

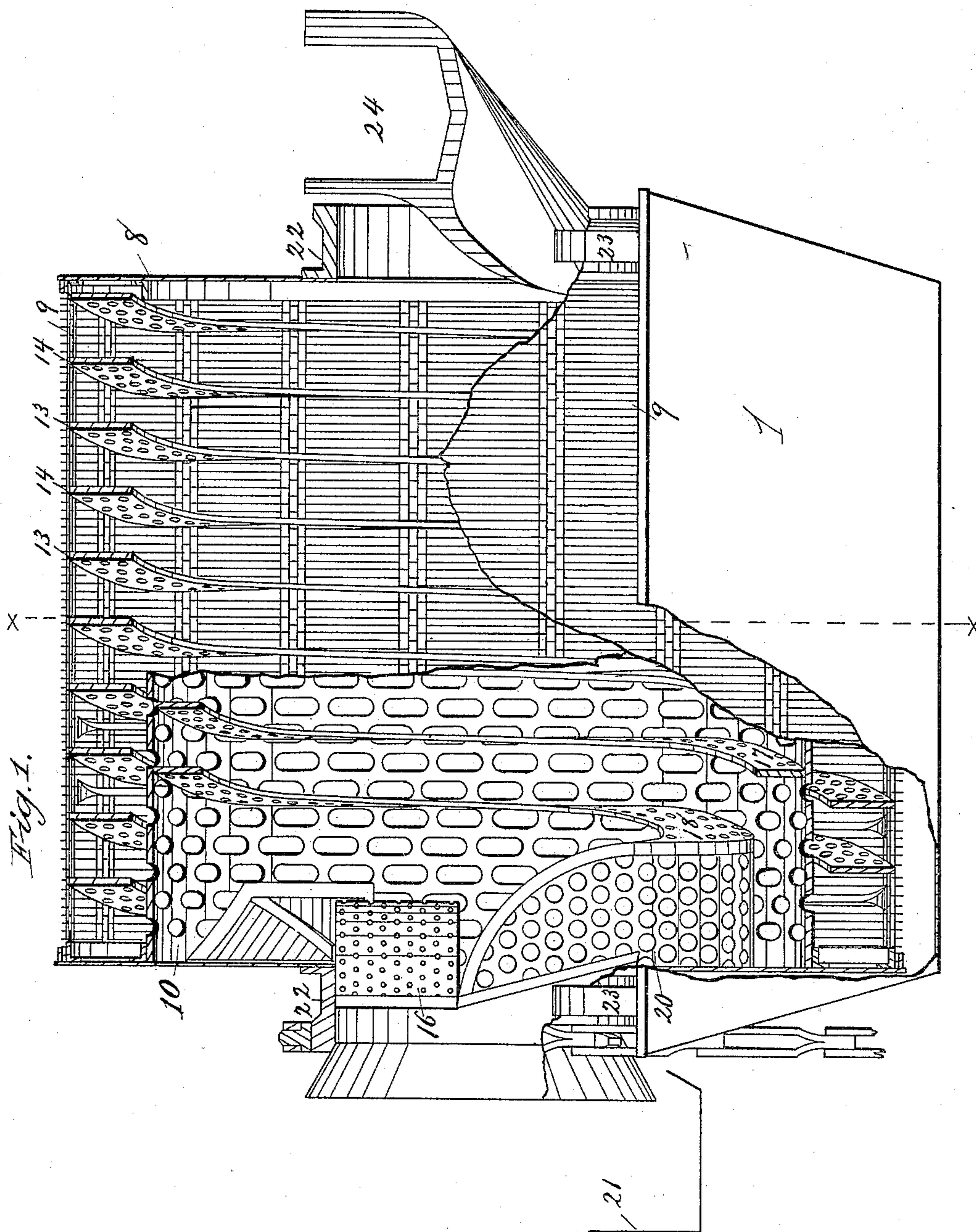
(No Model.)

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E. S. BENNETT.  
SEPARATOR.

No. 448,189.

Patented Mar. 10, 1891.



WITNESSES:

H. S. Smith  
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INVENTOR

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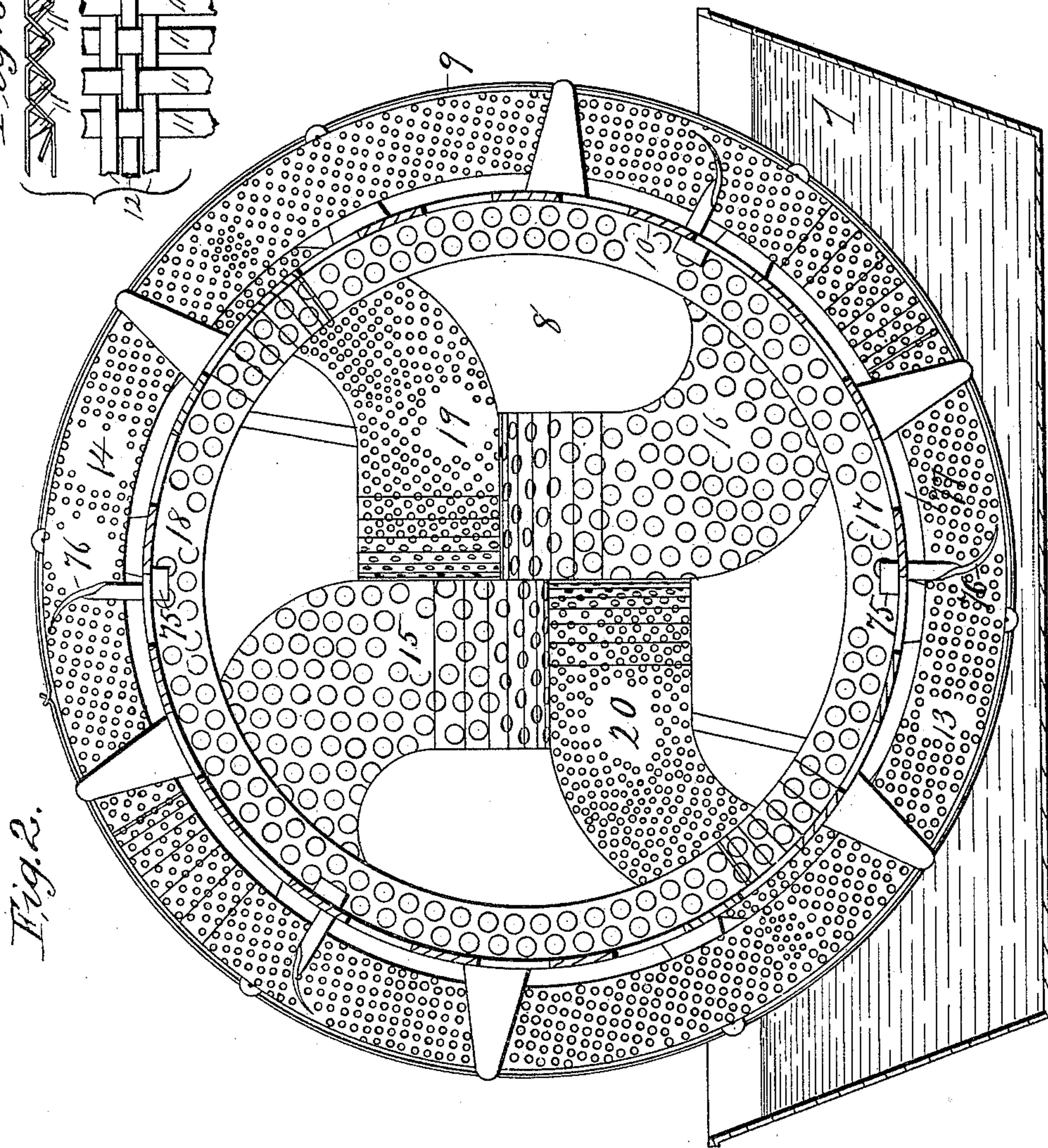
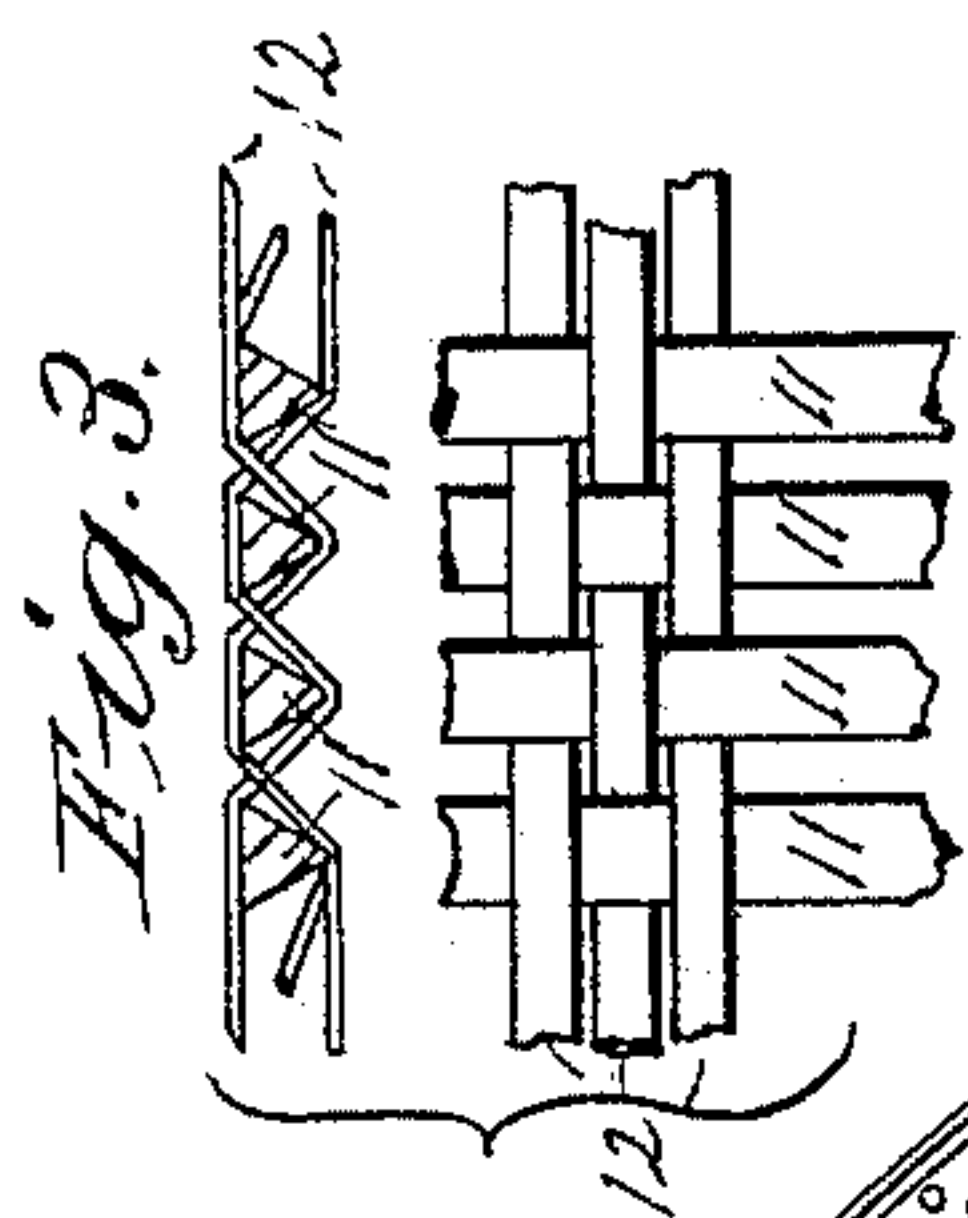
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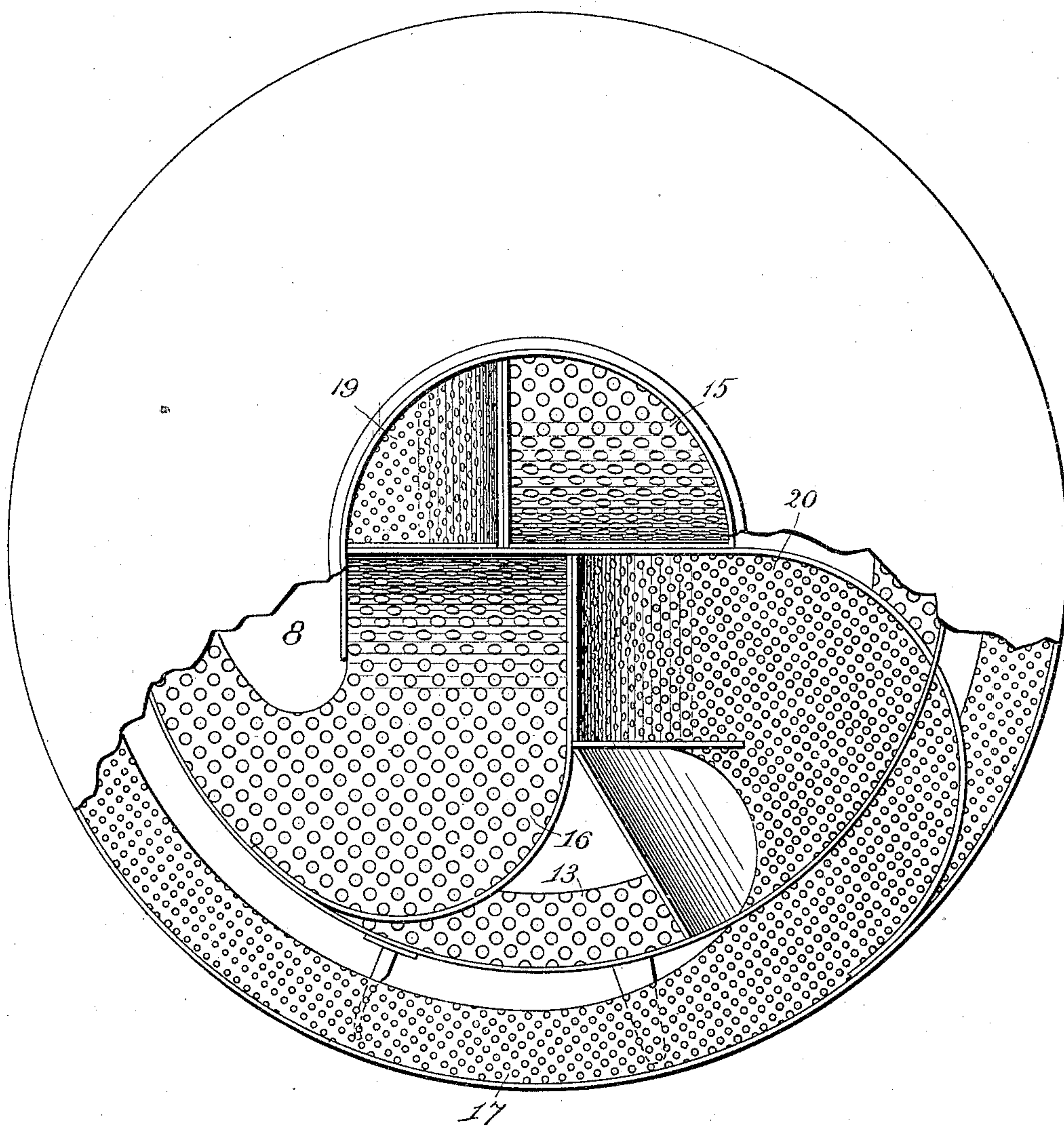
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*Fig. 4.*



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# UNITED STATES PATENT OFFICE.

ERASTUS S. BENNETT, OF DENVER, COLORADO.

## SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 448,189, dated March 10, 1891.

Application filed April 11, 1889. Renewed August 16, 1890. Serial No. 362,151. (No model.)

*To all whom it may concern:*

Be it known that I, ERASTUS S. BENNETT, a citizen of the United States of America, residing at Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Separators, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to an improved form and construction of a rotary separator intended more specially, by the conjoint action of water and the mechanism used, for the washing and separation of metaliferous earths from stones, gravels, &c., though well adapted for the separation and gradation of any other materials, either with or without the use of water.

Its objects are to provide a separator of compact strong construction, capable of speedily and thoroughly treating a large bulk or mass of material in a comparatively small space, one in which, if desired, all earthy matters may be completely washed and removed from the stones, gravel, and rock therewith associated and any lumps, clods, &c., of an earthy nature be broken up and comminuted, so as to be in fit condition for the extraction therefrom of any mineral mingled therewith, a separator reliable and efficient in action, durable in use, and easily operated and controlled; to which ends the invention consists in the features, constructions, and combinations more particularly hereinafter described and claimed.

In the drawings is illustrated an embodiment of the invention, in which Figure 1 is a view, partly in elevation and partly in longitudinal section, of my improved separator; Fig. 2, a section on line *xx*, Fig. 1; Fig. 3, a plan view and a cross-section of a fabric which may be employed in the construction thereof. Fig. 4 is a view of the discharge end of the cylinder partly broken away to show the internal construction.

In the drawings, the reference-numeral 8 indicates the rotating separator. As preferably in the operation of separation and gradation of the material operated on water is to be used therewith, the rotating separator is mounted in bearings supported by or from the body of any suitable tank 1, so as to partly

lie and revolve therein. It is composed of two concentric screens 9 and 10, secured to rotate together, the outer being of finer mesh than the inner. That the outer one at least may be self-cleaning and danger of clogging of its meshes be avoided, its periphery or screen portion is formed of the fabric shown in enlarged detail in Fig. 3, wherein 11 represents wires or rods formed in cross-section into triangular shape, or shape approximately triangular, such wires or rods being secured at the proper distance apart by the metallic strips or ribbons 12, woven therearound, the rods or wires being so held by the strips that their flat surfaces are upon the interior of the screen, the outlets between them increasing in width to the exterior. If the wires or rods be not true triangles in cross-section, they should at least be formed with two opposite sides inclined to or approaching each other, so that the resultant screen may be self-clearing. Both screens may be formed of such fabric or the inner one may be formed of perforated or slotted sheet metal, or either or both may be formed of ordinary reticulated or perforated material. The inner screen 10 has an inlet at one end and an outlet at the other, while the outer or finer screen has no inlet except through the apertures or meshes of the inner screen, but has an outlet at the same end as is the outlet of the inner screen, all the discharges being through the buckets hereinafter noted.

Upon the inner faces of the screens are fixed edgewise spirally-wound plates forming Archimedean screws or conveyers for conveying the material across the faces of the screens from the inlet to the outlet thereof. Preferably each screen is furnished with two such screws or conveyers—13 14 indicating those in the outer screen 9, and 17 18 those in the inner screen 10—one in a screen alternating with the other in such screen, the one being placed, so to speak, in the groove or inter-thread-space of the other. At the discharge ends of the screens the web or thread of the screws is carried inward to or beyond the center to form thereat discharge-buckets, one for each screw, the screw 13 ending in the discharge-bucket 15, screw 14 in bucket 16, screw 17 in bucket 19, and screw 18 in bucket 20. If these buckets be carried inward somewhat



beyond the center, as is the case with buckets 15 16 in Fig. 1, a greater discharge capacity may be secured. The webs or threads of these screws are perforated correspondingly 5 to the screens—that is, the perforation of the screens 17 and 18 of the inner screen are larger than those of the screens 13 and 14 of the outer screen—and through their discharge-bucket ends they discharge all mate- 10 rial too coarse to pass through their meshes into the chute 21, by which the rejected material may be conveyed to the dump.

In Fig. 2 the perforations and the relative sizes thereof are indicated by the groups of 15 perforations indicated thereon by circles, it being understood, however, that the entire area of the screws and discharge-buckets is correspondingly perforated.

The screws in the outer screen should not 20 project inwardly the distance of the entire space between the cylinders, but to such distance only as leaves a space of an inch or two (more or less) between the inner edge of the screw and the exterior of the inner screen, 25 as shown at 77, so if the groove between the threads becomes filled up or clogged at any point the material may run over the top of the threads into an adjoining space.

At several points in the periphery of the 30 inner screen are fixed series of fingers projecting therefrom and taking in the grooves or interthread-spaces of the outer screen. These fingers may be formed of a single shank 75, seated in and projecting into the inner 35 screen, from which shank or limb a finger 76 projects into an interscrew-thread space.

At either end of the rotating separator-ring 40 metallic collars 22 22 are rigidly secured, such collars resting on rollers 23, with spindles journaled in bearings secured upon or supported from the body of the tank and forming roller-bearings for the separator and on the exterior of the collars, so that its interior 45 is left free from any central shaft which might be in the way of the ready inlet and outlet of material therefrom.

At the end of the rotating separator, opposite the discharge-buckets, a hopper or chute 24 is supported in any suitable way to 50 discharge the material to be operated on through the collar at that end into the inner screen of the separator.

It is to be understood that when the machine is in operation and water is used the 55 tank is kept full of water nearly to its top, so that about a third of the separator is constantly submerged. If now power be applied to rotate it and material be fed to its interior, the operation thereof is as follows: the material falls to the then lower side of the inner 60 screen at its inlet end, and such material as is not too large will fall into the furrows or interthread-space. The screens in revolving tend to carry the material upwardly, while 65 gravity is constantly pulling it downwardly, so that it is kept in motion, tumbling over and over in the water. At the same time the

screws are forcing it transversely across the screens from inlet to outlet, while the water 70 entering the screens and being forced through the perforations in the blades or threads of the screws is thrown into numberless little currents, all these influences, acting simultaneously on the material, scouring from the gravel and rock all traces of dirt and sand and disintegrating any earthy clods. If lumps of sticky, 75 tenacious, or clayey earth be present, such as usually forms "sluice-robbers," not only are the fingers 76 cutting and dividing the same, but every movement against the perforated 80 screw-blades and over the screens, and such motion is constant, planes or chips small particles therefrom, which are immediately mingled and coated with the sand or other non-adhesive dirt and their capacity for the rob- 85 bing of gold and amalgam destroyed. During this time the suitably-reduced material separated from rock, &c., is passing through the apertures of the inner screen into the outer screen, wherein it receives another course of similar 90 treatment, and from which the material ready for the amalgamation process drops into the tank, while the gravel, rock, and other unfit material are discharged from the screens by the buckets into the chute 21. It is to be 95 noted that by this construction of revolving separators and screens the unfit material has been subjected to a rolling, tumbling, and scouring treatment equal to what it would have received in a length of sluice-box equal 100 to the circumference of the separator multiplied by the number of turns of either screw, so that in addition to great efficiency and speed of action great compactness is attained.

It should be noted that in order to more 105 clearly show the construction the right-hand lower corner of Fig. 1 is in elevation showing the exterior of the screen, while the upper right-hand portion is in section showing the interior of the inner screen, such screen being 110 broken away at the left to show the interior of the outer screen.

While the rotating separator is herein shown as cylindrical in cross-section, it is 115 evident that it may be of other contour in such section—as, for instance, polygonal—and have the same desirable arrangement of screens and conveying-screws. It may also be used for dry separation and grading of 120 any materials, though I have found it specially well adapted for use in combination with an amalgamator, an example of such combination and use being shown in my prior application, Serial No. 292,266, filed November 30, 1888. 125

Having thus described my invention, what I claim is—

1. A rotating separator composed of two concentric cylindrical screens rigidly secured together, each screen being provided on its 130 inner surface with two perforated conveying-screws, the thread of one screw being in the interthread-space of the other screw, substantially as described.



2. A rotating separator composed of two concentric cylindrical screens, each screen being provided on its inner surface with two perforated conveying-screws, the thread of one screw being in the interthread-space of the other screw and the thread of each screw being carried to or about the center of one end of the cylinder, where such threads are formed into four perforated discharge-buckets 15, 16, 19, and 20, substantially as described.

3. A rotating cylindrical separator composed of two concentric cylindrical screens, each screen being provided on its inner surface with two perforated screw conveyers, the conveyers of both screens being adapted to conduct the material toward the discharge end of the separator, the threads of the conveyers being carried to or about the center of the discharge end of the separator and formed into four perforated discharge-buckets 15, 16, 19, and 20, the two concentric screens being of such relative diameters that there is a space left between the two screens of a width greater than the width of the conveyer of the outer screen to allow material, if necessary, to pass between the free edges of the conveyers and the outer surface of the inner screen, substantially as described.

4. A rotating cylindrical separator composed of two concentric cylindrical screens of different meshes, the outer being the finer, each screen being provided on its inner surface with two perforated screw conveyers, the threads of the conveyers being carried to or about the center of the discharge end of the separator and formed into four perforated discharge-buckets 15, 16, 19, and 20, substantially as described.

5. A rotating cylindrical separator composed of two concentric cylindrical screens provided with two perforated screw conveyers, the inner screen being provided with the fingers 76, projecting from its outer surface into the interthread-spaces of the conveyers of the outer screen, substantially as described.

6. A rotating separator of uniform diameter, composed of two concentric screens of different meshes, the outer being the finer, each screen being provided on its inner surface with two perforated screw conveyers, the conveyers of each screen being adapted to conduct the material in the same direction, the threads of the conveyers being carried to or about the center of the discharge end of the separator and formed into four perforated discharge-buckets 15, 16, 19, and 20, the two screens being of such relative diameters that the space between them is of greater width than the thread of the conveyers of the outer screen to allow material to pass between the free edge of the conveyers' thread and the outer surface of the inner screen, fingers 76, projecting from the periphery of the inner screen into the interthread-spaces of the conveyers of the outer screen, an inlet at one end

of the separator, through which the material is discharged to the inner screen, a water-supply tank, and suitable means of supporting the separator within said tank, substantially as described.

7. A rotating cylindrical ore-separator suitably supported and composed of an inner and an outer screen of different meshes, the outer screen being the finer and constructed of wires or rods of triangular or approximately triangular shape in cross-section and secured together in such a manner that the openings between the wires shall increase in size from the interior to the exterior of the screen, the separator being provided at one end with discharge-spouts leading from each screen and at the opposite end with an inlet through which the material to be treated is fed to the inner screen, each screen being provided on its inner surface with perforated screw conveyers adapted to conduct the material treated toward the discharge end of the separator, substantially as described.

8. A rotating cylindrical ore-separator of uniform diameter and provided with a ring or metallic collar 22 at each end, in combination with a tank adapted to supply the separator with water, said tank being provided with suitable roller-bearings for collars 22, the separator being composed of two screens rigidly secured together and arranged concentrically to each other, the screens being of different meshes, the outer being the finer and constructed of wires or rods of triangular shape or of a shape approaching triangular in cross-section, these wires being secured together in such a manner that the openings between them increase in size from the interior to the exterior of the screen, each screen being provided with perforated screw conveyers, the separator having a discharge-spout at one end for each screen and an inlet-pipe at the opposite end through which the material is fed to the inner screen, substantially as described.

9. A rotating cylindrical ore-separator of uniform diameter and composed of two screens arranged concentrically to each other and rigidly secured together, said screens being of different meshes, the outer being the finer and constructed of wires or rods triangular or approximately triangular in cross-section and secured together in such a manner that the openings between the wires increase in size from the interior to the exterior of the screen, each screen being provided on its interior with perforated screw conveyers, the separator having discharge-openings at one end for each screen and an inlet at the opposite end through which the material to be treated is fed to the inner screen, in combination with a tank provided with suitable bearings for the separator and within which the separator may be partially immersed in water, substantially as described.

10. A rotating cylindrical ore-separator of uniform diameter and composed of two



5 screens arranged concentrically to each other  
and rigidly secured together, a space being  
left between the exterior of the inner and the  
interior of the outer screens, the two screens  
10 being of different meshes, the outer being the  
finer and constructed of wires or rods trian-  
gular in shape or approaching the triangular  
shape in cross-section, the wires being se-  
cured together in such a manner that the  
15 openings between them shall increase from  
the interior to the exterior of the screen, each  
screen being provided with two perforated  
conveying-screws on its interior, the end of  
each screw being carried to the center of the  
20 separator at one end and formed into a dis-  
charge-bucket thereat, the separator being  
provided at the opposite end with an inlet  
through which the material to be treated is  
fed to the inner screen, in combination with  
25 a suitable tank adapted to support the sepa-  
rator and supply it with water, and suitable  
means for rotating the separator, substan-  
tially as described.

11. A rotating cylindrical ore-separator of  
25 uniform diameter and composed of two  
screens arranged concentrically to each other  
and rigidly secured together, the screens be-

ing of different meshes, the outer being the  
finer and constructed of wires or rods wider  
in cross-section on their interior than on their 30  
exterior faces, each screen being provided  
with one or more perforated conveying-screws  
on the interior, the end of each screw being  
carried to the center of the separator at one  
end and formed into a discharge-bucket 35  
thereat, the separator being provided with an  
inlet at the opposite end, through which the  
material is discharged to the inner screen,  
the periphery of the inner screen being pro- 40  
vided with fingers 76, which project there-  
from into the interthread-spaces of the screws  
upon the outer screen, in combination with a  
tank provided with suitable roller-bearings  
for the ends of the separator and within which  
the separator may be partially immersed, and 45  
suitable mechanism for propelling the sepa-  
rator, substantially as described.

In testimony whereof I affix my signature  
in presence of two witnesses.

ERASTUS S. BENNETT.

Witnesses:

S. D. HAYWARD,  
S. M. BRONSON.