No. 842,614. PATENTED JAN. 29, 1907.

T. BLASS.

APPARATUS FOR SEPARATING MATERIALS.

APPLICATION FILED OCT. 28, 1905.

FIG. 1.

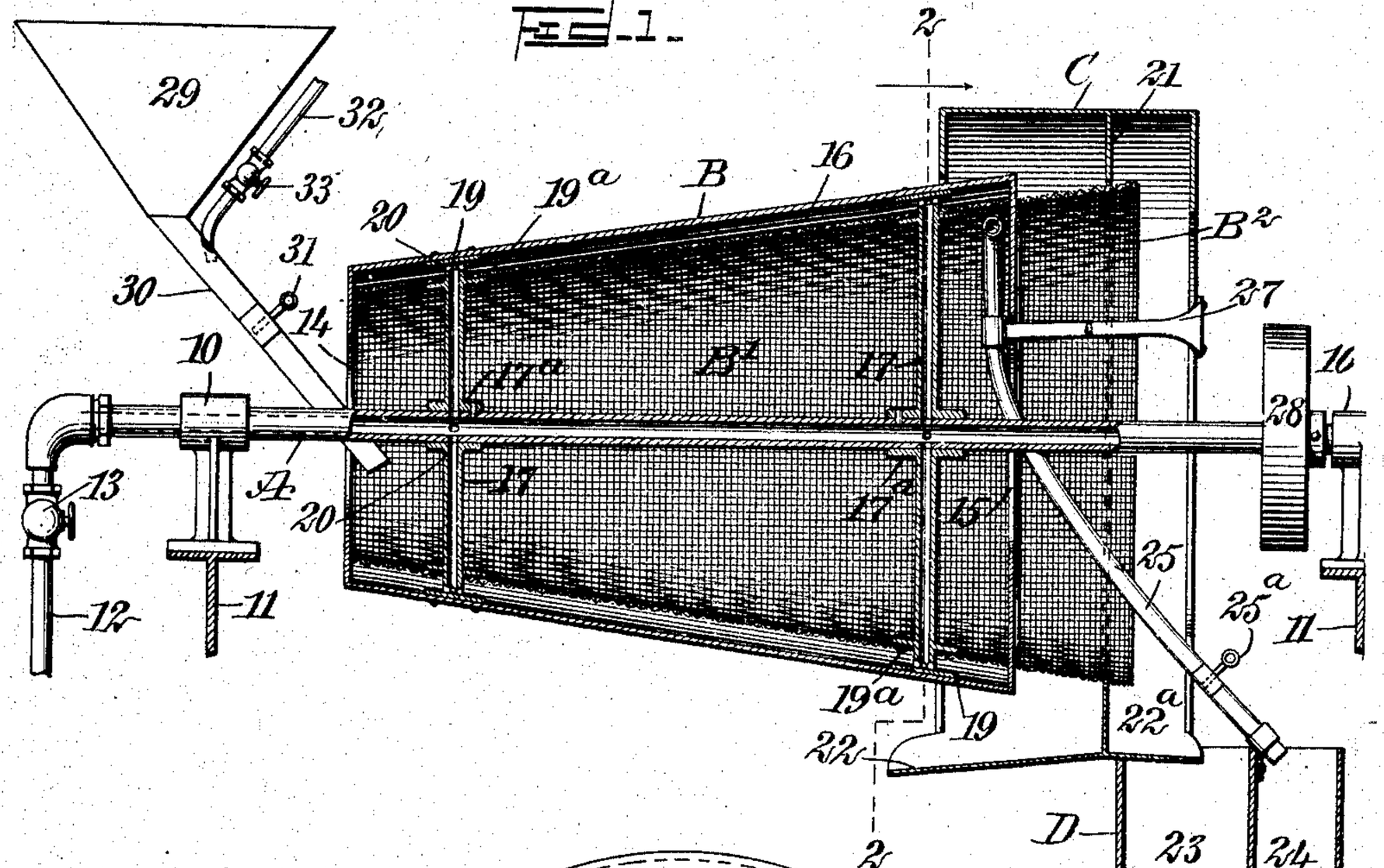
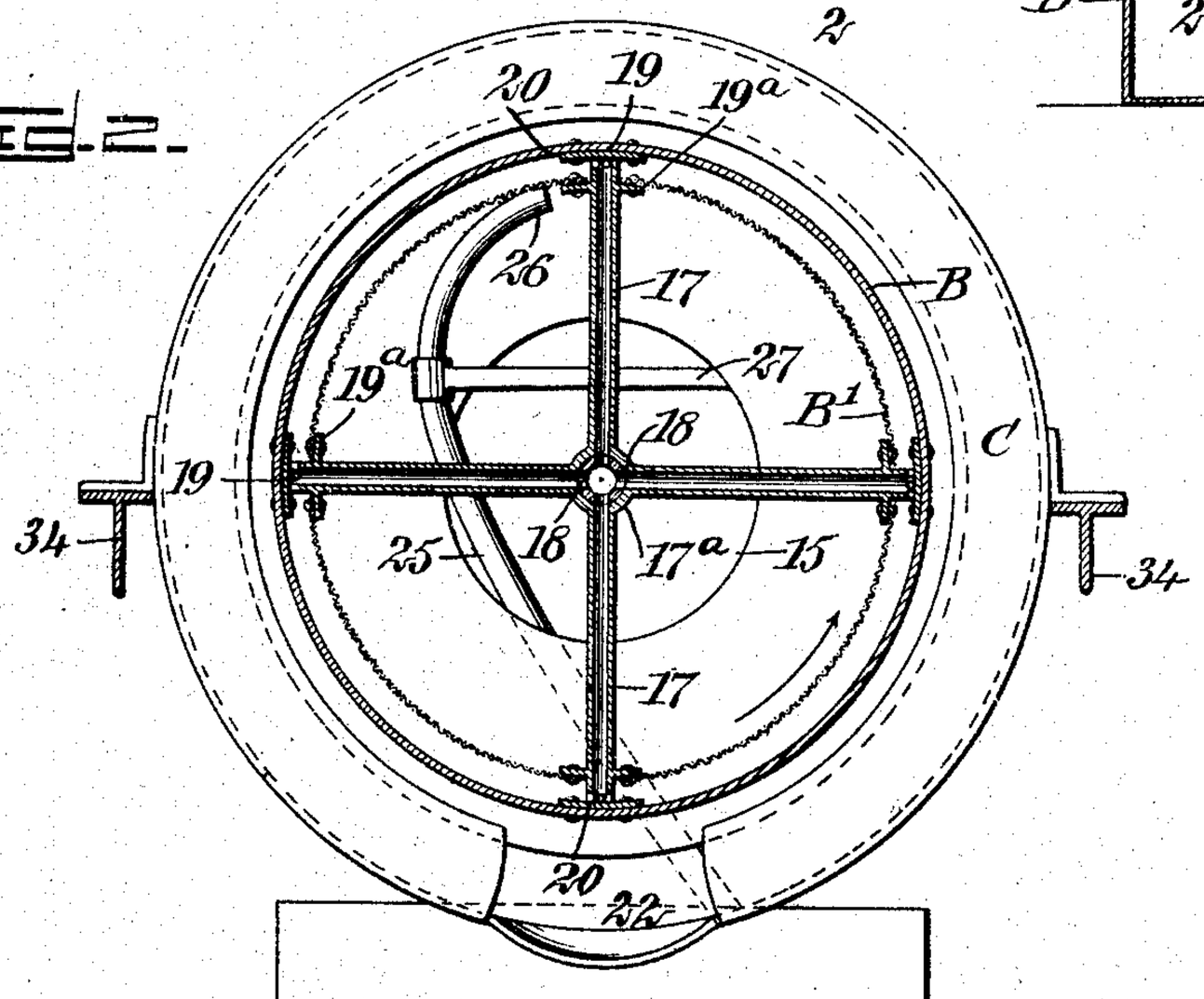


FIG. 2.



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APPARATUS FOR SEPARATING MATERIALS.

No. 842,614. Specification of Letters Patent. Patented Jan. 29, 1907.

Application filed October 28, 1905. Serial No. 284,778.

To all whom it may concern:

Be it known that I, TALMADGE BLASS, a citizen of the United States, and a resident of Lebanon, in the county of Lebanon and State of Pennsylvania, have invented a new and Improved Apparatus for Separating Materials, of which the following is a full, clear, and exact description.

The invention relates to devices for the concentration and separation of ores, coals, and other minerals carrying gangue or refuse material which it is desirable to separate from the said ores or other minerals having a greater or less specific gravity than such gangue or refuse material.

The purpose of the invention is to augment the difference in specific gravity between the mineral and the refuse material to be separated by the action of centrifugal force while the mineral and its refuse material are suspended in water, the ultimate object being the concentration and separation of such mineral from the refuse material.

The invention consists in the novel construction and combination of the several parts, as will be hereinafter fully set forth, and pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a sectional side elevation of the improved device, and Fig. 2 is a vertical transverse section taken practically on the line 2 2 of Fig. 1.

A represents a tubular shaft mounted to turn in bearings 10, carried by suitable supports 11, and one end of the said shaft is closed, while the other or open end is in revoluble connection with a stand-pipe 12, adapted to supply water to the said shaft, the said standpipe being provided with a valve 13. The shaft A carries a conical outer cylinder B and an inner cylinder B′ of reticulated or perforated material.

The outer cylinder B is closed except for an opening 14 at its receiving or contracted end and a larger opening 15 at its discharge or larger end, and there is sufficient space between the two cylinders B and B′ to constitute an annular chamber 16. The inner perforated or reticulated cylinder B′ is open at both ends; but its ends are made to abut against the solid end portions of the outer cylinder B, and the two cylinders B and B′ are of the same formation; but the inner perforated or reticulated cylinder B′ is provided with an extension B^2 at its discharge or larger end, the said extension being made fast to the outer face of the larger end portion of the outer cylinder B; but the extension B^2 of the said inner reticulated or perforated cylinder B′ constitutes practically a perfect continuation thereof. These cylinders B and B′ are attached to the shaft A to turn therewith and are held a suitable distance apart to provide the chamber 16, as has been stated, by means of tubular arms or spokes 17, which are made to radiate from hubs 17^a, the said hubs being secured in any approved manner to the tubular shaft A.

The arms or spokes 17 are provided with flanges 19 and 19^a at their outer ends, the flanges 19 being secured to the inner face of the outer cylinder B and the flanges 19^a to the inner face of the inner cylinder B′. Where the tubular arms or spokes 17 connect with their hubs 17^a apertures 18 are made, being in communication with the tubular shaft A, so that water supplied to said shaft will enter the said tubular spokes or arms 17 and will pass out into the chamber 16 between the two cylinders B and B′ through apertures 20, made in the outer end portions of the said spokes or arms, as is clearly shown in the drawings.

The delivery or larger ends of both cylinders B and B′ are mounted to revolve within a stationary circular cylinder C, having an inner partition 21, which loosely surrounds the extension B^2 of the perforated or reticulated inner cylinder B′, as is clearly shown in Fig. 1. The bottom of this casing C is inclined in opposite directions and at what may be termed its "rear" end is provided with a spout 22, facing the smaller ends of the cylinders, and the forward lower portion of the casing C is provided with a spout 22^a. Beneath the spout 22^a a receptacle D is located, which may be attached to the casing C, and this receptacle D is divided into two compartments 23 and 24, the compartment 23 being below the spout 22^a and the compartment 24 forward thereof. The compartment 24 is adapted to receive the heavier mineral and the compartment 23 the lighter minerals.

The lighter minerals, as will be described, are conducted from the extension B^2 of the inner cylinder B through the medium of the spout 22^a to the compartment 23, the water passing off from the spout 22, and such fluid may be conducted wherever desired, while

the heavier material is delivered to the compartment 24 through the medium of the pipe 25, whose lower end enters the compartment 24 and whose upper portion is carried into the forward or larger end of the inner cylinder B′, and the upper end 26 of this pipe 25 is curved in a direction opposite to the direction of rotation of the cylinders, and the said upper curved portion 26 of the said pipe lies close to the mesh of the said inner cylinder, as is shown particularly in Fig. 2. This delivery-pipe 25 is provided with a suitable gate or valve 25ª near its lower end, and its upper portion is supported by brackets 24 of any approved construction, attached ordinarily to the casing C.

The shaft A is provided with an attached pulley 28, adapted to be connected with any suitable source of power, and the pulley 28 is ordinarily placed outside of yet adjacent to the casing C. A hopper 29, adapted to contain the mineral to be separated, is located at and above the rear or contracted ends of the said cylinders, and the hopper is provided with a connected tubular spout 30, which extends through the opening 14 into the contracted portion of the inner cylinder B′, as is shown in Fig. 1, and this spout is provided with a valve or a gate 31.

A pipe 32, connected with any source of water-supply and provided with a valve 33, is made to enter the spout 30 adjacent to where said spout connects with the hopper 29, so that the mineral as it passes from the hopper to the cylinders is accompanied by suitable quantities of water.

In Fig. 2 the casing C is shown supported by attachment to longitudinal beams 34, which in their turn are suitably supported.

The operation of the device is as follows: The cylinders B and B′ are revolved at the desired speed, and the minerals to be separated are placed in the hopper 29 and are washed from the hopper by the water supplied at the pipe 32. The minerals upon entering the contracted end of the cylinder B′ take up the circular motion of the cylinders and separate themselves into layers or become stratified according to the specific gravity of the minerals to be separated, with the heaviest material near the inner face of the cylinder B′. The said cylinder is thus filled with water and material in layers parallel with the shaft A until the opening 15 in the larger head of the cylinders is reached, whereupon the lighter material overflows with the water into the perforated or reticulated extension B² of the inner cylinder B′, where again the water is separated from the said lighter material and is thrown out through the perforated extension into the casing C, where it is conducted by the spout 22 to any desired point. The material thus separated from the water passes, by means of the opposing spout 22ª, into the compartment 23 of the receptacle D. While the above operation is in progress water under pressure is forced from the stand-pipe 12 into the hollow shaft A and connecting arms or spokes 17 into the annular chamber 16 between the cylinders B and B′. The water thus entering the chamber 16 separates the heavy separated layers of minerals from the surface of the inner cylinder B′, allowing such material to descend to the larger end of said cylinder B′, due to the increased centrifugal force at the larger diameter of said cylinder, and at such point the said heavy material is forced into the upper end of the discharge-pipe 25 and is directed thereby to the compartment 24 in the receptacle D. In this manner a complete separation is obtained of the heavy from the light minerals, the difference in the weight of the heavy and the light materials being augmented by the centrifugal force applied while in the reticulated cylinder B′ and the jacketing-cylinder B.

The means for forcing water under pressure against the material thrown outward by centrifugal force when passing through the device is an important part of the invention, as without it the material would be thrown down in solid mass and proper separation would not take place. The water is under the same pressure the whole length of the annular space and is forced through the openings in the inner cylinder under the same pressure. The jets of water therefore have the same force throughout the whole length of the cylinder for lifting or agitating or holding in suspension the material acted upon. The centrifugal force at the small end of the cylinder is less than it is at the large end on account of having a slower peripheral speed. The force of the water coming through the perforations tends to hold the material being separated in suspension at the small end of the cylinder. As the material passes toward the large or discharge end the centrifugal force increases and overbalances the water-pressure, so as to throw down the material being separated. This takes place gradually as the material passes from the small end to the large end of the cylinder, the material separating into layers, with the heaviest material to the ouside or near the inner face of the cylinder.

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

1. In a device for separating materials, means for containing the material, means for exerting centrifugal force on said material, means for exerting a constant force against said material in a direction opposite to the centrifugal force sufficient to retain all of said material in suspension in a stratified state, and means for separately removing the stratified material.

2. In a device for separating materials, a

receiver for containing the material, means for revolving the receiver to subject the material to centrifugal force, means for forcing fluid against the material in a direction opposite to the centrifugal movement of the material of sufficient resistance to retain all of said material in suspension in a stratified state, and means for separately removing said stratified material.

3. A device for separating materials, comprising a reticulated or perforated receiver into which the material is fed, means for revolving the receiver to subject the material to centrifugal force, means for forcing fluid through the perforations in the cylinder against the material thrown outward by the centrifugal force to retain all of said material in suspension in a stratified state within said receiver, and means for separately removing said stratified material from said receiver.

4. A device for separating materials, comprising an inner reticulated or perforated receiving-cylinder into which the material is fed, an outer imperforate inclosing cylinder, means for revolving said cylinder to subject the material to centrifugal force, and means for forcing fluid through the receiving-cylinder against the material thrown outward by the centrifugal force.

5. A device for separating materials, comprising an inner conical reticulated or perforated receiving-cylinder into which the material is fed, an outer conical imperforate inclosing cylinder arranged with respect to said inner cylinder to provide an intervening chamber of even width throughout, means for revolving said cylinder to subject the material to centrifugal force, and means for forcing fluid into the chamber between said cylinders to exert its force through the inner cylinder against the material thrown outward by the centrifugal force.

6. A device for separating materials, comprising connected conical cylinders, one contained within the other, the inner cylinder being perforated or reticulated and provided with an extension at its larger end beyond the corresponding end of the outer cylinder, the latter cylinder having openings at its end portions, and the inner cylinder being of less diameter than the outer cylinder forming an annular chamber between the two closed at its ends and extending the full length of the outer cylinder, means for supplying material mingled with fluid to the contracted end of the inner cylinder, means for simultaneously revolving the said cylinders to subject the material to centrifugal force, and means for supplying fluid under pressure to the annular chamber between the cylinders, the fluid passing under pressure from said annular chamber into the interior cylinder in a direction opposite to that of the material when thrown outward by the centrifugal force.

7. A device for separating materials, comprising an inner conical reticulated or perforated receiving-cylinder into which the material is fed, an outer conical imperforate inclosing cylinder arranged with respect to said inner cylinder to provide an intervening chamber, means for revolving said cylinders to subject the material to centrifugal force, means for forcing water into chamber between said cylinders to exert its force through the inner cylinder against the material thrown outward by the centrifugal force, and means for discharging from the inner surface of the inner cylinder at approximately its enlarged end the heavier material collected there by the centrifugal force.

8. A device for separating materials, comprising an inner conical reticulated or perforated receiving-cylinder into which the material is fed, an outer conical imperforate inclosing cylinder arranged with respect to said inner cylinder to provide an intervening chamber, means for revolving said cylinders to subject the material to centrifugal force, means for forcing water into chamber between said cylinders to exert its force through the inner cylinder against the material thrown outward by the centrifugal force, and a discharge-pipe having its receiving end lying within the enlarged end of the inner cylinder adjacent to the same and facing in a direction opposite to the direction of rotation of said cylinder for carrying off the heavier material collected by the centrifugal force.

9. A device for separating materials, comprising connected conical cylinders, one contained within the other, the inner cylinder being perforated or reticulated and provided with an extension at its larger end beyond the corresponding end of the outer cylinder, the latter cylinder having end walls provided with openings, and the inner cylinder being of less diameter than the outer cylinder forming an annular chamber between the two closed at its ends by the end walls of the outer cylinder, means for supplying material mingled with fluid to the contracted end of the inner cylinder, means for simultaneously revolving the said cylinders, means for supplying fluid under pressure to the space between the cylinders, a discharge-pipe supported at its receiving end within the enlarged end of the inner cylinder adjacent to the same, the upper end of said pipe facing in a direction opposite to the direction of rotation of the cylinder, and a receptacle divided into compartments, one of which compartments receives the material from the casing and the other from the said discharge-pipe.

10. A device for separating materials, comprising inner and outer revolving conical cylinders, the outer cylinder being a jacketing-cylinder and having openings in its end walls, the opening in one end wall being

larger than that in the other, the inner cylinder being reticulated or perforated and open at its ends and engaging at said ends the end walls of the outer cylinder thereby forming an annular chamber between the cylinders, means for revolving said cylinders together in the same direction, and means for delivering fluid under pressure to the space between the cylinders to cause the fluid to pass under pressure into the inner cylinder against the material thrown outward by the revolution of the cylinders.

11. A device for separating materials, comprising inner and outer revolving conical cylinders, the outer cylinder having end walls provided with openings and the inner cylinder being open at its ends and engaging at said ends the end walls of the outer cylinder, thereby forming an annular chamber between the cylinders, the inner cylinder being reticulated or perforated and the outer cylinder being imperforate, means for revolving said cylinders together in the same direction, means for delivering fluid under pressure to the space between the cylinders, and a fixed discharge-pipe for the heavier particles extending within the larger portion of the inner cylinder, having its upper end pointed in a direction opposite to the direction of rotation of the cylinders, and having its lower end carried out from the cylinders for the delivery of the material received thereby.

12. In a device for separating materials, a reticulated or perforated conical cylinder to which the material and water is fed, an annular chamber surrounding said cylinder, means for forcing fluid under pressure into said annular chamber and through the perforations in the cylinder against the material to hold the same in suspension; and means for revolving the cylinder, whereby the material thrown outward by the centrifugal force against the pressure of the fluid is caused to separate into layers.

13. A device for separating materials, comprising a reticulated or perforated conical cylinder for containing the material mixed with a fluid, an annular chamber surrounding said cylinder, means for forcing fluid under pressure into said annular chamber to cause the fluid to pass under pressure through the perforated walls of the conical cylinder against the material to hold the same in suspension, means for revolving the said cylinder whereby the material is caused to separate into layers with the heaviest near the inner face of the cylinder, the said cylinder having an inlet-opening for the material at its smaller end, and a central discharge-opening at its larger end for the lighter material, and means for discharging the heavy material.

14. In a device for separating materials, an inner reticulated or perforated cylinder, an outer imperforate cylinder, the two forming an intervening chamber, means for supplying the material to be separated to the inner cylinder, a central hollow shaft for rotating said cylinders, means for supplying fluid under pressure to said shaft, and hollow radial arms on said shaft supporting said cylinders and discharging the fluid into the chamber formed between said cylinders.

15. In a device for separating materials, an outer conical cylinder having its end walls provided with central openings, an inner reticulated or perforated conical cylinder smaller in diameter than the outer cylinder and having its ends engaging the end walls of the outer cylinder forming an annular chamber between the cylinders, means for feeding the material and a fluid to the contracted end of the inner cylinder, a tubular shaft mounted to turn in suitable bearings and closed at one end, the other end of said shaft being revolubly connected with a pipe for supplying fluid under pressure, tubular arms radiating from and communicating with the tubular shaft, the said arms extending through the wall of the inner cylinder and provided with flanges secured to the inner spaces of said cylinders, the arms having apertures in their outer end portions communicating with the space between the cylinders.

16. In a device for separating materials, means for subjecting the material to centrifugal force, means for simultaneously subjecting said material to fluid-pressure in opposition to said centrifugal force, means for separately discharging the lighter and heavier materials thus separated by said forces, and means for screening the fluid from said lighter material by said centrifugal force.

17. In devices for separating materials, an inner conical cylinder open at its ends and formed of reticulated or perforated material, an outer conical jacketing-cylinder having end walls provided with central openings, the inner cylinder being of less diameter than the outer cylinder and having its open ends abutting against the end walls of the outer cylinder whereby an annular space is formed between the cylinders, the inner cylinder being provided with an extension at its larger end secured to the outer face of the corresponding end wall of the outer cylinder, means for revolving said cylinders, means for supplying fluid under pressure to the space between the cylinders, and a delivery device for the heavy material having its inlet end arranged within the larger end of the inner cylinder and extending close to the inner surface of said cylinder.

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

TALMADGE BLASS.

Witnesses:
T. C. CLARK,
M. R. SLOAN.