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SEPARATOR.

APPLICATION FILED JAN. 7, 1902.

NO MODEL.

Fig. 1.

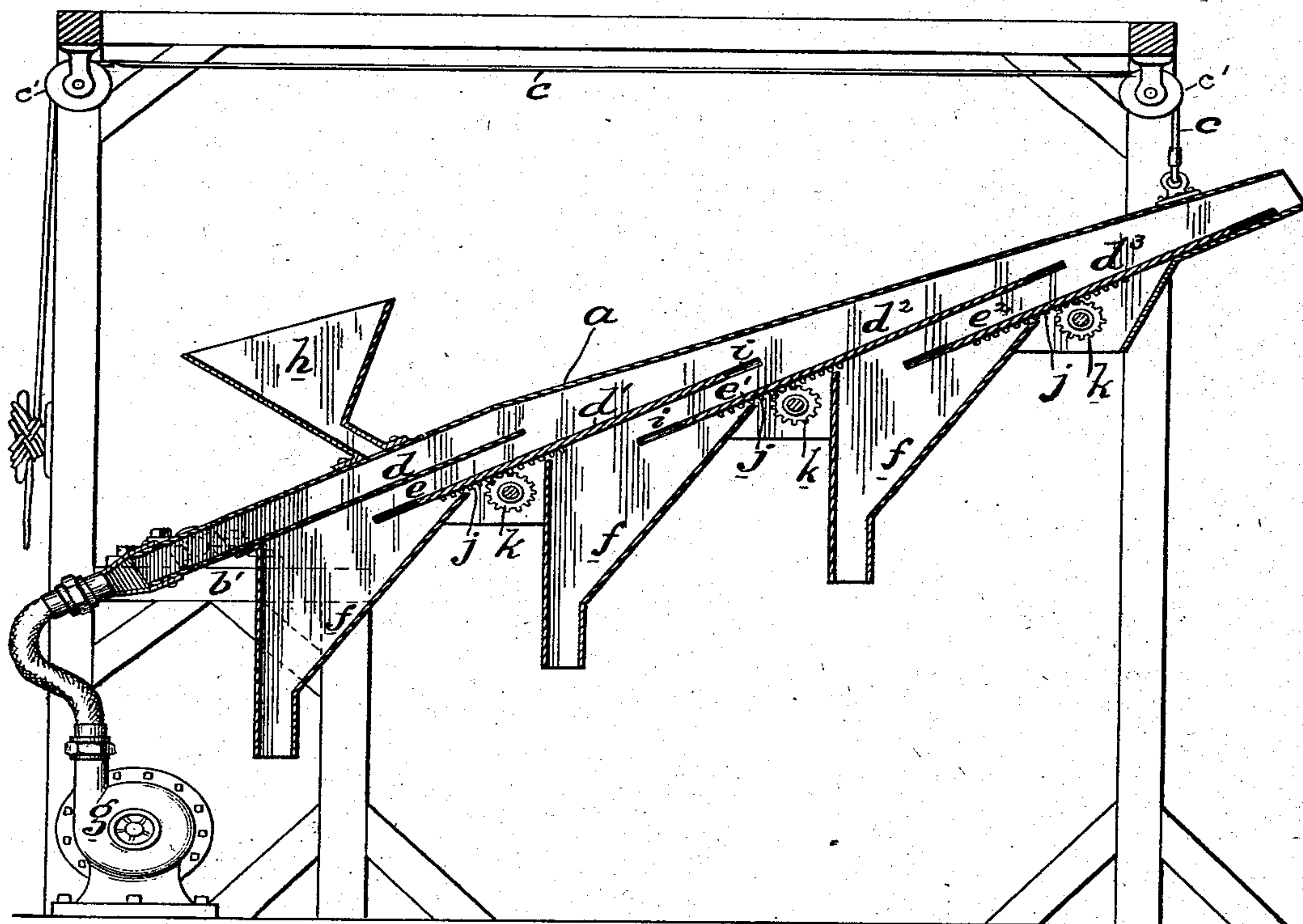
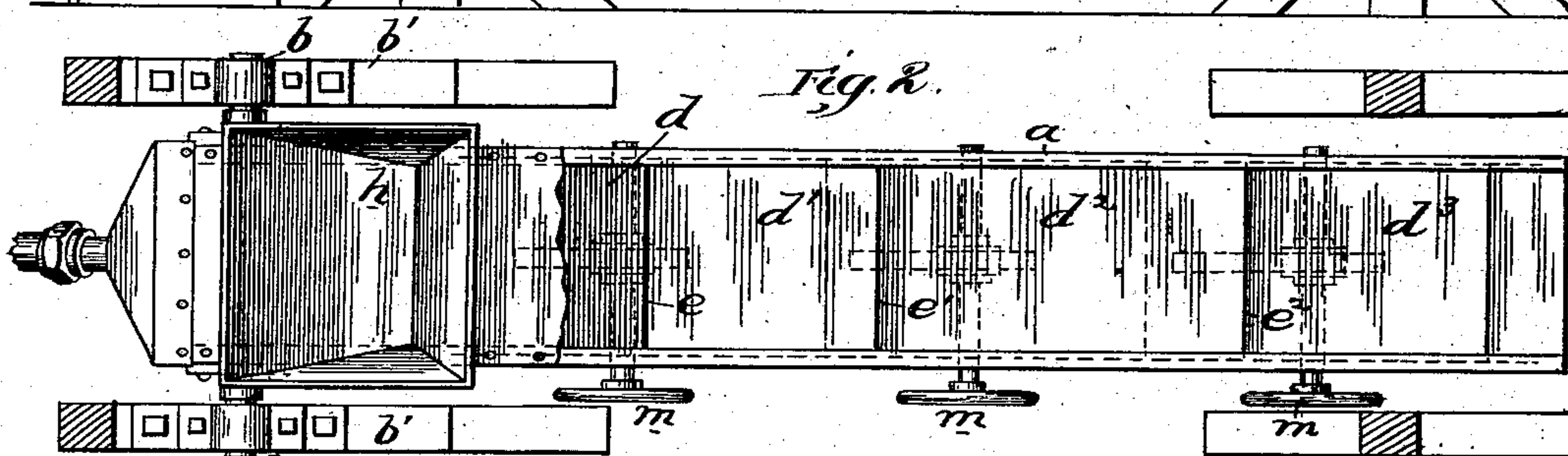


Fig. 2.



Witnesses:
H. B. Hallock.
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By *J. M. Burr* atty.

UNITED STATES PATENT OFFICE.

JESSE T. BURR, OF GLENVILLE, OHIO.

SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 730,229, dated June 9, 1903.

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To all whom it may concern:

Be it known that I, JESSE T. BURR, of Glenville, county of Cuyahoga, State of Ohio, have invented an Improvement in Separators, of which the following is a specification.

My invention relates to apparatus for separating masses of matter into portions composed of particles of like or approximately equal specific gravity, and is fully set forth in the following specification.

More particularly my invention relates to the separation of a mass composed of loose particles of matter into one or more component portions composed of particles of like or approximately equal specific gravity.

In carrying out my invention I employ fluid-pressure—either air, gas, or liquid, according to the nature of the material acted upon—to move the mass over an upwardly inclined plane, which imposes a frictional resistance to the movement of the particles of which the mass is composed proportional to their specific gravity, and permit the heavier particles to drop from the mass when the frictional resistance imposed by the inclined plane over which the particles are moving is sufficient to overcome the pressure of the current. The lighter particles are carried on to the next inclined plane by the fluid-pressure after the heavier particles have been removed and may be subjected in like manner to one or more separations, as the nature of the mass may require. By this means particles of an approximately equal specific gravity may be separated from the mass, or any body of matter may be divided into component portions of different specific gravity. This elimination or separation of the moving particles by the frictional resistance of the inclined planes upon them is effected by the arrangement of the planes at angles slightly exceeding the critical angles of the material and by providing them with extended frictional surfaces in planes intercepting at small angles the line of movement of the material under the force of the blast, and this frictional resistance, and consequently the point of separation, may be regulated to suit the character of the material by varying the fluid-pressure by changing the angle of inclination of the planes up which the mass is moved or by varying the length of the in-

clined plane over which the material must pass before separation is permitted. By "the critical angle of the material" is meant the greatest angle at which the material will remain at rest on the planes. Consequently when this angle is exceeded by the inclined planes the material will be moved in contact with their extended frictional surfaces. Separation may also be facilitated by reducing the fluid-pressure at the point at which the separation is desired.

In the accompanying drawings, Figure 1 is a longitudinal vertical sectional view of a separator embodying my invention, and Fig. 2 is a sectional plan view of the same with the top of the body broken away to expose the interior.

The separator embraces a longitudinal hollow body *a* of substantial length having openings at its ends to permit the passage of the air or liquid by which the material to be separated is conveyed through the separator. The body *a* is adapted to be arranged in a more or less inclined position, and this inclination should be adjustable. For this purpose I have shown the body *a* supported by trunnions *b b* at one end in side frames *b' b'* and with the other end adjustably supported by a cable *c*, running over guides *c' c'* in the framework. By this means the outer end of the body *a* may be raised or lowered to any extent desired to adjust the angular inclination of the separator. Any other suitable means may, however, be employed for adjusting the inclination of the separator.

The base of the body *a* consists of a series of inclined planes *d d' d² d³*, arranged substantially parallel with one another and overlapping, so that the upper end of one plane projects over the lower end of the next plane, leaving an open passage-way *e e' e²* between the overlapping ends, which forms a discharge-outlet and may communicate with a discharge-chute *f*. The number of inclined planes and discharge-outlets provided in the length of the body *a* will depend upon the number of separations desired in the mass of material passing through the separator. In the drawings I have shown four planes *d d' d² d³*, forming three discharge passage-ways *e e' e²*.

A current of fluid—either air, gas, or liquid—is produced through the separator. This may

be produced either by pressure at the lower end of the separator or by suction at the upper end. In the drawings I have shown the lower end of the separator connected with a fan-blower *g*, by which a current of air at any pressure desired may be blown through the separator.

The unseparated mass of material is introduced into the lower end of the separator in any suitable manner, as through the hopper *h*, and falls upon the lower inclined plane *d*, where it is subjected to the current of fluid and is carried upward over the plane *d* and falls from the end thereof on the next inclined plane *d'*. If the specific gravity of a portion of the particles of matter of which the mass is composed is such that the frictional resistance produced by the surface of the inclined plane on which the particles rest is sufficient to resist the pressure of the current at this point, it is obvious that a separation in the particles of the mass will be effected at the partition *d'*. The lighter portion will be carried on by the current over the partition *d'* to the next inclined plane *d''*, while the heavier particles will fall by gravity through the outlet passage-way *e*. On the next partition a second separation will be effected in a similar manner. If only one separation is required, it will be necessary to employ only two inclined planes, and the lighter particles may be discharged through the end of the separator. If, however, it is desired to collect the lighter particles, as well as the heavier, an additional inclined plane and outlet should be provided. As the mass drops from the end of one inclined plane upon the next plane it passes for an instant through the air or fluid out of frictional contact with the planes. At such moment there is a tendency of the particles to separate, the heavier particles falling slightly to the rear of the lighter particles. Such slight separation as takes place at this moment while to some extent facilitating the separation effected by the resistance due to the frictional contact on the inclined plane is not in itself sufficient to produce an effective separation of the particles in the manner required in practice. While the separation can be satisfactorily effected with many masses simply by the difference in the frictional resistance imposed upon the particles of matter by the inclined surfaces over which they move, it may be desirable to produce a slight diminution in the pressure of the current at such point of separation. This is effected in the apparatus shown by reason of the increase in the area of the body of the separator at the upper end of each inclined plane and the opening afforded by the escape-outlet, which will have the effect of diminishing to some extent the pressure of the current at the moment the mass falls from one plane to the next. If with some materials a greater diminution of pressure is desirable, it can be produced by providing additional fluid-inlets at these points. As the separation is

effected by the difference in the frictional resistance imposed upon particles of matter of different specific gravity in passing upward over inclined planes, the separation may be varied to suit the materials acted upon by adjusting the inclination of the planes. This may be effected by varying the inclination of the separator, as has been described. A further adjustment may, however, be afforded by increasing or decreasing the length of the inclined planes over which the particles move while subjected to the current of fluid. For this purpose each of the planes may be provided with means for longitudinal adjustment. I have shown the inclined planes supported at their ends in guides *i* in the sides of the body and provided on their lower faces with racks *j*, engaging pinions *k*, which may be operated by hand-wheels *m*.

Where the fluid-pressure is produced by a current of liquid, the entire separator may be submerged in liquid, if desired.

As the critical angles of the planes, and consequently the frictional resistance which they present, depends not only upon the specific gravity of the material and the area of the planes, but also upon the inclination of the planes to the direction of the blast or current, it is apparent that the frictional resistance may be controlled not only by the adjustment of the angular inclination of the planes themselves and the variation of their frictional area, but also by the variation of the angular direction or line of action of the blast or current with reference to the planes.

What I claim as new, and desire to secure by Letters Patent, is as follows:

1. A separator for separating a mass of matter into component portions composed of particles of like or approximately equal specific gravity, consisting of a longitudinal hollow body, having a base formed of a series of upwardly-inclined planes inclined at angles slightly exceeding the critical angles of the material and presenting extended frictional surfaces in planes intercepting at small angles the line of movement of the material under the force of the current and separated at their ends from one another so as to form escape-outlets between adjacent planes, an inlet for the mass of material adjacent to the lowermost inclined plane, and means to induce a current of fluid upward through said hollow body over said inclined planes.

2. A separator for separating a mass of matter into component portions composed of particles of like or approximately equal specific gravity, consisting of a longitudinal hollow body, having a base formed of a series of upwardly-inclined planes inclined at angles slightly exceeding the critical angles of the material and presenting extended frictional surfaces in planes intercepting at small angles the line of movement of the material under the force of the current and separated at their ends from one another so as to form escape-outlets between adjacent planes, an inlet for

the mass of material adjacent to the lowermost inclined plane, means to induce a current of fluid upward through said hollow body over said inclined planes, and means to reduce the fluid-pressure within said hollow body at the point or points at which separation is desired.

3. A separator for separating a mass of matter into component portions composed of particles of like or approximately equal specific gravity, consisting of a longitudinal hollow body, having a base formed of a series of upwardly-inclined planes inclined at angles slightly exceeding the critical angles of the material and presenting extended frictional surfaces in planes intercepting at small angles the line of movement of the material under the force of the current and separated at their ends from one another so as to form escape-outlets between adjacent planes, an inlet for the mass of material adjacent to the innermost inclined plane, means to vary the angular inclination of said planes, and means to induce a current of fluid upward through said hollow body over said inclined planes.

4. A separator for separating a mass of matter into component portions composed of particles of like or approximately equal specific gravity, consisting of a longitudinal hollow body, having a base formed of a series of overlapping upwardly - inclined planes inclined at angles slightly exceeding the critical angles of the material and presenting extended frictional surfaces in planes intercepting at slight angles the line of movement and provided with an escape-outlet between the overlapping portions of said inclined planes, and means to induce a current of fluid upwardly through said hollow body over said inclined planes.

5. A separator for separating a mass of matter into component portions composed of particles of like or approximately equal specific gravity, consisting of a longitudinal hollow body, having a base formed of a series of overlapping upwardly - inclined planes in-

clined at angles slightly exceeding the critical angles of the material and presenting extended frictional surfaces in planes intercepting at slight angles the line of movement of the material under the force of the current and provided with an escape-outlet between the overlapping portions of said inclined planes, means to vary the angular inclination of said inclined planes, and means to induce a current of fluid upwardly through said hollow body over said inclined planes.

6. A separator for separating a mass of matter into component portions composed of particles of like or approximately equal specific gravity, consisting of a longitudinal hollow body, having a base formed of a series of overlapping upwardly - inclined planes inclined at angles slightly exceeding the critical angles of the material and presenting extended frictional surfaces in planes intercepting at slight angles the line of movement of the material under the force of the current and provided with an escape-outlet between the overlapping portions of said inclined planes, means to adjust said planes longitudinally to vary the area of their effective frictional surfaces, and means to induce a current of fluid upwardly through said hollow body over said inclined planes.

7. A separator for separating a mass of matter into component portions composed of particles of like or approximately equal specific gravity consisting of a series of upwardly-inclined planes inclined at angles slightly exceeding the critical angles of the material and presenting extended frictional surfaces in planes intercepting at small angles the line of movement of the material under the force of the current, and means to induce a current of fluid upward over said inclined planes.

In testimony of which invention I have hereunto set my hand.

JESSE T. BURR.

Witnesses:

Mrs. G. H. SHIMMIN,
J. G. FENTON.