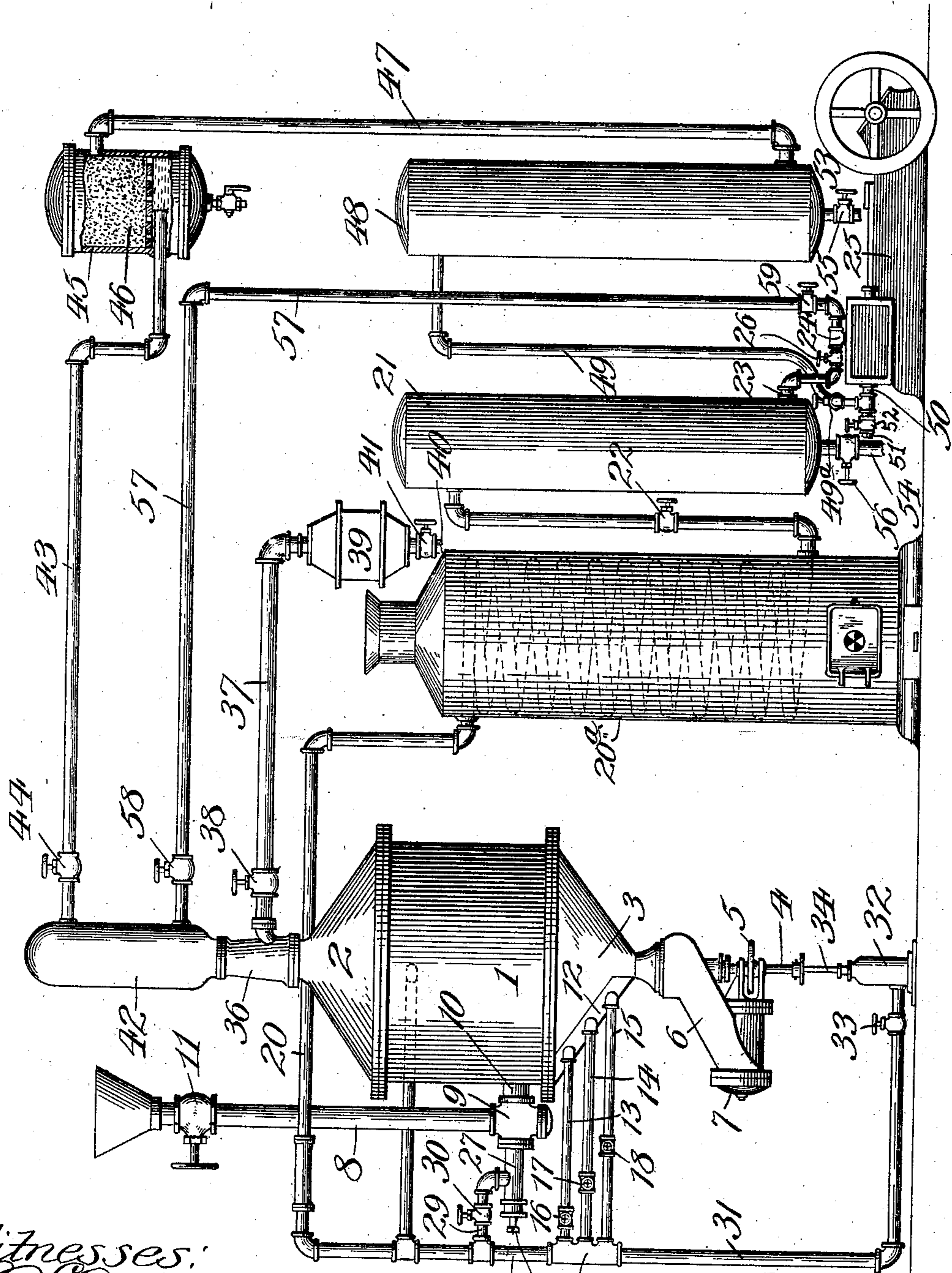


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PATENTED JUNE 21, 1904.

H. A. ALLEN.
APPARATUS FOR TREATING ORES.
APPLICATION FILED MAR. 16, 1903.

NO MODEL.



Witnesses:
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UNITED STATES PATENT OFFICE.

HENRY A. ALLEN, OF CHICAGO, ILLINOIS.

APPARATUS FOR TREATING ORES.

SPECIFICATION forming part of Letters Patent No. 762,869, dated June 21, 1904.

Application filed March 16, 1903. Serial No. 148,043. (No model.)

To all whom it may concern:

Be it known that I, HENRY A. ALLEN, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Apparatus for Treating Ores, of which the following is a full, clear, and exact description, reference being had to the accompanying drawing, forming a part of this specification, in which similar numerals of reference indicate corresponding parts.

The object of my invention is to so construct an apparatus for separating materials of different gravities and at the same time treating the same that the principle of the vortex whirl may be utilized in conjunction with a heated fluid or fluid compound operating throughout a closed system, said heated fluid acting in conjunction with said vortex whirl to produce a separating action upon the mass of material to be treated. I accomplish said object by means of a closed circular vessel having induction and eduction openings at different levels, with means for introducing the materials to be separated or treated, together with a heated fluid or fluid chemical compound under pressure, said fluid being introduced, preferably, tangentially to the body of said receiving vessel and arranged to circulate through an auxiliary system in such a way that the heated fluid may be used over and over again to any predetermined extent. This, with other minor objects, I accomplish in the manner hereinafter more particularly set forth, and definitely pointed out in the claims.

The figure represents a side elevation of a separator, a pump, a heating apparatus, together with the necessary reservoirs and connecting-pipes, which serve to complete the system.

Referring to the drawing, 1 represents a hollow cylinder, preferably formed of metal, which constitutes the body of the separator. Bolted or otherwise attached to suitable flanges upon the respective ends of said cylinder are end pieces 2 3, preferably of conical shape, as shown, the one forming the bottom and the other the top of the separator. A central discharge-opening is formed in the bottom, which opening is normally closed by means of

a valve (not shown) upon the upper end of a screw-threaded valve-stem 4, having a hand-wheel 5. An inclined conduit 6 is provided with an opening at the lower end normally closed by means of a cap 7, secured thereto in an approved way. The construction of said valve, discharge-conduit, and other special features in connection therewith are fully shown and described in an application heretofore filed by me as Serial No. 116,672, filed July 23, 1902, and I make no claim thereto in this application, but contemplate, using the features hereinafter claimed with any well-known or suitable form of discharge.

A vertical charging-pipe 8 is connected, by means of a jointed fitting 9, with a horizontal induction-pipe 10, arranged tangentially to and in communication with the cylindrical portion of said separator.

The charging-pipe 8 is preferably provided with a closing-valve 11 at or near its upper end. The bottom 3 of the separator is preferably provided with a vertical portion 12, with which is connected, by means of suitable fittings, as shown, a series of pipes 13 14 15, the inlet of which is tangential to the part 3. Said pipes are provided, respectively, with shut-off valves 16, 17, and 18. Said pipes 13, 14, and 15 connect with a fitting 18, which in turn connects with a service-pipe 20, in communication with a suitable furnace or heating apparatus 20^a, through which said pipe is coiled, as indicated in dotted lines, and from which it leads to a closed reservoir 21, a valve 22 being interposed in said pipe. The reservoir 21 is connected, by means of a pipe 23, with the eduction-pipe 24 of a pump 25, a valve 26 being interposed to shut off communication when desired, as hereinafter described.

Connected with the fitting 9 is pipe 27, to which is connected a nozzle which is extended into and is concentric with the pipe 10. Said nozzle is rendered adjustable by means of an adjusting-screw 28. A pipe 29, together with suitable fittings shown, serves to connect the pipe 27 with the pipe 20, a valve 30 being interposed between the two.

Connected with the fitting 19 is a pipe 31, leading downwardly and thence horizontally to a hollow casing 32, said pipe 31 being a con-

tinuation of the pipe 20 and being provided with a valve 33. The upper part of the casing 32 is provided with a suitable stuffing-box through which is projected a vertical pipe 34, which is carried upwardly through the hollow tube 4 into the throat of the opening at the bottom of the separator, thus forming a nozzle adapted to be adjusted by means of a hand-wheel 5.

10 Rigidly attached to the top 2 of the separator is a fitting 36, with which is connected a discharge-pipe 37, having a valve 38 therein. The discharge-pipe 37 is in communication with a closed receiver 39, having an outlet 40, normally closed by means of a valve 41. In starting the apparatus the pressure within the receptacle 39 is the normal atmospheric pressure. Upon opening the valve 38, the abnormal pressure in the main receptacle will cause a flow of material therefrom into the receptacle 39 until the pressure within the two is equalized. Above the fitting 36 is a chambered dome 42, in communication with said fitting, the upper part of which is connected, by means of a pipe 43, having a shut-off valve 44 therein, with the lower portion of a tank or reservoir 45, the upper portion of which is provided with a suitable absorbent material 46 to serve as a filter for the elimination of grit. A pipe 47 leads downwardly from the upper part of the vessel 45 to the bottom of a reservoir 48, the upper portion of which is connected, by means of a pipe 49, with the intake-pipe 50 of the pump 25. A pipe 51, having a shut-off valve 52, is connected with any suitable source of supply and enables fluid to be taken therefrom at will. Sediment-pipes 53 54 in the tanks 21 and 48, respectively, enable sediment to be withdrawn therefrom at will, said pipes being normally closed by means of valves 55 and 56. A pipe 57, having valves 58 and 59 therein, serves to connect the education-pipe of the pump with the chamber of the part 42. The pipe 57 is intended to be used merely for the purpose of cleaning out the separator, and it should be understood that the valves 58 59 are normally closed.

The operation of my improved apparatus is as follows: The material or materials to be separated or treated having been fed into the separator through the feed-pipes 8 and the valves 26 22 30 16 17 18 33 38 49^a being open and the valves 11, 52, 55, 56, 58, 59, and 41 being closed, a whirling and otherwise agitating action is imparted to the fluids and materials within the separator, whereby the particles of different gravity may tend to separate. The fluid is caused to pass upwardly through the chamber 42, through the pipe 43, filtering-receptacle 45, tank 48, pump 25, tank 21, heater 20^a, back to the separator, thereby completing a cycle.

The fluid loss may be replenished through the charging-pipe 8 or through the intake-

pipe leading to the pump from any suitable source of supply.

The material may be removed from the receptacle 39 by closing the valve 38 and opening the valve 41.

The heating device referred to serves to greatly facilitate the work in that it tends to drive the adhering particles of air from the ore-surfaces and to expand and release the air or gases contained in the ores, thereby modifying the specific gravities of the various particles, as well as to break up and disintegrate said particles. Moreover, such chemical action, if any, as might be due to the character of the fluid employed would thereby be greatly increased.

The reservoirs 21 and 48 serve in the nature of settling-tanks, and the water by passing through them being largely freed from sediment is returned to the main separating vessel 1 in a more clarified condition and better adapted to wash the ore therein. The violent vortical whirl imparted to the materials, in conjunction with the disintegrating and washing action of the fine fluid-jets, especially from the pipes 13, 14, and 15, serve to effectually separate the materials of different gravities, the heavier ones passing to the bottom, the lighter values to the receptacle 39, while the lighter impurities rise to the top, pass out through the pipe 43, and thence to the tanks 48 and 21.

Throughout the system, except the connecting-pipes, the fluid movement is upward, and hence every tendency is toward a complete separation of the materials of varying specific gravity.

Having thus described my invention, I claim—

1. An apparatus of the class described, comprising a continuous closed separating system in which is combined a main circular separating vessel, means for introducing thereto the materials to be separated, a pipe system leading from the top thereof and back to said vessel with which it is connected by means of a series of induction-pipes arranged tangentially thereto, reservoirs interposed in said pipe system each having an inlet at or near the bottom and an outlet at or near the top, a pump for inducing a circulation, heating means interposed in said pipe system, and a normally closed outlet at the bottom of said separating vessel, whereby a vortical whirl may be imparted to the material and fluids in said separating vessel while the heated fluid may be used over and over.

2. An apparatus of the class described, comprising a continuous closed circulating system in which are combined a circular separating vessel, means for introducing thereto the materials to be separated, a pipe system connected with the top thereof, from whence it is led away and back to a series of tangen-

tially - arranged induction - pipes connected with the lower portion of said separating vessel, reservoirs, a pump and heating apparatus all interposed in said pipe system, the
5 inlet to each of said reservoirs being at or near the bottom and the outlet at or near the top, a normally closed source of fluid-supply connected with said pump, means at the bottom of said separating-chamber for withdrawing materials of heavier gravity and a
10 normally closed receptacle connecting with the upper portion thereof for receiving materials of lighter gravity.

3. An apparatus of the class described, comprising a continuous closed separating system in which is combined a main circular separating vessel, means for introducing thereto the materials to be separated, a pipe system connected with the top thereof, from whence it
15 is led away in a circuit and back to a series of tangentially-arranged induction-pipes connecting with the lower portion as well as the main body of said separating vessel, reservoirs, a pump and heating apparatus all interposed in said pipe system, the inlet to each
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of said reservoirs being at or near the bottom while the outlet thereof is at or near the top, a normally closed source of fluid-supply connected with said pump, a normally closed blow-off pipe connected with said pump and
30 with the top of said separating vessel respectively, a normally closed eduction-opening in said separating vessel and means for closing the pipes of said circulatory system.

4. The combination in an apparatus of the
35 class described, of a closed separating vessel, induction and eduction pipes, a filter interposed in said pipe system, a plurality of closed fluid-holding tanks also interposed, a pump in operative connection with said system for
40 forcing a fluid circulation therethrough, and means for heating said fluid.

In testimony whereof I have signed this specification, in the presence of two subscribing witnesses, this 14th day of March, 1903.
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HENRY A. ALLEN.

Witnesses:

D. H. FLETCHER,
CARRIE E. JORDAN.