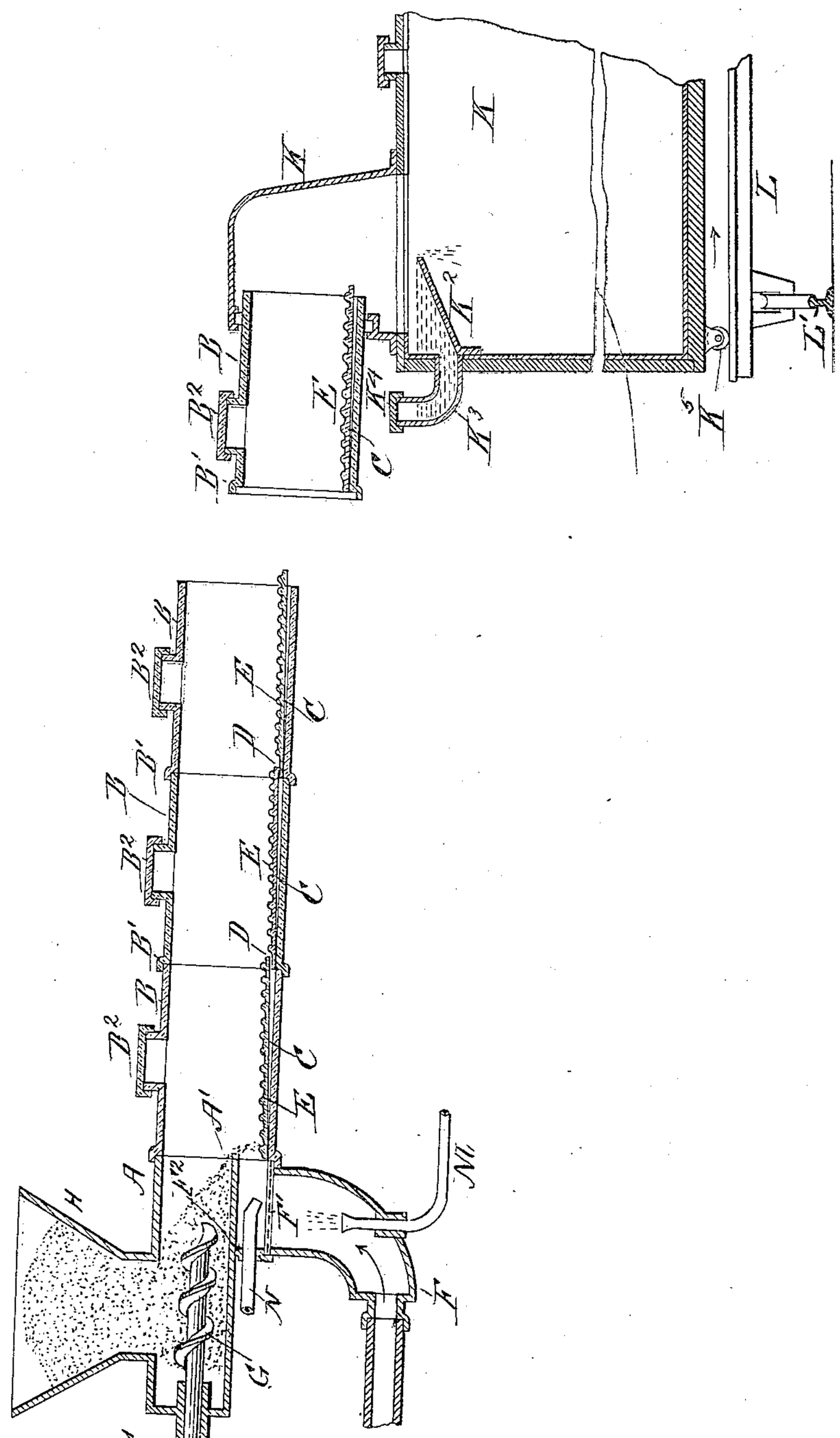
No. 841,328. PATENTED JAN. 15, 1907.

W. V. LANDER.

ORE CHLORINATION.

APPLICATION FILED APR. 27, 1906.



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ORE CHLORINATION.

No. 841,328. Specification of Letters Patent. Patented Jan. 15, 1907.

Application filed April 27, 1906. Serial No. 313,922.

To all whom it may concern:

Be it known that I, WINTWORTH V. LANDER, a citizen of the United States, and a resident of Newton, in the county of Middlesex and State of Massachusetts, have invented new and useful Improvements in Ore Chlorination, of which the following is a specification.

My invention relates to the chemical segregation of metallic values in ores by chlorination; and it consists in an improved method by which such chlorination is carried out.

Ore chlorination as practiced heretofore has involved confinement of a mass of comminuted ore in a closed vessel or drum, which is then charged with chlorin gas or with water having chlorin in saturated solution, the mass being then agitated by rotating the drum to facilitate the chlorination. Such methods as these, however, have not proved wholly satisfactory, first, because of the difficulty in constructing containing vessels which shall be capable of rotation or agitation and at the same time be qualified to resist the corrosive attacks of chlorin, and, second, because the agitation in closed vessels or drums is never completely effective, the internal part or core of the mass receiving little or no agitating effect. Moreover, with a stated charge of chlorin while the chemical reaction in a closed vessel may go on vigorously at first the chlorin is gradually exhausted by reaction and must either be replenished by fresh supply, necessitating stoppage of the apparatus, or be left to work out its effect with diminished efficiency and loss of time.

By my process hereinbelow described I carry out the chlorination of ores without incurring any of the disadvantages incident to the processes heretofore practiced.

In the drawing hereto annexed there is illustrated in longitudinal section an apparatus by the aid of which my improved process may with advantage be carried on.

This apparatus contains and embodies sundry mechanical and structural improvements which form the subject-matter of an application for United States Letters Patent, Serial No. 313,923, filed concurrently herewith and are reserved for claim therein.

In the drawing, A represents a head-chamber into which comminuted ore is delivered, as from a superposed hopper H. The bottom of this head-chamber terminates in a lip or dry weir at A′, over which the ore is delivered in a cascade upon the riffle, presently to be described. The ore-feed may be secured in a number of different ways. The mode which I prefer is, as illustrated, to provide a feed-screw G, projecting into the head-chamber A and driven by some suitable appliance, as the pulley G′, on the outside. This head-chamber, together with the hopper above it, are proportioned with relation to the character and degree of comminution of the mass of ore-carrying earth or rock to be treated, so that so long as the supply is maintained in the hopper H the head-chamber A will be completely full from base to top, and it will thus be difficult, if not impossible, for any gases within the apparatus to escape by backing up through the head-chamber and hopper. Below the delivery end of the head-chamber A, I arrange a water-intake chamber F^2, which receives water through the pipe F, preferably through a strainer-plate F′, which will serve to distribute the stream and prevent undue disturbances or gushes of liquid from the pipe F.

To the delivery ends of the head-chamber A and water-intake F^2, I secure the upper section B of the sectional riffle-pipe, making a gas-tight joint. The sections B of the riffle-pipes are composed, preferably, of glazed tile or other refractory earthenware, which will effectually resist the attacks of chlorin, and, moreover, I prefer to employ pipe-sections B which are square in cross-section. Each of the sections B is joined and hermetically sealed to its neighbor, as by the flanges B′, and in the tops of each of these sections B are provided tightly-covered hand-holes, as at B^2. When the sections B are assembled, they form an inclined pipe, the angle of inclination being about one foot in ten. Each pipe-section B is provided with a riffle-plate C, which, like the pipe, should be constructed of refractory material, as glazed tile, and sealed, as by burning and glazing, to the interior of the pipe-section itself. The riffles when the apparatus is in position are set at a slight angle to the axis of the pipe, so that each riffle is nearly horizontal, just enough inclination being given to it to offset the friction between a stream of liquid running over the plate and the plate itself, so that the stream may be as nearly as possible of uniform depth.

Each riffle-plate C is provided with transverse corrugations or ridges, as E, and pro-

jects a slight distance beyond the end of the pipe-section, as at D. A riffle-pipe of this character extending for about fifty feet will probably be sufficient for all practical purposes, although I consider it desirable to extend this pipe considerably farther and to make it in some instances at least two hundred feet in length. The length of the pipe will be determined for each case according to the nature of the ore and the concentration of chlorinated water. Each section B need not be longer than eighteen inches, so that there will be in the pipe when assembled a large number of riffle-sections each overhanging the next, as at the points marked D in the drawing. The lower or delivery section of the riffle-pipe delivers into the receiving-tank K. Means should be provided whereby the receiving-tank K shall be gas-tight with the riffle-pipe, and for this purpose I have indicated the construction of the hood K′, which slips over the delivery end of the riffle-pipe and may be sealed thereto, as by a rubber gasket or packing-ring. The tank K should, moreover, be removable or capable of disconnection from the riffle-pipe B, and for this purpose I have indicated the arrangement shown in the drawing—namely, rails or runways L, upon which the tank K is mounted by means of small wheels or riffles K^5. The runway L is also mounted on trucks, as at L′, so that it may be removed with the tank transversely to the axis of the riffle-pipe itself. If the tanks used are too large for such manipulation, the connections may be by large rubber-hose pipe.

In order to provide means to sample the liquor in the tank K, I show in the drawing a trough and sampling-elbow at K^2 and K^3, covered by the cap K^4, or instead of this the covered opening K^5 may be used, through which a sampling-tube can be inserted to draw out liquid from the tank.

The operations of the apparatus and the conduct of my improved process are as follows: Simultaneously ore is sprinkled in a cascade from the dry weir A′ upon the head riffle, and chlorinated water is introduced upon the riffle through the pipe F. This water may have been chlorinated by a process of preliminary preparation, or clear—that is to say, unchlorinated—water may be brought through the pipe F and a stream of chlorin gas, as through the pipe M, mingled therewith just before it enters the ore-chlorinating apparatus. The ore and chlorinated water mingled at the head of the riffle-pipe will proceed as one stream, being agitated by the riffle-ridges E and still further agitated by falling in cascades from one riffle-plate to the other, as at the points marked D, until finally the solution falls from the delivery end of the lowest riffle-plate in the series into the tank K. If the chlorinated water entering the apparatus carries chlorin in sufficiently-concentrated solution, an atmosphere of chlorin will be maintained thereby in the riffle-pipes. The presence and maintenance of this atmosphere is of value in the process, for the reason that as the chlorinated water becomes exhausted or depleted by its reaction upon the soluble portions of the ore it has an opportunity by being agitated in the presence of and falling in occasional cascades through this atmosphere of chlorin to become regenerated and reinforced during the continuance of the chlorination process itself, so that the chlorinated water is to all practical intents and purposes just as vigorous at the lower end of the series of riffle-plates as it is at the head. This renders the chlorin action effective at all stages and promotes the solution of the smaller and smaller residues of soluble matter. The insoluble portions of the mass of metal containing earth or rock are detained by the riffle-plates and retarded and classified according to their size, specific gravity, &c. The grooves between the riffle-rigdes gradually fill up with these insoluble concentrates, the filling proceeding gradually from the head of the riffle-pipe toward its foot. When by means of samples taken from the tank the process is observed to have proceeded far enough, the flow of chlorinated water is cut off and clear—that is to say, unchlorinated—water substituted, which flowing gently through the riffle and over the concentrates washes out any chlorin which may remain absorbed therein and likewise clears the riffle-pipe of its chlorin atmosphere. When this last cleaning operation is finished, the receiving-tank is removed from its connection with the riffle-pipes, which may in turn be connected by any suitable means to a wash-tank. The uppermost hand-hole B^2 is then opened and a vigorous stream of water, as by a hose, is turned into the riffle-pipe and the riffle washed out, the concentrates being sent down the pipe. By washing successively in this way through each of the hand-holes B^2 the concentrates are deposited in the wash-tank. The subsequent treatment of the chlorids in the receiving-tank and of the concentrates in the wash-tank will depend upon the requirements of each particular operator and need not differ from the processes now in vogue.

The above-described process has the advantage of being continuously and uniformly effective during the whole period between charging and discharging the apparatus. By connecting the receiving-tank with suitable chlorinating towers or gas-tanks the residues of chlorin gas from the process may readily be saved to be used over again, so that by continuous operation in rotation by several such apparatus as above described an economical and effective cycle can be maintained. Moreover, all the discomfort and danger to workmen from the escape of

chlorin gas is eliminated by the confinement of the gas in a continuous closed system, which is not opened to the air until all chlorin gas has been washed out.

What I claim, and desire to secure by Letters Patent, is—

1. The process of ore chlorination, which consists in mingling a stream of ore with a stream of chlorinated water, conveying the ore and water as one stream, retarding the insoluble concentrates, collecting the solution and recovering the values therefrom.

2. The process of ore chlorination, which consists in mingling a stream of ore with a stream of chlorinated water, conveying the ore and water as one stream through an atmosphere of chlorin gas, retarding the insoluble concentrates, collecting the solution, and recovering the values therefrom.

3. The process of ore chlorination, which consists in mingling a stream of ore with a stream of chlorinated water, conveying the ore and water as one stream, agitating the stream, retarding the insoluble concentrates, collecting the solution, and recovering the values therefrom.

4. The process of ore chlorination, which consists in mingling a stream of ore with a stream of chlorinated water, conveying the ore and water as one stream through an atmosphere of chlorin gas, agitating the stream, retarding the insoluble concentrates, collecting the solution, and recovering the values therefrom.

5. The process of ore chlorination, which consists in mingling a stream of ore with a stream of chlorinated water, conveying the ore and water as one stream, rechlorinating the water during the progress of the combined stream, retarding the insoluble concentrates, collecting the solution, and recovering the values therefrom.

Signed by me at Boston, Suffolk county, Massachusetts, this 23d day of April, 1906.

WINTWORTH V. LANDER.

Witnesses:

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