J. M. DRAPER.

APPARATUS FOR SEPARATING SUBSTANCES OF DIFFERENT SPECIFIC GRAVITIES, SUCH AS FINE COAL OR ORES AND THE LIKE.

APPLICATION FILED JAN. 24, 1916.

1,210,916. Patented Jan. 2, 1917.

Fig. 1.

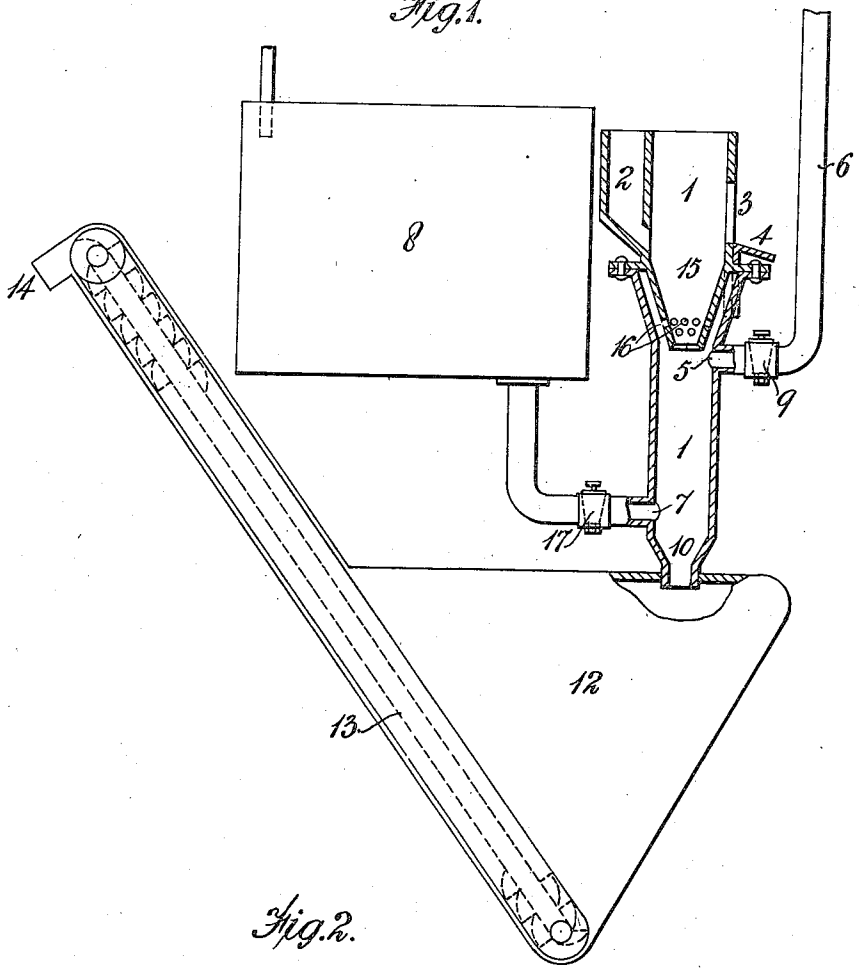


Fig. 2.

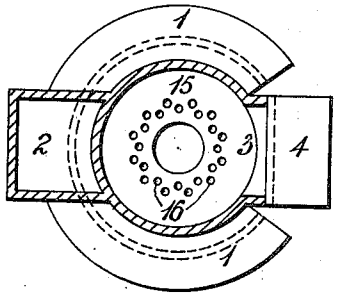
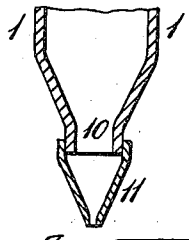


Fig. 3.



Inventor
John Manitt Draper
By H. C. Jones
Attorneys.

UNITED STATES PATENT OFFICE.

JOHN MARRIOTT DRAPER, OF MANCHESTER, ENGLAND.

APPARATUS FOR SEPARATING SUBSTANCES OF DIFFERENT SPECIFIC GRAVITIES, SUCH AS FINE COAL OR ORES AND THE LIKE.

1,210,916. Specification of Letters Patent. Patented Jan. 2, 1917.

Application filed January 24, 1916. Serial No. 73,916.

To all whom it may concern:

Be it known that I, JOHN MARRIOTT DRAPER, a subject of the King of Great Britain, residing at 38 King street west, Manchester, England, have invented new and useful Improvements in Apparatus for Separating Substances of Different Specific Gravities, Such as Fine Coal or Ores and the like, of which the following is a specification.

My invention relates to apparatus for washing or separating fine coal or ores and the like, and it comprises a vertical tube shaped receptacle to the upper end of which the material to be treated is fed, and which is provided wtih a water connection for the purpose of producing an uprising current of water to act on the downwardly descending material. A second water inlet is provided below the first water connection and leads to a suitably shaped chamber open at the top and situated in such a position as to maintain a constant level approximately in line with the discharge opening from the upper end of the vertical tube shaped separating chamber, and to so constitute a steady head or balancing column, which is essential for the efficient separation of the material therein.

The discharge opening at the upper end of the separating chamber is fitted with an adjustable sill to allow the height of the water level or overflow to be adjusted as required to suit the material under treatment.

From the lower end of the separating chamber the heavy product from the material not carried up by the ascending water current is discharged, and may either pass into a closed collecting chamber in conjunction with which a suitable elevator device is employed, or such discharge may be effected simply through a diminishing nozzle fitted to the bottom of the separating chamber and which will serve to vary or control the outflow to suit the material under treatment.

The invention is illustrated in the accompanying drawings in which—

Figure 1 is an elevation partly in section; Fig. 2 is a horizontal section through the separating tube drawn to a larger scale, and Fig. 3 a vertical section of the discharge end of such tube, also drawn to a larger scale and fitted with a diminishing nozzle.

In these drawings 1 is the vertical tube shaped separating receptacle or chamber, provided at its upper end with a feed chamber 2, through which the material to be separated is supplied, and an outlet or overflow orifice 3, to which is fitted an adjustable sill 4 for varying the height of such overflow.

The chamber 1 is provided with an inlet orifice 5 connected with a hydraulic supply 6, and below this with a second water inlet 7 connected with a tank 8, in which the water is maintained, by ball cock or overflow, at the same level as the overflow over sill 4 of the discharge opening 3 of the separating chamber 1. The connection 7 is at a point between the upward current producing water supply 6 and the lower or discharge orifice 10 of the separating chamber 1 and consequently at a point to produce the maximum effect in insuring a body of quiescent liquid for the material to pass through beneath the point where it is acted upon by the upward current and so allow gravitation to act in the most efficient manner to insure the desired separation. The tank 8 is open at top and the water therein by acting as a balancing column to the separating chamber 1 will enable the separation of the material passing through same to be efficiently effected.

The supply 6 is fitted with a valve 9 for regulating the supply of water to produce the upwardly rising current which effects the separation of the material under treatment and carrying the lighter portions thereof to the overflow discharge opening 3, while the heavier portions passing through the body of water maintained below inlet 5 by the balancing column of water from tank 8 communicating with separating chamber 1 at 7, are discharged by gravity through the bottom 10 of said chamber 1.

If the material under treatment is not of a coarse nature the orifice 10 at the bottom of the separating chamber may be fitted with a diminishing nozzle 11 and the discharge be effected directly, such nozzle 11 being changed to suit the particular material under treatment. In the case of coarse material on the contrary the discharge end 10 of chamber 1 will communicate with a closed collecting and water recovery chamber 12 from the bottom of which a suitable elevator 13 conveys the heavy material to discharge 14, said elevator working in a tube in which

the water level is maintained at the same height as that in the separating chamber 1 and balancing tank 8.

The connection between balancing tank 8 and the inlet into the separating chamber 1 is fitted with a valve 17 to permit of the necessary adjustment to suit the rate of overflow over the sill 4.

The upper end of the separating chamber 1 is preferably formed with an inner chamber 15 separated from the outer wall and leading from the point of entrance 2 of the material to be treated to just above the inlet 5 of the hydraulic supply 6, such inner chamber further preferably narrowing downward and its lower end being provided with perforations 16, such construction effecting the direction of the material to the position to enable it to be subjected to the action of the uprising column of water entering at 5 in the most efficient manner to insure the desired separation.

The operation of the apparatus is as follows:—The valve 17 from the balancing water tank 8 is opened until the water rises very nearly to the outflow governed by the sill 4, which has been adjusted to suit requirements. The hydraulic water cock 9 is then opened slightly until water is just flowing through the overflow opening 3. The unseparated material is fed in at 2 and the heavies pass downward through the uprising current of water entering at 5 and out through discharge 10, while the lights are carried upward with the stream and over the discharge sill 4. An increase of hydraulic water will cause less of the heavier particles to be discharged, and a point is reached by regulating the flow so that only the heavier particles can be discharged at the lower end of the apparatus, while the lights are all carried over.

Where the material fed into the apparatus is coarse, the water recovery chamber 12 and some type of elevator device 13, such as that shown in Fig. 1, is required, but for fine materials this is not essential, the discharge nozzle being all that is necessary, provided it is fitted with a diminishing nozzle 11 as illustrated in Fig. 3.

In cases where the coal or ore contains particles of an intermediate specific gravity between the lighter material passing out of the upper part of the tube and the heavies going out with the water at the lower end I provide additional outlets in the vertical separating tube of a smaller total area than the main outlet for the lighter materials, through which the intermediate materials will pass out and be recovered.

What I claim as my invention, and desire to secure by Letters Patent, is:—

1. A separator for fine material such as fine ores, fine coal and the like comprising a separating chamber having a discharge outlet for heavy material in its lower part and an overflow outlet for light material in its upper part, a hydraulic inlet connected with said separating chamber below said overflow outlet and adapted to establish an upward current in said chamber, and means connected with said separating chamber between said discharge outlet and said hydraulic inlet for maintaining a constant balancing column on a level with said overflow outlet.

2. A separator for fine material such as fine ores, fine coal and the like comprising a separating chamber having a discharge outlet for heavy material in its lower part and an overflow outlet for light material in its upper part, a hydraulic inlet connected with said separating chamber below said overflow outlet and adapted to establish an upward current in said chamber, means connected with said separating chamber between said discharge outlet and said hydraulic inlet for maintaining a constant balancing column on a level with said overflow outlet, a closed collecting chamber connected with said discharge outlet and provided with a water tube adapted to maintain a level of water corresponding with that in said separating chamber, and an elevator working in said collecting chamber and tube.

3. A separator for fine material such as fine ores, fine coal and the like comprising a separating chamber having a discharge outlet for heavy material in its lower part and an overflow outlet for light material in its upper part, a hydraulic inlet connected with said separating chamber below said overflow outlet and adapted to establish an upward current in said chamber, means connected with said separating chamber between said discharge outlet and said hydraulic inlet for maintaining a constant balancing column on a level with said overflow outlet, and an inner conical chamber disposed in said separating chamber between said overflow outlet and said hydraulic supply inlet.

4. A separator for fine material such as fine ores, fine coal and the like comprising a separating chamber having a discharge outlet for heavy material in its lower part and an overflow outlet for light material in its upper part, a hydraulic inlet connected with said separating chamber below said overflow outlet and adapted to establish an upward current in said chamber, a balancing tank, and a pipe connecting said balancing tank with said separating chamber at a point between said discharge outlet and said hydraulic inlet, said pipe and hydraulic inlet being provided with regulating means.

5. A separator for fine material such as fine ores, fine coal and the like comprising a separating chamber having a discharge outlet for heavy material in its lower part

and an overflow outlet for light material in its upper part, a hydraulic inlet connected with said separating chamber below said overflow outlet and adapted to establish an upward current in said chamber, a balancing tank, and a pipe connecting said balancing tank with said separating chamber at a point between said discharge outlet and said hydraulic inlet.

6. A separator for fine material such as fine ores, fine coal and the like comprising a separating chamber having a discharge outlet for heavy material in its lower part and an overflow outlet for light material in its upper part, a hydraulic inlet connected with said separating chamber below said overflow outlet and adapted to establish an upward current in said chamber, means connected with said separating chamber between said discharge outlet and said hydraulic inlet for maintaining a constant balancing column on a level with said overflow outlet, and means for varying the height of said overflow outlet.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN MARRIOTT DRAPER.

Witnesses:
ERNALD SIMPSON MOSELEY,
MALCOLM SMETHURST.