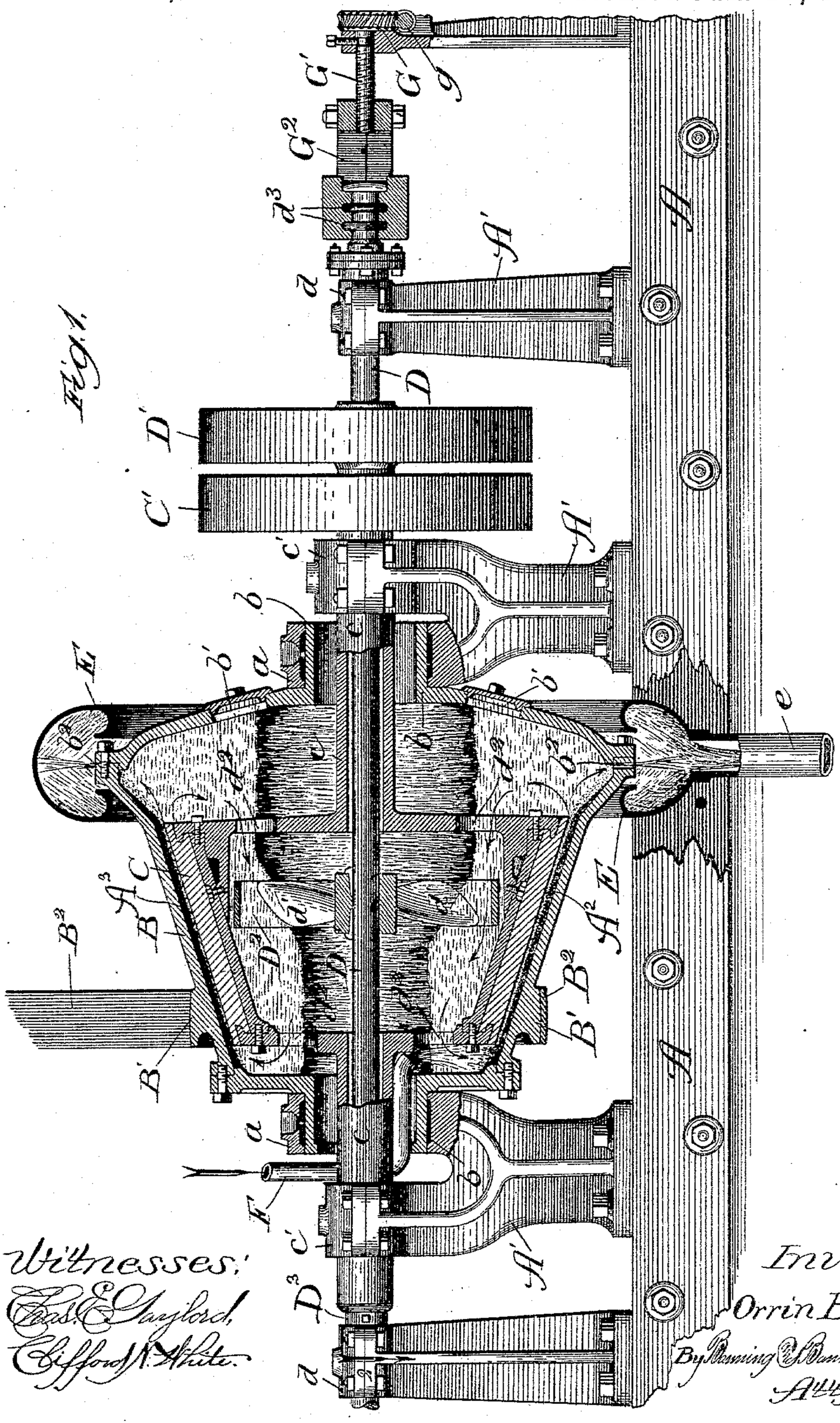
(No Model.) 4 Sheets—Sheet 1.

O. B. PECK.

CENTRIFUGAL ORE SEPARATOR.

No. 490,084. Patented Jan. 17, 1893.



Witnesses:
Chas. E. Gaylord,
Clifford N. White.

Inventor:
Orrin B. Peck,
By Banning & Banning & Payson,
Attys.

(No Model.) 4 Sheets—Sheet 2.

O. B. PECK.

CENTRIFUGAL ORE SEPARATOR.

No. 490,084. Patented Jan. 17, 1893.

Fig. 2.

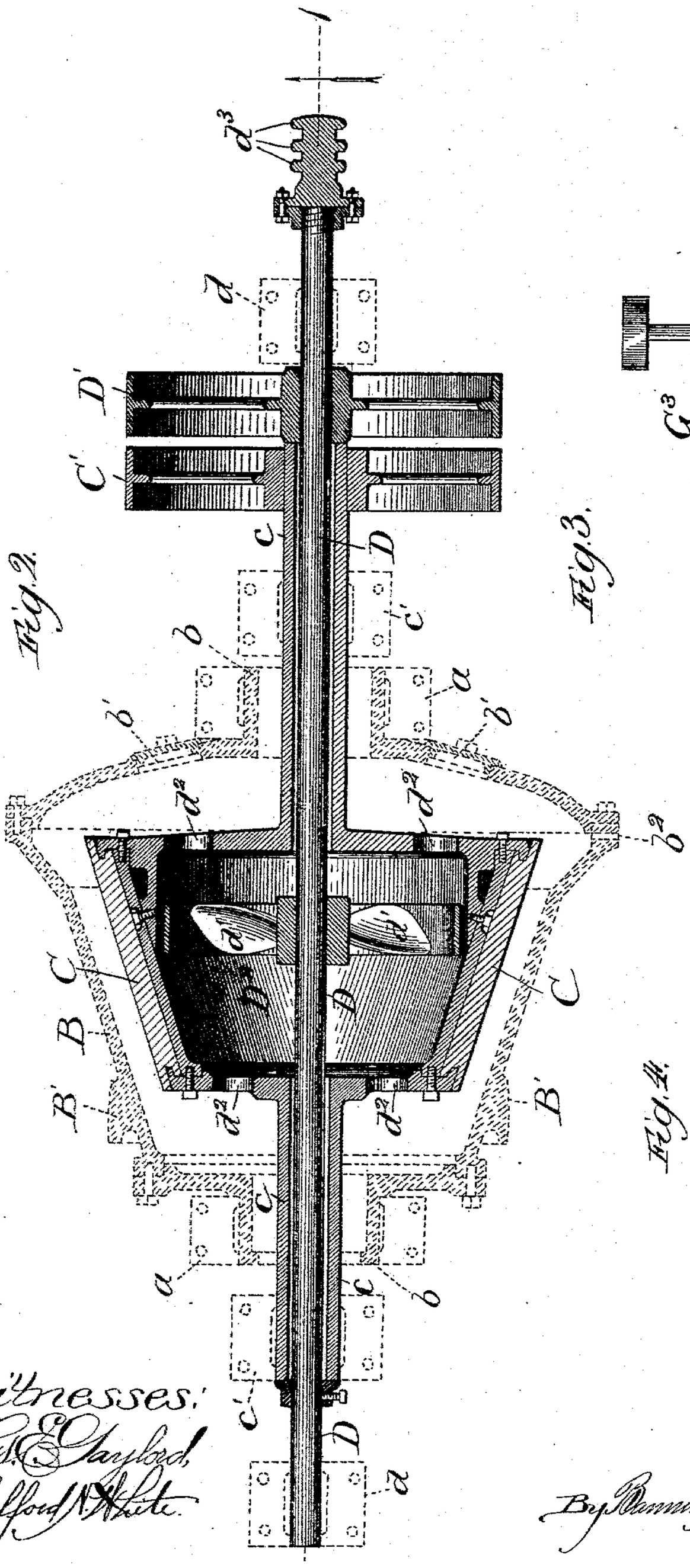


Fig. 3.

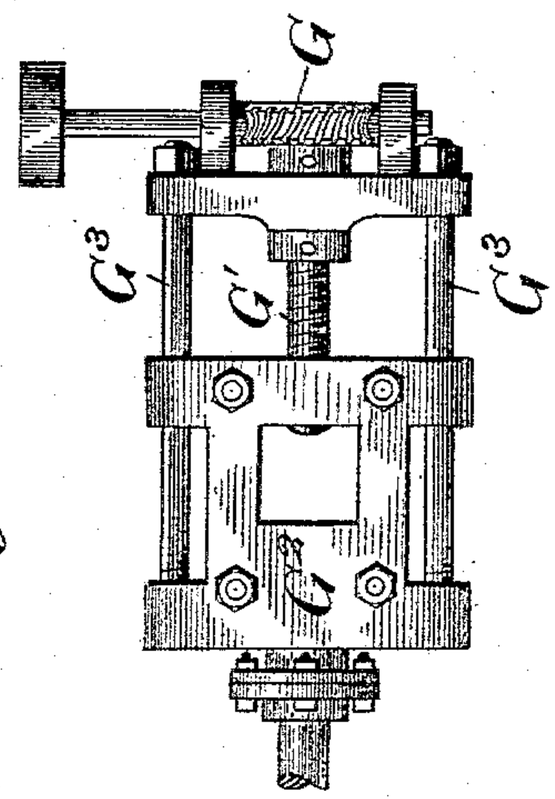
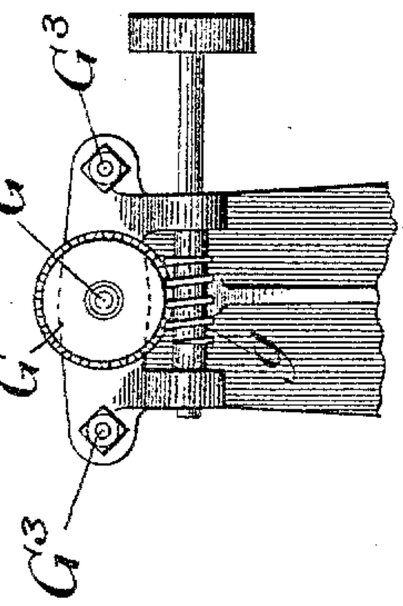


Fig. 4.



Witnesses:
Chas. E. Gaylord,
Clifford N. White.

Inventor:
Orrin B. Peck,
By Banning & Banning & Payson
Attys.

(No Model.) 4 Sheets—Sheet 3.

O. B. PECK.

CENTRIFUGAL ORE SEPARATOR.

No. 490,084. Patented Jan. 17, 1893.

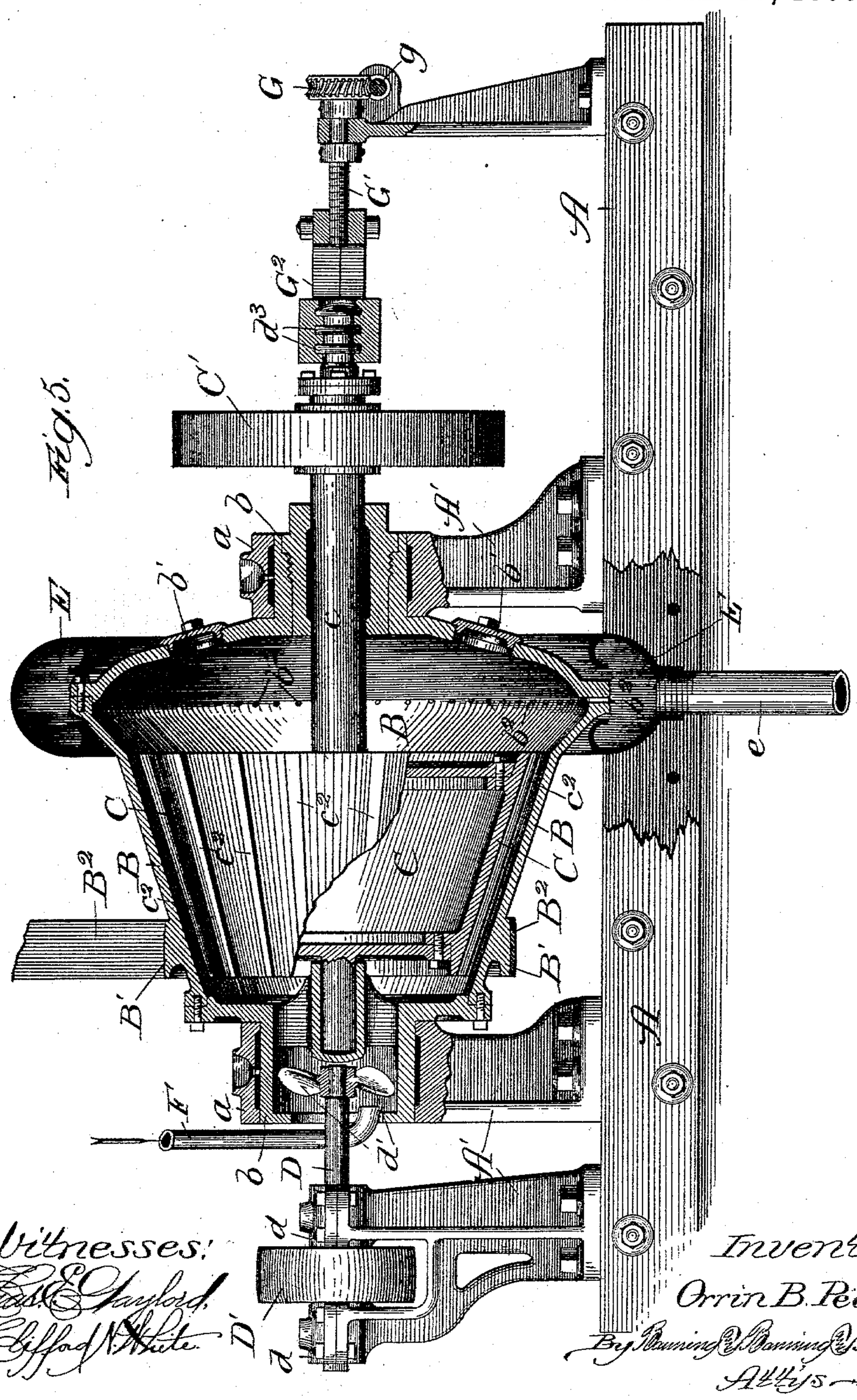


Fig. 5.

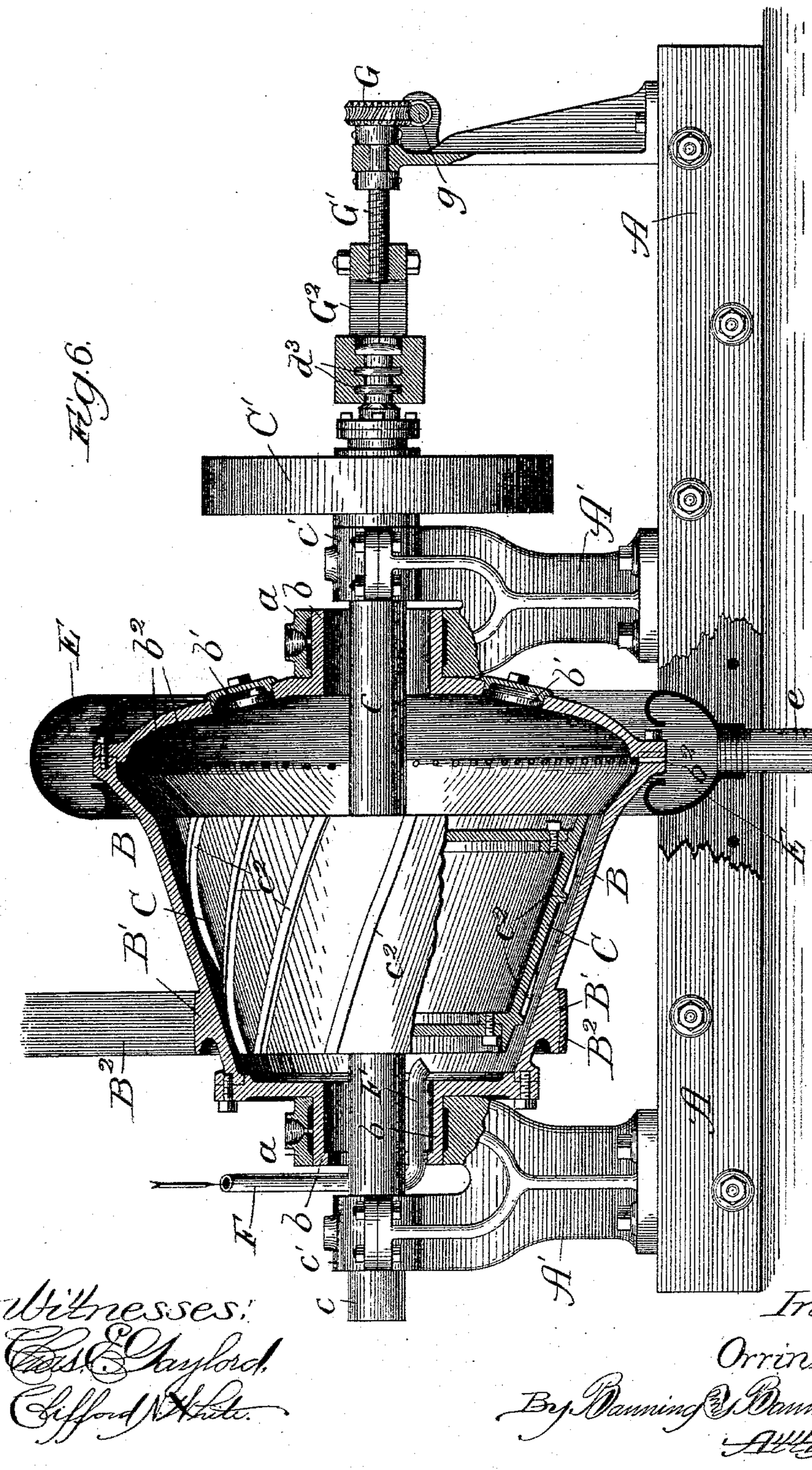
(No Model.) 4 Sheets—Sheet 4.

O. B. PECK.

CENTRIFUGAL ORE SEPARATOR.

No. 490,084. Patented Jan. 17, 1893.

Fig. 6.



Witnesses:
Chas. E. Gaylord.
Clifford N. White.

Inventor:
Orrin B. Peck,
By Banning & Banning & Payson,
Att'ys.

UNITED STATES PATENT OFFICE.

ORRIN B. PECK, OF CHICAGO, ILLINOIS, ASSIGNOR TO MELINDA PECK, OF SAME PLACE.

CENTRIFUGAL ORE-SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 490,084, dated January 17, 1893.

Application filed September 26, 1892. Serial No. 446,911. (No model.)

To all whom it may concern:

Be it known that I, ORRIN B. PECK, a citizen of the United States, residing at Chicago, Illinois, have invented certain new and useful Improvements in Centrifugal Ore-Separators, of which the following is a specification.

In the drawings, Figure 1 is a central longitudinal broken sectional elevation taken on line 1 of Fig. 2, looking in the direction of the arrow; Fig. 2 is a plan sectional view, with parts shown in dotted lines taken on line 2 of Fig. 1; Figs. 3 and 4 a plan and end elevation respectively of mechanism used in shifting the position of the deflector or smoother, hereinafter described; Figs. 5 and 6 are broken sectional elevations of modified forms of construction.

In making my improved centrifugal ore separator, I make a bed or frame work, A, provided with brackets or standards, A′ on which the operative parts are intended to be mounted. I make a treatment vessel, B, preferably bell-shaped or enlarging from one end to the other and provide it with a separating surface A^2 on the inside, preferably of such form as to be adapted to receive and retain material thereon the more securely the greater the amount of centrifugal force developed. It is preferably partly closed at its ends so as to be adapted to contain a body or quantity of water while in practical use or operation, as hereinafter described. This vessel, however, is preferably arranged in a horizontal position and is supported by the brackets A′ in suitable journals or bearings *a*. It is preferably provided with a belt surface, B′, so that it may be rotated by means of a belt, B^2 operated by any convenient motive power, although, if preferred, other means may be used for rotating it. The ends or trunnions, *b*, which rest in the bearings *a* are hollow, as shown in the drawings, for purposes hereinafter described. The vessel may be also provided with hand holes, *b*′, to permit access into its interior, if desired, for cleansing and other purposes.

Arranged within the vessel B is a deflector C, which may also be used to perform the office of a stirrer or distributer to stir or distribute the material being treated uniformly over the separating surface, and to loosen and assist in the removal of the heavier particles at the proper stages of the treatment, hereinafter described. The outside surface of this deflector preferably corresponds in form to the form of the inside of the treatment vessel B, leaving an annular space between the deflector and the treatment vessel. This deflector serves to deflect and guide the material along near or in proximity to the separating surface. I wish to say here, however, that while I have shown the deflector as a vessel, yet as one of its main objects is to form the inside wall of the passage or channel A^3 in which the material to be treated is passed, it is not essential that it be in the form of a vessel, and any other arrangement may be adopted that is preferred, so long as it serves to form the inner walls of the ways or channels in which the material is treated, nor need the channel in which the material is treated be annular or extend entirely around the interior of the treatment vessel, as separate channels may be used instead of one continuous annular channel, if preferred. I shall for convenience, however, describe the construction, arrangement and operation of my improvements as they are exhibited in the drawings, and merely make the above explanation to show that I do not intend to limit myself strictly to details of construction.

The deflector C is preferably provided with hollow trunnions, *c*, as shown in Fig. 1, which extend out through the hollow trunnions of the treatment vessel, and are supported in bearings, *c*′. In order to rotate the deflector, I have mounted a pulley C′ on the end of one of the trunnions *c*, so that it may be rotated by a belt operated by any convenient motive power, although other means may be used, if desired, for rotating the deflector. I arrange a shaft, D, in suitable bearings *d*, and extend it through the hollow trunnions *c* of the deflector, so that it may be rotated by a pulley, D′, or other convenient means. I mount on it means for forcing or causing a circulation of water, (which may incidentally contain some of the material) through the deflector, and then, together with the material, through the channel or channels in which the mate-

rial is treated. These means are preferably formed of a wheel, D^2, mounted on the shaft, with spirally or obliquely arranged blades, d', so that, as the wheel is rotated by the rotation of the shaft D, the blades will force the water and material along. I have shown these means, though others may be used operating to pump or force the water and material along the separating surface. The deflector is provided with holes or openings, d^2, at its ends, to form a passage, through which the desired portion of the water is returned to the receiving end of the treatment vessel, and the treatment vessel is provided with small holes or perforations, b^2, through which the water and the material treated may be discharged, as hereinafter described.

A trough or curbing E is preferably arranged around the discharge holes or perforations of the treatment vessel, to catch the water and material discharged, so that they can be carried off through one or more discharge pipes *e*. The material to be treated is introduced through a pipe, F, which enters the hollow trunnion *b* of the treatment vessel, and discharges the material in a finely powdered condition, and preferably mixed or diluted with water at the receiving end of the treatment vessel. The material and water immediately pass, through the action of centrifugal force, to the wall of the treatment vessel, and proceed along the separating surface toward the discharge holes or orifices. Before the operation is commenced, a sufficient quantity of water is introduced into the treatment vessel to partially fill the same thus forming a body of water in the vessel, or a sufficient quantity therein to preferably wholly submerge the separating surface and the material under treatment, which is usually very desirable. As the operation begins, and new water is introduced with the material to be treated, the water already in the vessel assumes a position to the outside, leaving a hollow space along the center, as shown in Fig. 1, and the pump or means for forcing a current of water, moves the desired portion of the water toward the receiving end of the vessel, and forces it to commingle with the material being introduced and passed along the separating surface toward the discharge end.

The water introduced with the material is intended to be sufficient to maintain about the same quantity of water in the vessel, or in other words, to compensate for the water constantly discharged through the orifices b^2. The current of water flowing over the separating surface is intended to be maintained at sufficient strength and rate of speed to wash off and carry away the lighter particles of the material, without being sufficiently rapid and strong to carry off the heavier particles, which are allowed to accumulate on the separating surface of the treatment vessel.

The deflector C and the shaft D, although rotatable independently of each other, are preferably connected together so as to move longitudinally in unison. This connection is effected through means of the pulley D', against which the deflector shaft contacts at one end, and a collar D^3 on the shaft D, against which it contacts at the other, whereby it is moved longitudinally with the shaft. A screw wheel G, operated by a screw shaft *g*, rotated in any convenient way, turns a screw G', which engages with screw threads in a sliding block or frame G^2, supported in rods, G^3, which in turn engages with rings, d^3, on the extended end of the shaft D, so that, in the operation of the machine, the shaft, and with it the deflector, may be moved in or out as may be desired. Details of these parts are particularly shown in Figs. 3 and 4, although other means may be employed if desired.

At the commencement of the operation the deflector is intended to be in its in position, as shown in Fig. 1. In this position the channel through which the material passes while being separated, is of the desired size or depth to assist in regulating the flow of the water over the separating surface, to carry off the lighter but not the heavier particles. As the heavier particles increase or accumulate on the separating surface, the deflector is gradually moved endwise and out, by the means above described, so as to maintain the space in the separating channel at about its initial size or depth, so as to secure uniformity in the flow of water and treatment of the particles, from the commencement to the end of the operation, although, as the deflector moves out, the size of the separating channel constantly increases, to accommodate the increasing quantity of heavier particles accumulated. It is intended that a sufficient quantity of the heavier particles will have accumulated on the separating surface by the time the deflector has been moved to its extreme out position, as shown in Fig. 2. When this occurs, the introduction of material may be suspended, although the water may be allowed to continue to enter. The discharge pipe *e*, may be transferred to another receptacle. The shaft D and the deflector now begin to move to their in position. In doing this the size or depth of the separating channel or channels is gradually decreased, so that the water flowing through or over the same is accelerated in its speed or flow, so that it washes out or removes the heavier particles which have accumulated, to be discharged through the orifices b^2, and carried by the discharge pipe *e* into the receptacle provided for them. When the deflector has reached its in position, it is intended that the heavier particles will have been discharged, and the introduction of material with the water may be again commenced, and the operation repeated.

If desired, the deflector may be moved in much more rapidly than out, so that the period required to discharge the accumulated

material will be much less than that employed in effecting the separation of the material. In this way, and without stopping or interrupting the revolution of the treatment vessel, the cylinder or deflector C may be alternately moved back and forth endwise, increasing or decreasing the size of the channel or passage in which the separation is effected, and the material may be introduced and treated, and the heavier particles discharged and secured.

In Fig. 5, I have shown a modification of some of the parts. The deflector is provided on its surface with longitudinal ribs, c^2, which, in the rotation of the deflector, serve to stir smooth or distribute the material under treatment. During the in movement of the deflector to discharge the heavier particles, these ribs also serve to disturb or loosen the heavier particles, so that they are the more easily washed out. The deflector, as illustrated in Fig. 5, is unprovided with the openings d^2 shown in Fig. 1, for the passage of the water back through it. In this arrangement, the water is not intended to be returned to again pass over the separating surface, and the pump or screw is arranged at the point where the water and material are introduced, and the blades arranged in that position which forces the water and material, when introduced, forward through the shallow passage or channel and over the separating surface in a thin layer or stream, irrespective of the rotation of the vessel. In this modification, also, the deflector is mounted upon a solid shaft, instead of being mounted upon hollow trunnions, as in Fig. 1. These, and other modifications in construction, however, will be obvious on an inspection of Fig. 5, and need not be dwelt upon in detail.

In Fig. 6 I have shown the longitudinal ribs or flanges, c^2, as arranged spirally around the deflector. I dispense with the means for pumping or forcing the water and material through the channels or passages and over the separating surface, and depend upon the action of centrifugal force to advance the material; and I may say, generally, that I do not intend to limit myself to details of construction further than as the same may be specified in the claims. I may also say that when I use the term "material" in the claims, I intend it in a sufficiently broad signification to include any water or other liquid which may be mixed with the material, and it is apparent that the means for forcing the material through the channels or passages largely employ the water or other liquid as the agent through which such force is exerted on the material.

In some of the claims I shall speak of the separating surface forming one side of a covered channel or passage, and of increasing or decreasing the size or depth of the channel or passage by moving the other side. As the size or depth of the channel will be increased or decreased whichever side be moved, I wish it understood that in speaking of the movement of one part, I simply have reference to the change of relative position of the two parts, and mean to cover the arrangement whichever side may be moved.

What I regard as new and desire to secure by Letters Patent is:—

1. In a centrifugal ore separator, the combination of a rotatable vessel adapted to contain a body of water while in operation, and provided with a separating surface adapted to receive and retain material thereon the more securely the greater the amount of centrifugal force developed, and rotatable means for forcing or circulating material over the separating surface, substantially as described.

2. In a centrifugal ore separator, the combination of a rotatable vessel adapted to contain a body of water while in operation, and provided with a separating surface adapted to receive and retain material thereon the more securely the greater the amount of centrifugal force developed, and means for forcing or circulating material over the separating surface rotatable independently of such surface, substantially as described.

3. In a centrifugal ore separator, the combination of a rotatable vessel adapted to contain a body of water while in operation, and provided with a separating surface adapted to receive and retain material thereon the more securely the greater the amount of centrifugal force developed, and a rotatable wheel or disk provided with spiral or oblique blades for forcing or circulating material over the separating surface, substantially as described.

4. In a centrifugal ore separator, the combination of a rotatable vessel adapted to contain a body of water while in operation, and provided with a separating surface adapted to receive and retain material thereon the more securely the greater the amount of centrifugal force developed, means for stirring and distributing the material on the separating surface, and means for forcing or circulating material over such surface, substantially as described.

5. In a centrifugal ore separator, the combination of a rotatable vessel adapted to contain a body of water while in operation, and provided with a separating surface adapted to receive and retain material thereon the more securely the greater the amount of centrifugal force developed, means for stirring and distributing the material on the separating surface rotatable independently of such surface, and means for forcing or circulating material over such surface, substantially as described.

6. In a centrifugal ore separator, the combination of a rotatable vessel adapted to contain a body of water while in operation, and provided with a separating surface adapted to receive and retain material thereon the more securely the greater the amount of centrifugal force developed, means for deflecting or guiding the material along near or in proximity

to the separating surface, means for stirring and distributing the material on the separating surface, and means for forcing or circulating material over such surface, substantially as described.

7. In a centrifugal ore separator, the combination of a rotatable vessel adapted to contain a body of water while in operation, and provided with a separating surface adapted to receive and retain material thereon the more securely the greater the amount of centrifugal force developed, means for deflecting or guiding the material along near or in proximity to the separating surface, means for stirring and distributing the material on the separating surface rotatable independently of the separating surface, and means for forcing or circulating material over such surface, substantially as described.

8. In a centrifugal ore separator, the combination of a rotatable vessel adapted to contain a body of water while in operation, and provided with a separating surface adapted to receive and retain material thereon the more securely the greater the amount of centrifugal force developed, means for deflecting or guiding the material along near or in proximity to the separating surface, and means for forcing or circulating the material over such surface, substantially as described.

9. In a centrifugal ore separator, the combination of a rotatable vessel adapted to contain a body of water while in operation, and provided with a separating surface adapted to receive and retain material thereon the more securely the greater the amount of centrifugal force developed, means for deflecting or guiding the material along near or in proximity to the separating surface rotatable independently of such surface, means for stirring and distributing the material on the separating surface, and means for forcing or circulating material over such surface rotatable independently thereof, substantially as described.

10. In a centrifugal ore separator, the combination of a rotatable vessel adapted to contain a body of water while in operation, and provided with a separating surface forming one side of a covered channel or passage, and means for alternately increasing and decreasing the size or depth of such channel or passage by moving the other side substantially as described.

11. In a centrifugal ore separator, the combination of a rotatable vessel adapted to contain a body of water while in operation, and provided with a separating surface forming one side of a covered channel or passage in which the separation is effected, and means for changing the size or depth of such channel or passage from the beginning to the end of the operation by moving the other side, substantially as described.

12. In a centrifugal ore separator, the combination of a rotatable vessel adapted to contain a body of water while in operation, and provided with a separating surface forming one side of a covered channel or passage in which the separation is effected, and means for gradually changing the size or depth of such channel or passage by moving the other side, substantially as described.

13. In a centrifugal ore separator, the combination of a rotatable vessel adapted to contain a body of water while in operation, and provided with a separating surface forming one side of a covered channel or passage in which the separation is effected, means for gradually changing the size or depth of such channel or passage by moving the other side, and means for forcing or circulating material through the channel or passage, substantially as described.

14. In a centrifugal ore separator, the combination of a rotatable vessel adapted to contain a body of water while in operation, and provided with a separating surface forming one side of a covered channel or passage in which the separation is effected, means for gradually changing the size or depth of such channel or passage by moving the other side, means for stirring and distributing the material in such channel or passage, and means for forcing or circulating material through such channel or passage, substantially as described.

15. In a centrifugal ore separator, the combination of two rotatable cylinders, one within the other, with a channel or passage between them, the outer cylinder adapted to contain a body of water while in operation, and with a separating surface forming one wall of such channel or passage, at least one of said cylinders being movable endwise with respect to the other, substantially as described.

16. In a centrifugal ore separator, the combination of a rotatable vessel provided with a separating surface and with hollow shafts or trunnions, a deflector within the vessel provided with shafts or trunnions extending over such hollow shafts or trunnions, and rotatable independently of the vessel, and means for effecting the independent rotation of the vessel and deflector, substantially as described.

17. In a centrifugal ore separator, the combination of a rotatable vessel provided with a separating surface and with hollow shafts or trunnions, a deflector within the vessel movable endwise with respect to the vessel and provided with shafts or trunnions extending through the hollow shafts or trunnions of the vessel, and means for effecting the endwise movement of the deflector, substantially as described.

18. In a centrifugal ore separator, the combination of a rotatable vessel provided with a separating surface and with hollow shafts or trunnions, a deflector within the vessel provided with hollow shafts or trunnions extending through the hollow shafts or trunnions of the vessel, and means for circulating material over the separating surface of the vessel, mounted on a shaft extending through the

hollow shafts or trunnions of the deflector, substantially as described.

19. In a centrifugal ore separator, the combination of rotatable cylinders, one within the other, with a channel or passage between them, a separating surface and a stirrer or distributer within the channel or passage, and means for forcing or circulating material through such channel or passage, substantially as described.

20. In a centrifugal ore separator, the combination of two rotatable cylinders, one within the other, each rotatable independently of the other, with a channel or passage between them, and a separating surface within such channel or passage, substantially as described.

21. In a centrifugal ore separator, the combination of two rotatable cylinders, one within the other, with a channel or passage between them, a separating surface and a stirrer and distributer within the channel or passage, and mechanism within the inner cylinder for forcing or circulating material through such channel or passage, substantially as described.

22. In a centrifugal ore separator, the combination of two rotatable cylinders, one within the other, with a channel or passage between them, a separating surface in the channel or passage, and means for changing the size or depth of such channel or passage, substantially as described.

23. In centrifugal ore separators, the combination of two rotatable cylinders, one within the other, of a greater diameter through one portion than another, at least one of the cylinders being movable endwise with respect to the other, and a separating surface between the cylinders, substantially as described.

24. In a centrifugal ore separator, the combination of two rotatable cylinders, one within the other, of a greater diameter through one portion than another, at least one of the cylinders being movable endwise with respect to the other, a separating surface between the cylinders, and means for forcing or circulating material over the separating surface, substantially as described.

25. In a centrifugal ore separator, the combination of two rotatable cylinders, one within the other, of a greater diameter through one portion than another, at least one of the cylinders being movable endwise with respect to the other, and a separating surface and a stirrer and distributer between the cylinders, substantially as described.

26. In a centrifugal ore separator, the combination of two rotatable cylinders, one within the other, at least one of the cylinders being provided with ribs, corrugations or projections on its surface for stirring and distributing the material under treatment, and a separating surface between the cylinders, substantially as described.

27. In a centrifugal ore separator, the combination of two rotatable cone-shaped cylinders, one within the other, at least one of the cylinders being movable endwise with respect to the other, and a separating surface between the cylinders, substantially as described.

28. In a centrifugal ore separator, the combination of two rotatable cone-shaped cylinders, one within the other, at least one of the cylinders being movable gradually endwise with respect to the other, and a separating surface between the cylinders, substantially as described.

29. In a centrifugal ore separator, the combination of a rotatable separating surface, means for introducing material and water to such surface, and means for causing water to circulate repeatedly over the separating surface before its discharge from the separator, substantially as described.

30. In a centrifugal ore separator, the combination of two rotatable cylinders of a greater diameter through one portion than another, at least one of said cylinders being movable endwise with respect to the other, and mechanism for alternately effecting such endwise movement forward and backward during the operation of the machine, substantially as described.

31. In a centrifugal ore separator, the combination of two rotatable cone-shaped cylinders, one within the other, the inner cylinder being movable endwise with respect to the outer, and the outer cylinder being mounted on hollow shafts or trunnions through which the shafts or trunnions of the inner cylinder extend, and means for effecting the endwise movement of the inner cylinder through the instrumentality of its extended shaft or trunnion, substantially as described.

32. In a centrifugal ore separator, a rotatable separating surface adapted to receive and retain material thereon the more securely the greater the amount of centrifugal force developed, and means for forcing or circulating a current of water over the separating surface in a thin and substantially uniform sheet or layer, irrespective of the rotation of the separating surface, substantially as described.

ORRIN B. PECK.

Witnesses:
SAMUEL E. HIBBEN,
ANNIE C. COURTENAY.