clear, it is best to remove a small quantity of the fluid and add a few drops of the previously-prepared saturated solution of sodium carbonate for the purpose of testing it, and if no precipitate appears it is evident that the lead has all been precipitated and will be found in the bottom of the tank. Should this test show a precipitate, open up tanks 7, 6, and 5 and add more of the sodium-carbonate solution, a small quantity at a time, until it fails to give a precipitate, thus indicating the complete precipitation of the lead. Now draw off the clear solution from tanks 5 to 8 in a proper receptacle, add about ten gallons of clear water to each tank, allow to settle, and draw this solution off into the same receptacle. The precipitated white lead may now be removed by the openings at bottoms of the tanks provided for that purpose. Place the precipitate in a drying-oven which is kept at a temperature of about 100° centigrade. After the white lead has become dry it is ready for market. The solution left after precipitating the white lead is to be used again to replace in part the dissolving fluid in the next run.

I have found by actual working of the process that by confinement of all the elements in a solid, liquid, or gaseous state during the chemical changes the power of the chemical action in dissolving and precipitating the metal is increased fully five hundred per cent. This, together with the reproduction of a number of compounds and the saving in fuel, labor, &c., and avoiding all danger of escaping gases, which tend to destroy life, especially in the processes at present employed in the production of white lead, makes this an exceedingly safe and cheap process.

This process gives a perfectly-pure white lead ready for the market and, produced direct from the sulfid ore, does not contain a trace of sulfur. The residue, however, in ore-tanks is nearly pure sulfur, providing the lead ore is of a high grade. This residue is a valuable product to be used in the manufacture of sulfuric acid.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The hereinbefore-described process of manufacturing white lead from lead ores, comprising the following steps: viz., crushing the ore, charging a series of receptacles with said crushed ore, adding thereto a suitable solvent, in liquid form, causing circulation of the gases generated thereby through said series of receptacles, removing the solution thus produced to a second series of receptacles, adding a precipitating reagent, recharging the first series of receptacles with ore and solvent fluid, and coupling the two series of receptacles to cause gases generated in the first series to circulate through the second series; substantially as described.

2. The hereinbefore-described process of manufacturing white lead from lead ores, comprising the following steps: viz., crushing the ore, charging a series of receptacles with said crushed ore, adding thereto a suitable solvent in liquid form, causing circulation of the gases generated thereby through said series of receptacles, removing the solution thus produced to a second series of receptacles, adding a precipitating reagent, recharging the first series of receptacles with ore and solvent fluid, coupling the two series of receptacles to cause gases generated in the first series to circulate through the second series, removing and drying the white lead thereby precipitated in said second series of receptacles; substantially as described.

3. The hereinbefore-described process of treating lead ores, comprising the following steps: viz., charging a series of receptacles therewith, adding thereto a solvent including

water and nitric acid, causing circulation of gas generated thereby through the several receptacles of the series, removing the resultant solution to a second series of receptacles, adding thereto a precipitating reagent, recharging the first series of receptacles and causing circulation of gases generated therein therethrough and through said second series of receptacles to intensify the action of the precipitating in said second series; substantially as described.

4. The herein-described process of treating lead ores which consists of charging the first series of receptacles with crushed lead ore, and adding to such lead ore in each receptacle a dissolving solution, and closing the receptacles to compel circulation of the gases generated therein through the other receptacles of the series, and in removing the solution from said tanks to a series of precipitating-receptacles, and discharging the solid matter from said first series of receptacles, and recharging the first series of receptacles and permitting the gases therefrom to pass consecutively through the precipitating-tanks after the addition of a precipitating reagent to the contents thereof, substantially as described.

5. The herein-described process of treating lead ores, which consists in placing a charge of finely-ground ore in a tank, then adding a solvent, then placing the clear solution in a second tank, adding sodium bicarbonate, then recharging the first tank, and finally passing the gases generated in the first tank through the contents of the second tank; substantially as described.

In testimony whereof I hereunto affix my signature, in the presence of two witnesses, this 2d day of March, 1903.

CHARLES H. RIDER.

Witnesses:
F. H. GIBBS,
GEORGE BAKEWELL.