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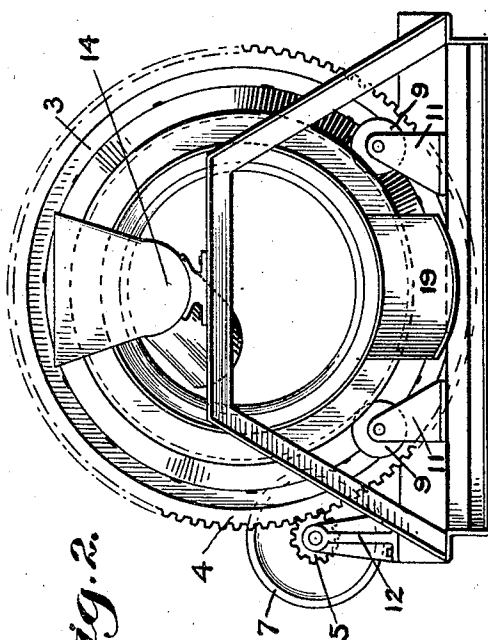
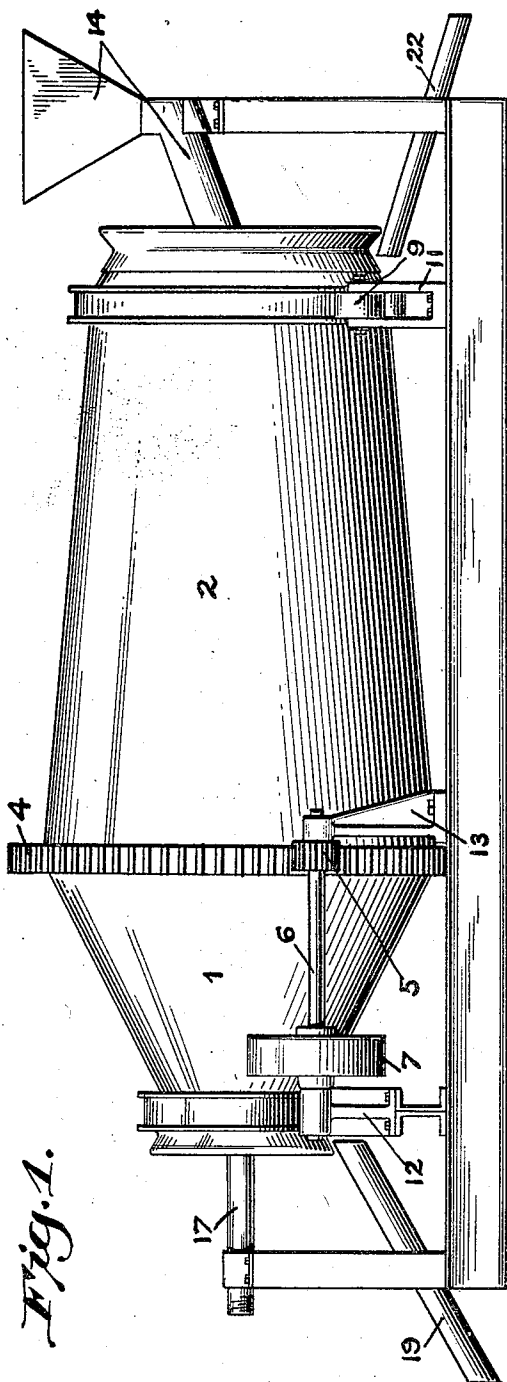
1,698,442

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GRAVEL WASHER AND SEPARATOR

Filed May 9, 1927

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

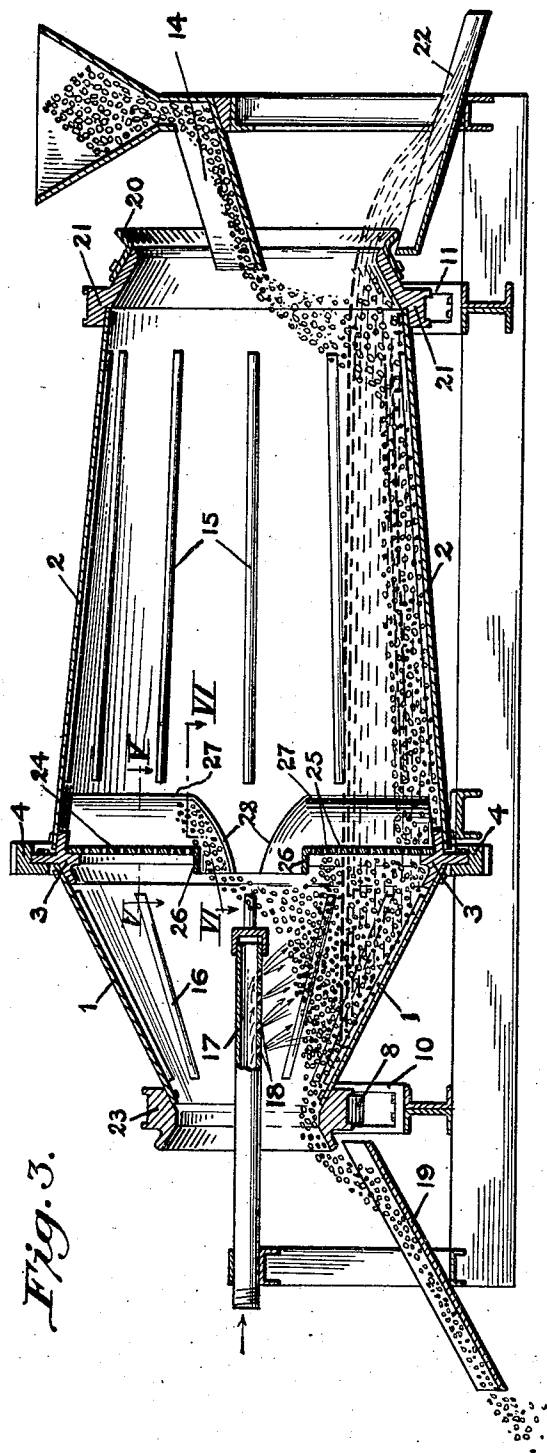


Fig. 3.

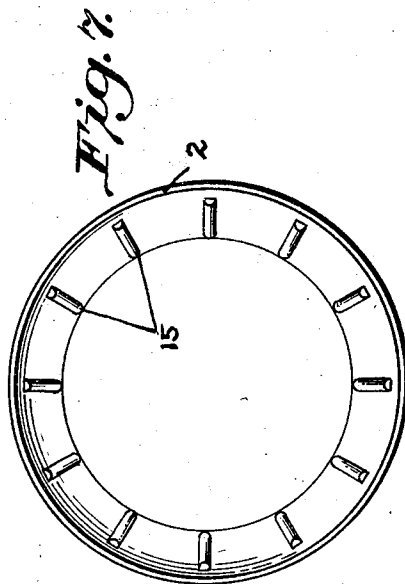


Fig. 7.

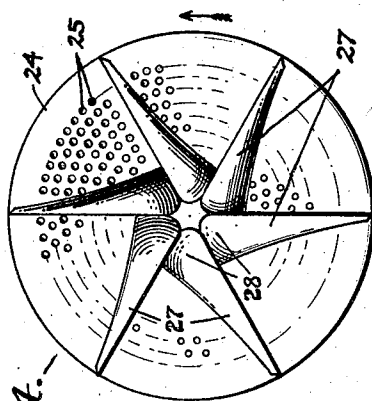


Fig. 4.

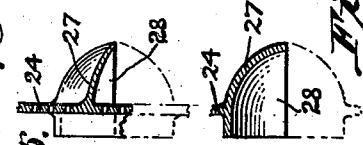


Fig. 5.

Fig. 6.

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UNITED STATES PATENT OFFICE.

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GRAVEL WASHER AND SEPARATOR.

Application filed May 9, 1927. Serial No. 189,861.

This invention relates to apparatus for washing and separating mixed materials of different sizes and quality, such as sandy and dirty gravel, clayey phosphate rock, muddy ore, and the like, in order to separate the ingredients and clean or free the desired product for commercial purposes from contaminations or dirt, such as sand, clay, wood debris, or other rubbish. In particular, it is concerned with gravel or rock washers and separators, and comprises a biconical, two-chambered rotary drum adapted to discharge different products at its ends, and provided with a perforated separating screen or plate, having lifting scoops or blades, all designed to effect a thorough cleaning and separation of the gravel or rock fed into the apparatus from sand, clay, or other material of less specific gravity, and the transferral of the clean and heavier product to the gravel discharge end of the drum.

The main object underlying the invention is to provide a strong, compact and economic washer and separator, of ample capacity, having two washing chambers separated by a perforated partition and a pipe for spraying cleaning water or other fluid on the gravel just before its discharge, so as to secure a cleaner and, therefore, more marketable product, at less cost, than is possible with apparatus now in use.

Under my invention, the gravel or ore is introduced by a feed chute to one side of the center line of the machine, so as to prevent it falling in the direct path of the dirty water and trash which is passing to the outlet at the end of the feed chamber.

It is a further object of my invention to eliminate all unnecessary angle bars, internal fittings and other interfering structures on the inside of the revolving drum, and to replace them by thin strips or rounds attached to the inner surface of the long drum in such a way as to avoid undue lifting of the gravel and all undesirable agitation of the water as it flows to the outlet, while permitting easy renewal of the wear-receiving drums themselves.

The object of the perforated plate is to assist in separating the rubbish which is mixed with the gravel and sand recovered by suction-dredging from the bottom of rivers, which renders the gravel obtained

unmarketable at current prices, because of the great amount of rubbish which is mixed with it, such rubbish consisting of dead leaves, pieces of water-soaked bark, twigs of trees, flat pieces of shale, and miscellaneous junk of that sort which, while lighter than the gravel, will not float and is therefore difficult to eliminate. My perforated plate allows the water readily to pass from the feeding to the discharge chamber or compartment, while holding back the rubbish, which is carried back and out by the flow of the discharge water and sand, while the gravel in the discharge chamber receives a thorough rinsing and scrubbing by the cleaning water, and also by the sliding gravel pebbles themselves so as to free it particularly of the clay, a considerable quantity of which usually clings to the surface of the gravel itself.

Another object of the invention is to effect a discharging of the gravel without simultaneously lifting and discharging a large amount of water with the gravel, a disadvantage inherent in many of the washers now in use, which pick up the water along with the gravel, or which require the cleaning water to be used under considerable pressure and in large amounts, which provision necessarily entails considerable additional expense.

The mounting of the biconical drum of my washer on roller-bearings to turn on a horizontal axis is advantageous over the usual inclined drum arrangement, because a horizontal drum will operate with less friction and operative troubles, if on an even keel, with no appreciable thrust to be taken care of.

Other features of my invention will be set forth hereinafter and pointed out in the claims.

With these and such other objects in view and realized advantages, as will be apparent from the description, my invention resides in the novel construction, combination and arrangement of parts, as hereinafter described and claimed, taken in connection with the accompanying drawings, in which similar reference characters indicate the same parts in the several figures.

In the drawings,
Figure 1 is a longitudinal side elevation of my washer;

Figure 2 is a vertical end elevation of the same, looking at the feeding or rear end of the apparatus;

Figure 3 is a vertical longitudinal section along the center line of the apparatus;

Figure 4 represents a detailed rear view of the perforated plate with its lifting blades or scoops;

Figure 5 is a horizontal section of one of the lifting blades and showing a portion of the perforated plate taken along the line V—V of Figure 3;

Figure 6 is a sectional view of a lifting blade along the line VI—VI of Figure 3; and

Figure 7 represents an end view of the feeding chamber of the drum as taken from the front end and showing the arrangement of the half rounds on the inner wall thereof.

Referring now to the drawings and in particular to Figures 1, 2 and 3, the characters 1 and 2 represent respectively the relatively short, forwardly-tapering and the longer, rearwardly-tapering chambers, both frusto-conical in shape, of a suitably-driven revolving drum or barrel. The walls of these two conical chambers are constructed preferably of scarf-welded sheet metal, of varying lengths and diameters, depending upon the quantity of gravel to be handled, and at their largest diameters or cross sections are fastened together by any suitable means, in this case by bolting to a ring casting 3, to which is preferably in turn bolted a gear wheel 4. With this gear wheel meshes a spur wheel 5 firmly secured to a shaft 6, on which is rigidly mounted a belt-driven pulley 7, or a sprocket driven by a chain from a line shaft, or by an independent motor, or in any other convenient manner.

The fore and aft chambers of the revolving drum are suitably supported on ball bearings or rollers 8 and 9, respectively, which are journaled in supports 10 and 11, while the shaft 6 is journaled in bearings on supports 12 and 13.

The gravel or rock is introduced in the smaller end of the long chamber 2 by a chute 14, which deflects the gravel or rock to one side of the center line and causes the material treated to travel downwardly and toward the lowest point of the chamber, the drum revolving clockwise, as observed when standing at the gravel discharge end of the apparatus.

To the shells or walls of the chambers 1 and 2 are fastened preferably by spot-welding a large number of preferably half-round thin strips or flights 15 and 16, longitudinally disposed, to stir the material and deflect it in the direction desired, or the walls of the chambers themselves may be formed with corrugations, if desired, to take the place of the said strips or flights.

A pipe 17, preferably closed at its end,

connecting with a source of water supply and provided with rearwardly directed inclined openings or outlets 18, extends into the front chamber 1 of the apparatus and serves to deliver jets of clean water rearwardly and towards the second chamber onto the discharging gravel or cleaned material, which is finally delivered as a clean product onto the chute 19. The sand and wash water and dirt pass out of the constructed rear end of the chamber 2, preferably over a circular V-shaped lip 20, bolted to a ring end-casing 21, secured near the constricted end of the chamber 2, and are discharged to the chute 22. A similar, but preferably integrally-formed, flaring-lipped ring casing 23 is provided at the front delivery end of my apparatus, and to this casing the walls of section 1 are preferably bolted.

Partly separating the two washing chambers 1 and 2, and at or near the greatest diameter of the drum, is a vertical screen or plate 24, provided with suitably spaced perforations 25, a forwardly extending circular ledge 26 surrounding a central opening in the screen, and with a plurality of suitably curved lifting scoops or blades 27 extending radially from the periphery of the screen on its rear side to its central opening and discharging therethrough into the discharge chamber 1 by their flaring ends 28.

In practicing my invention, I usually proceed as follows in separating or cleaning gravel from sand, clay and rubbish, but it is to be understood that I may similarly wash and clean clayey phosphate rock, or separate and clean coarse from fine ingredients of an ore, dirty coal or other mixture of materials:

I first start the drum of my apparatus rotating at a suitable speed, turn on a supply of cleaning water, through outlets 18, of pipe 17, and feed the gravel continuously from the chute 14 into the main washing chamber 2, but to one side of its center, so as to prevent the gravel from falling in the direct path of the dirty water and rubbish being discharged at the rear. The gravel is thoroughly scrubbed as it slowly passes forwardly to the lowest portion of the chamber 2, where it accumulates, but in its forward movement is not unduly lifted by the half rounds or flights 15, or by the wall corrugations, when these are provided, thus avoiding excessive wear on the drum walls and undesirable agitation of the cleaning water as it flows toward its outlet.

Arriving at the base of the screen 24 the gravel is scooped up by the lifting blades 27 and discharged into the front chamber 1, where it receives a thorough final washing with fresh water and is continuously discharged through the chute 19 into receptacles for marketing. The rubbish, sand and clay are held back sufficiently by the screen 24,

although the perforations 25 thereof allow the wash water to pass through freely, and carry the sand and dirty water rearwardly for its continuous discharge.

5 My washer and separator is thus continuous and economic in operation, simple and practical in design and easy to manipulate.

What I claim is:

1. A mixed material washing and separating apparatus comprising a two-chambered double tapered imperforate drum forming a forward and a rear chamber, means for rotating said drum, a transverse perforated plate located at the largest transverse cross section of the drum at the junction of said forward and rear chambers and provided with means for lifting and conveying material fed into the rear chamber into the forward chamber and means located in the forward chamber for directing washing means into said forward chamber and toward the rear chamber.

2. A mixed material washing and separating apparatus comprising a two-chambered double tapered imperforate drum forming a forward and rear chamber, means for rotating said drum, a transverse perforated plate located at the largest transverse cross section of the drum at the junction of said forward and rear chambers and provided with means for lifting and conveying material fed into the rear chamber into the forward chamber, means located in the forward chamber for directing washing means into said forward chamber and toward the rear chamber, and means for stirring and deflecting said material as it passes forwardly.

3. A mixed material washing and separating apparatus comprising a two-chambered double tapering imperforate drum forming a forward and rear chamber, means for rotating said drum, a transverse perforated plate located at the largest transverse cross section of the drum at the junction of said forward and rear chambers and provided with means for lifting and conveying material fed into the rear chamber into the forward chamber, means located in the forward chamber for directing washing means into said forward chamber and toward the rear chamber, means for feeding raw material to be separated and washed into the rear chamber, and longitudinally disposed means for deflecting and stirring said material.

4. A mixed material washing and separating apparatus comprising a two-chambered horizontally mounted tapering imperforate drum forming a forward and a rear chamber, a transverse screen with a central opening located between the chambers and having means for conveying washed material from the rear chamber through said opening into the forward chamber, means located in the forward chamber for directing washing fluid toward the rear chamber,

and means for feeding in the rear chamber the material to be cleaned to one side of the drum axis and directing it toward the forward chamber, and longitudinally disposed means for deflecting and stirring said material.

5. A mixed material washing and separating apparatus comprising a two-chambered drum tapering toward either end and mounted to turn on a horizontal axis, a vertical, perforated screen serving in part to separate the two chambers, and provided with lifting blades adapted to receive partially cleaned material deposited in the first chamber and convey it to the second, a pipe for supplying washing fluid in the second chamber and directing it toward the first, and means for feeding the material to be cleaned to one side of the drum axis and in an opposite direction to the flow of the washing fluid.

6. A mixed material washing and separating apparatus comprising a two-chambered, biconical, horizontally mounted drum, a screen between the two chambers provided with a central opening and blades for lifting and conveying washed material from the first chamber through the central opening into the second chamber, a pipe for supplying washing fluid in the second chamber and directing it toward the first and means for feeding the material to be washed in an opposite direction to the flow of the washing fluid.

7. A mixed material washing and separating apparatus comprising a two-chambered double tapering imperforate drum forming a forward and a rear chamber, means for rotating said drum, a transverse perforated plate having a central opening located at the largest transverse cross section of the drum between the two chambers, and adapted to hinder the passage of dirt and rubbish from the rear to the forward chamber while permitting the ready flow of washing fluid in the opposite direction, and means for conveying material accumulating in said rear chamber adjacent to said plate through said opening into said forward chamber.

8. A mixed material washing and separating apparatus comprising a two-chambered double tapering imperforate drum forming a forward and a rear chamber, means for rotating said drum, a transverse perforated plate having a central opening located at the largest transverse cross section of the drum between the two chambers, and adapted to hinder the passage of material of less specific gravity than the desired end product from the rear to the forward chamber while permitting the ready flow of washing fluid through the plate in the opposite direction, means for conveying material of greater specific gravity accumulating in said rear chamber adjacent to said plate through said

opening into said forward chamber, and means located in said chamber for supplying and impinging clean washing fluid onto the material to be cleaned just prior to the discharge.

9. A mixed material washing and separating apparatus comprising a two-chambered double tapering imperforate drum forming a forward and a rear chamber, means for rotating said drum, means located between the two chambers for hindering the passage of material of less specific gravity than the desired end product from the rear to the forward chamber while permitting the ready flow of the washing and separating fluid in the opposite direction, and means for supplying said fluid, and means for conveying material of greater specific gravity accumulating at the lowest point in said drum in the rear chamber into the said forward chamber.

10. A gravel washer and separator comprising a two-chambered double tapering, a rotatably mounted drum, a transverse foraminiferous screen separating said chambers and formed with a radially disposed series of lifting scoops adapted to convey material through a central opening in said screen from the rear to the front washing chamber, a pipe with oblique rearwardly

directed nozzle openings for impinging clean water onto the partly cleaned gravel just before its discharge from the front chamber, a chute for feeding raw gravel into the drum to one side of the axis of the rear chamber, and longitudinally disposed flights secured to the walls of the drum for deflecting the said gravel, and means for discharging the wash water, sand and rubbish from the rear chamber.

11. A mixed material washing and separating apparatus comprising a two-chambered double tapering imperforate drum forming a forward and a rear chamber, means for rotating said drum, a transverse plate located between the two chambers for hindering the passage of material of less specific gravity than the desired end product from the rear to the forward chamber while permitting the ready flow of the washing and separating fluid in the opposite direction, and means for supplying said fluid, and means for conveying material of greater specific gravity accumulating at the lowest point in said drum in the rear chamber into the said forward chamber.

In testimony whereof I hereunto affix my signature.

ANDREW M. LOCKETT.