

No. 876,268.

PATENTED JAN. 7, 1908.

A. J. DIESCHER.

APPARATUS FOR WASHING COAL, ORE, &c.

APPLICATION FILED MAR. 5, 1907.

5 SHEETS—SHEET 1.

FIG. 1.

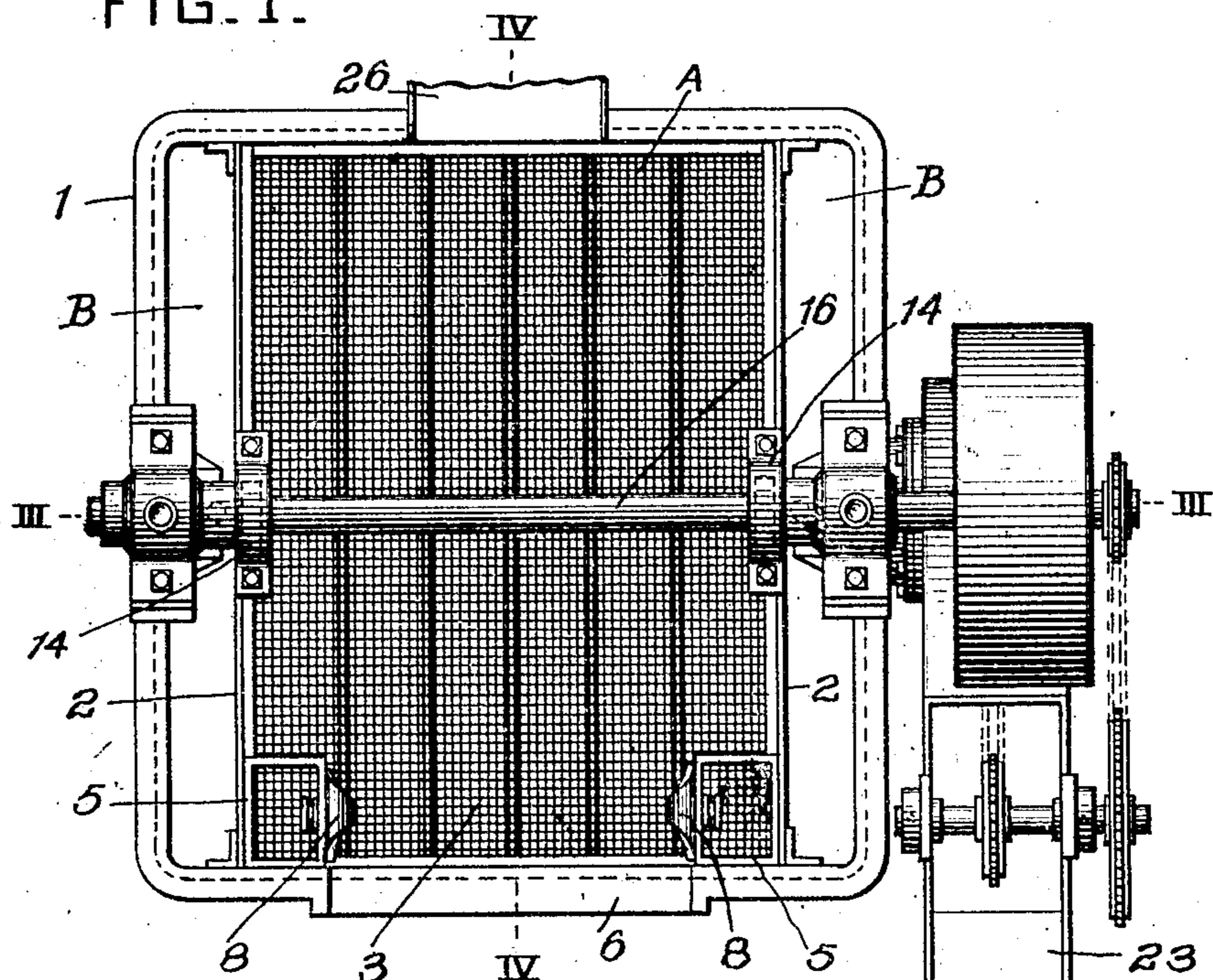
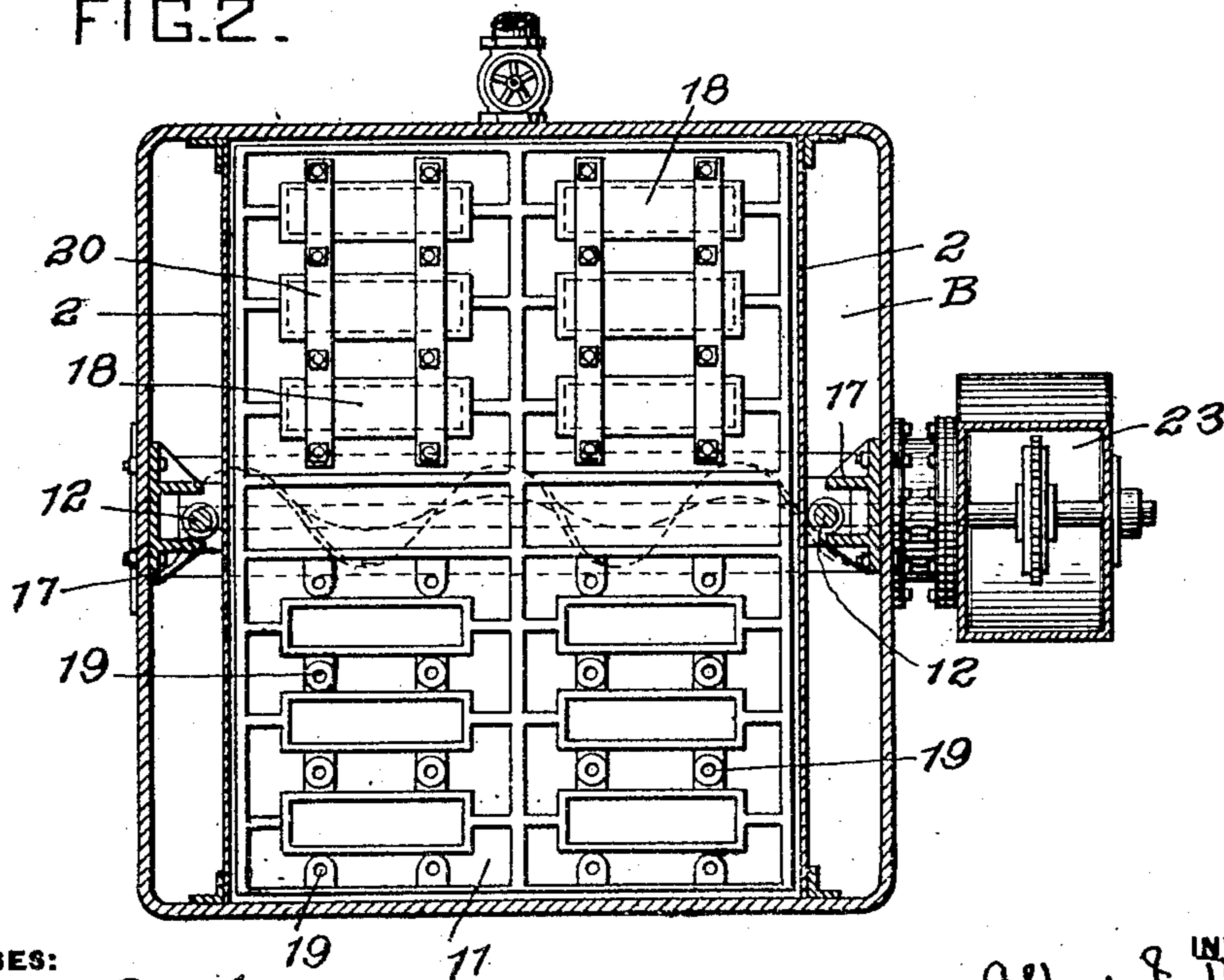


FIG. 2.



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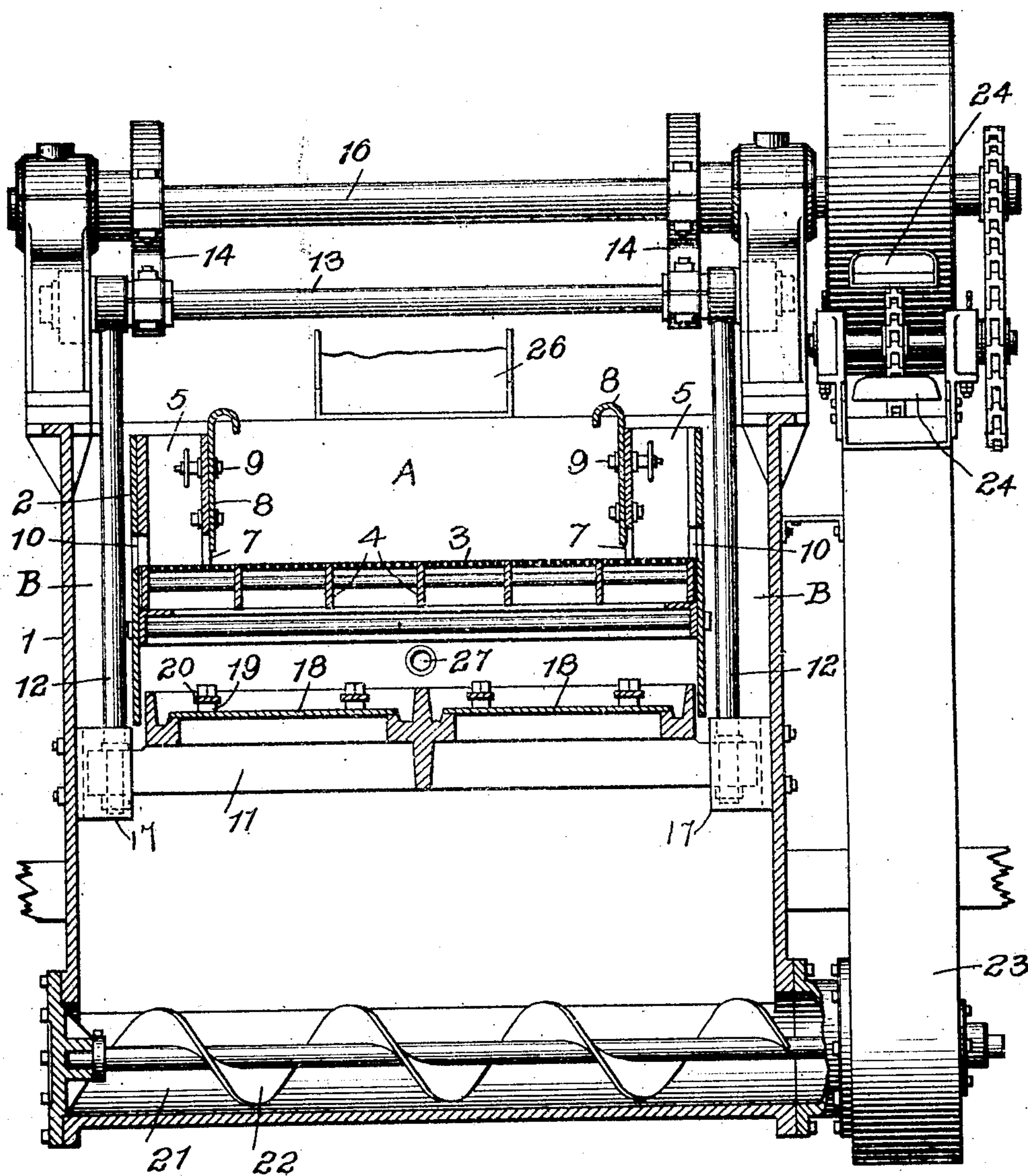
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5 SHEETS—SHEET 2.

FIG. 3.



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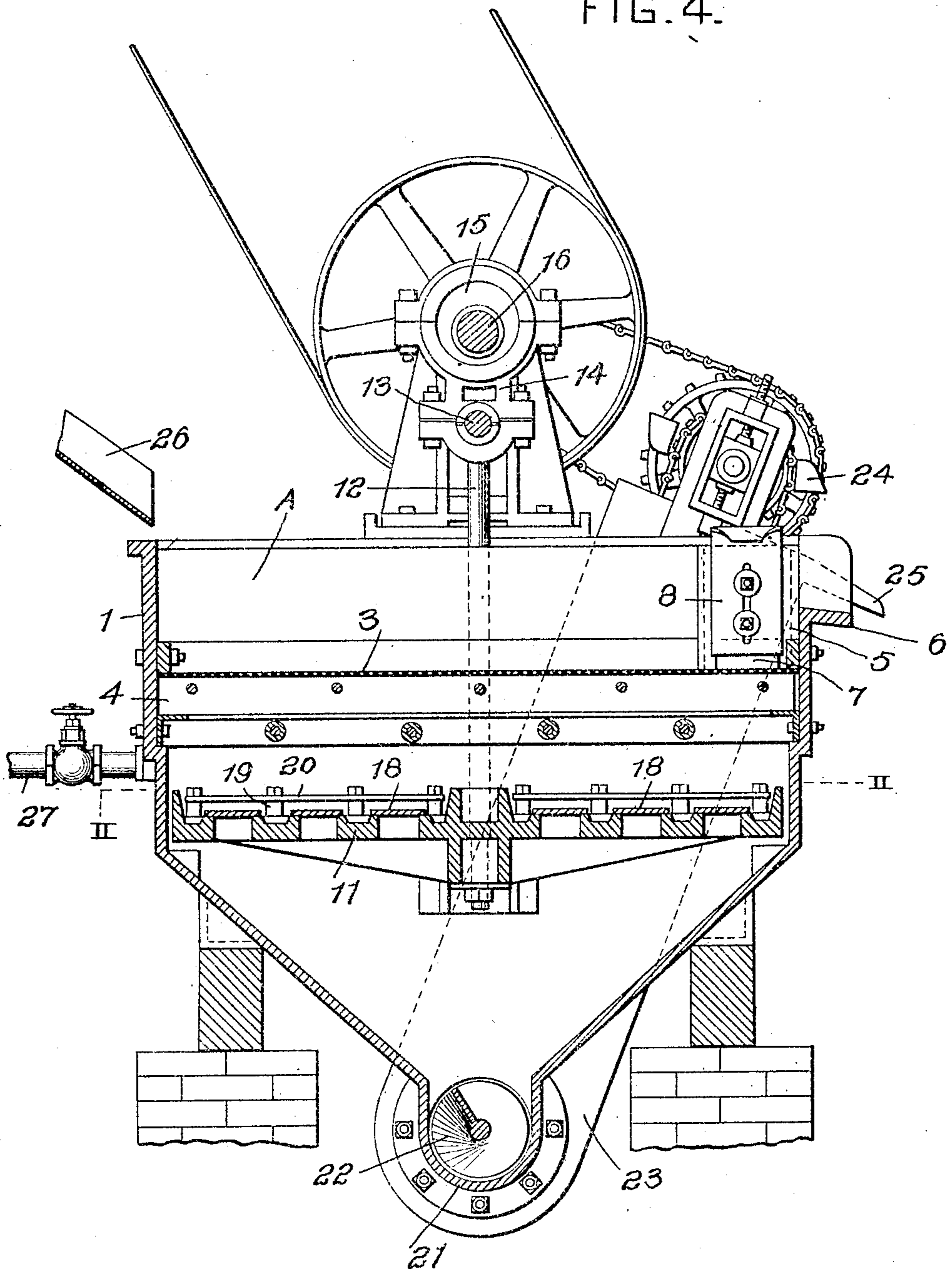
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5 SHEETS—SHEET 3.

FIG. 4.



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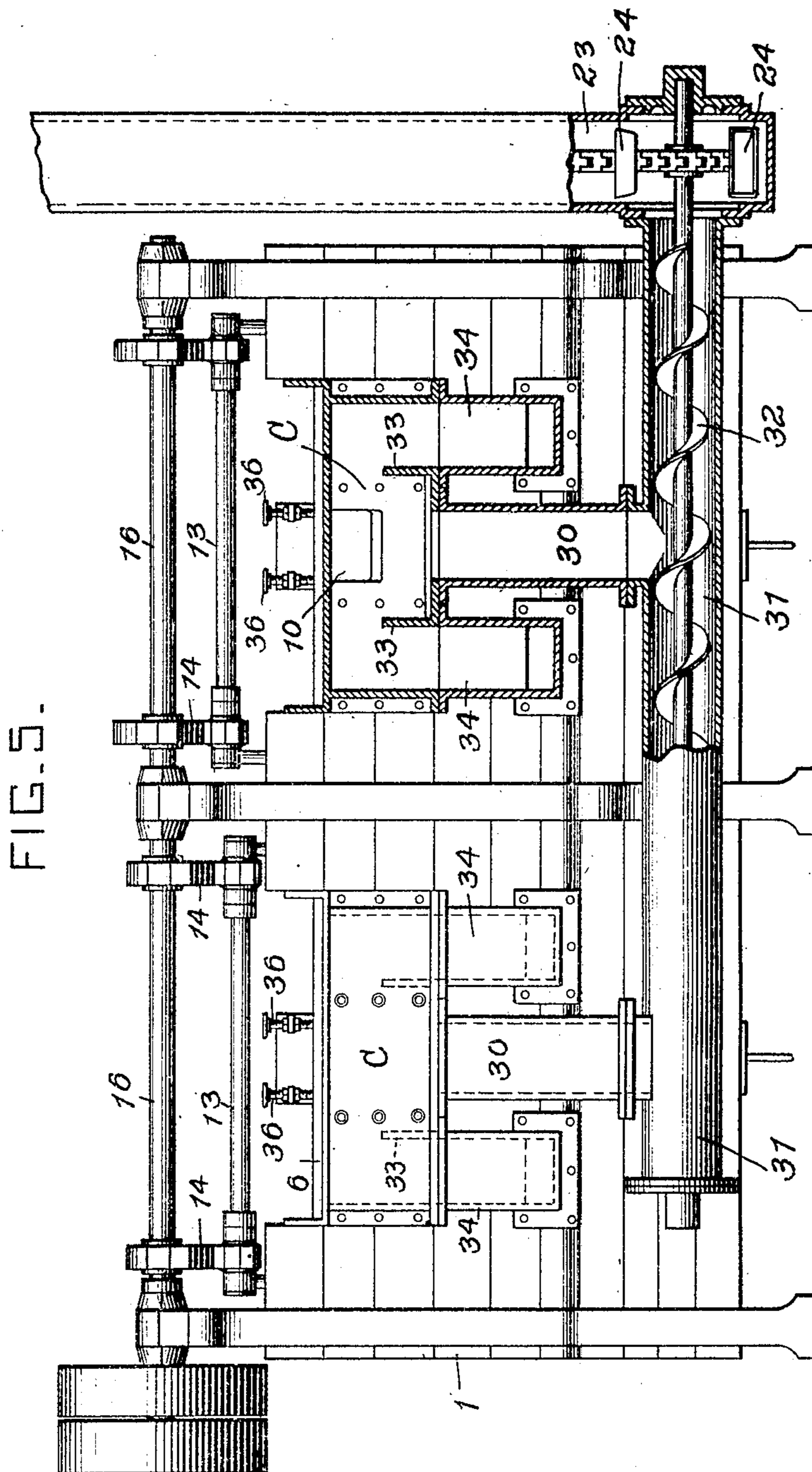
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5 SHEETS—SHEET 4.



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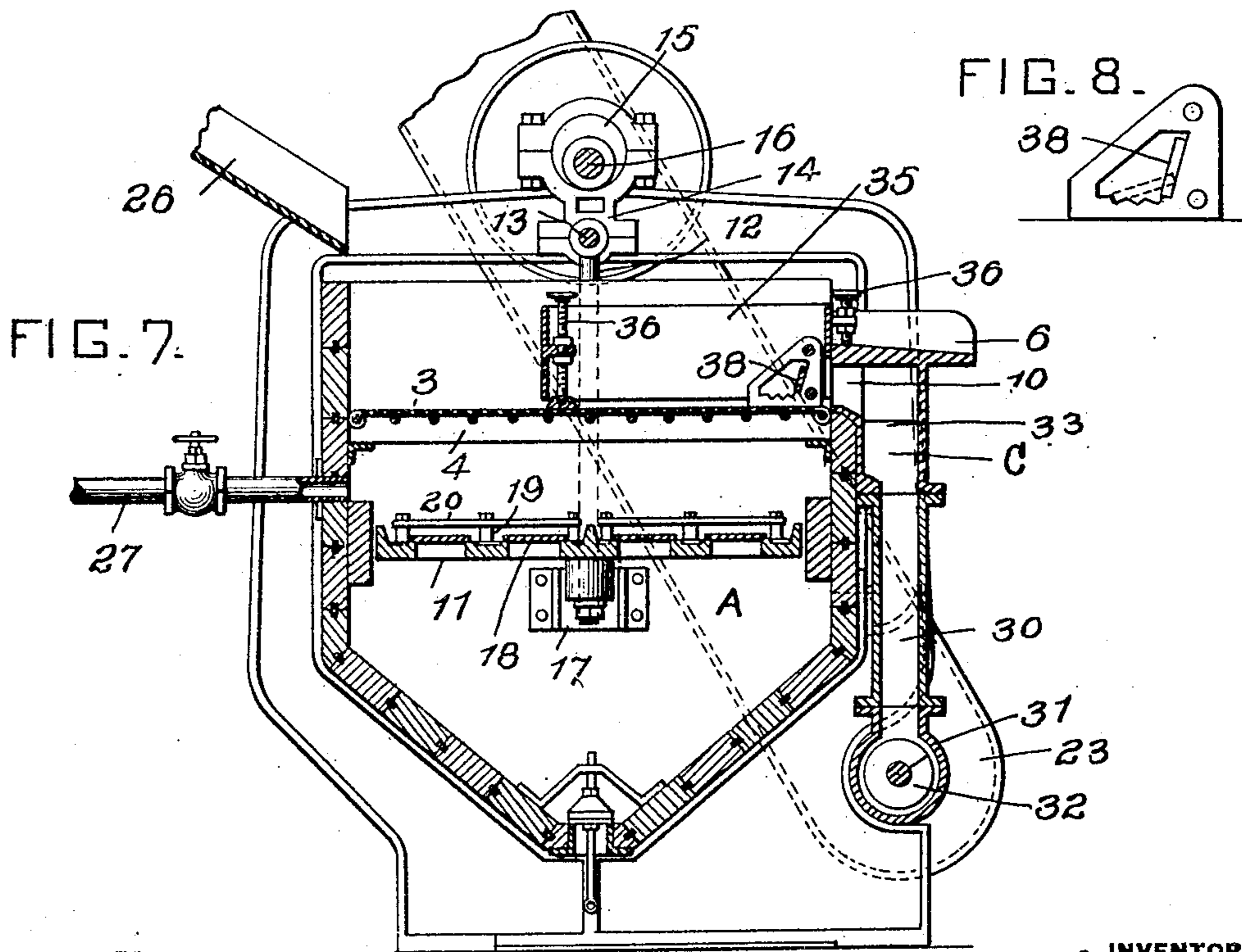
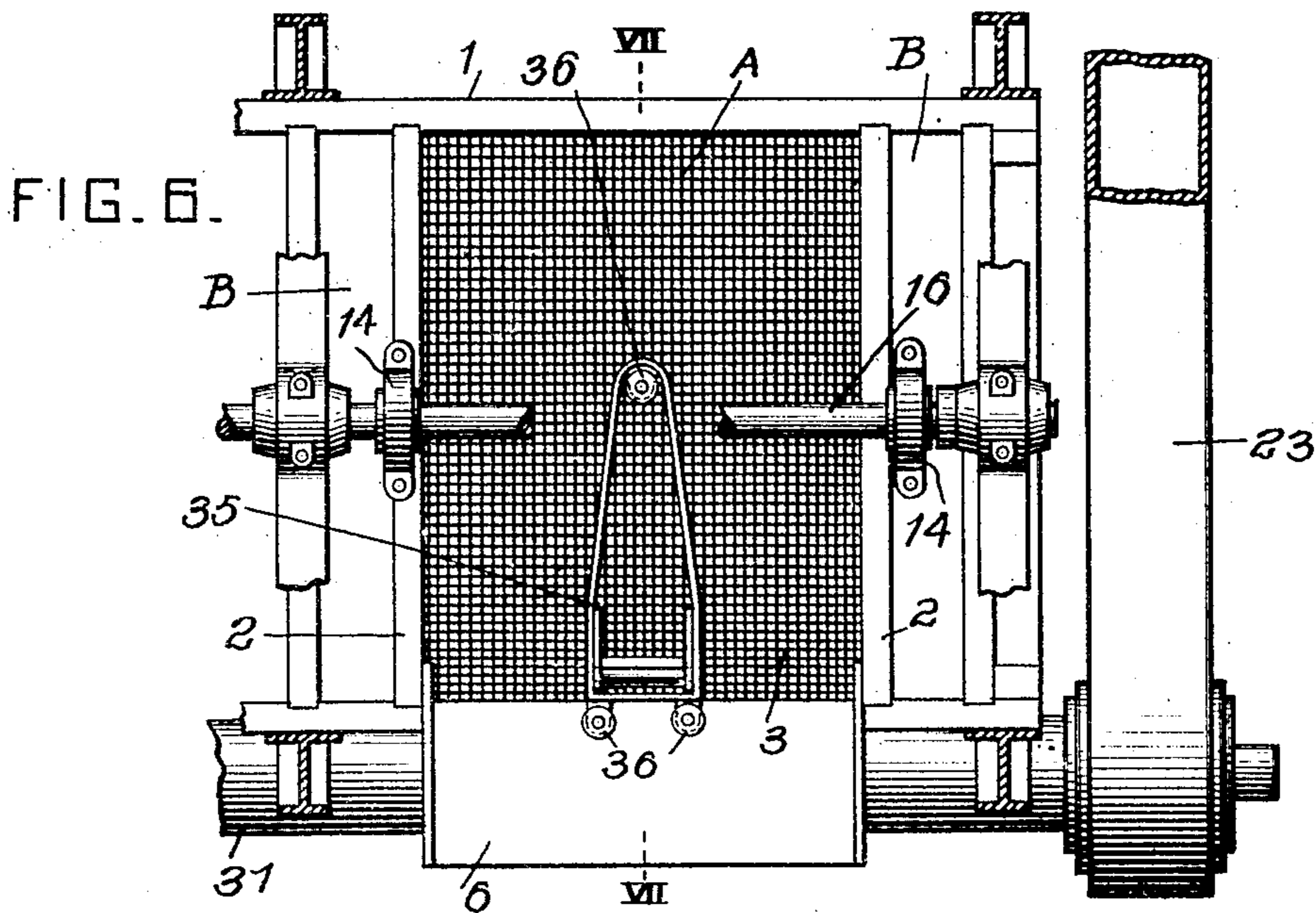
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5 SHEETS—SHEET 5.



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# UNITED STATES PATENT OFFICE.

ALFRED J. DIESCHER, OF PITTSBURG, PENNSYLVANIA.

APPARATUS FOR WASHING COAL, ORE, &c.

No. 876,268.

Specification of Letters Patent.

Patented Jan. 7, 1908.

Application filed March 5, 1907. Serial No. 360,663.

*To all whom it may concern:*

Be it known that I, ALFRED J. DIESCHER, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, a citizen of the United States, have invented or discovered certain new and useful Improvements in Apparatus for Washing Coal, Ore, &c., of which improvements the following is a specification.

The invention described herein relates to certain improvements in apparatus for washing coal, ore, etc.

The separation of coal, ore, etc., from impurities depends upon the difference in specific gravity between the impurities and the good material. In order that this gravity separation may take place the coal or ore with impurities are charged upon one portion of a screen arranged in a suitable tank or vessel. Water is forced intermittingly up through the screen thereby lifting the coal or ore to a greater or less degree and allowing it to settle back on the screen. This movement tends to cause the ore, coal, etc., to spread over the screen towards the discharge. This movement is facilitated by a constant flow of water through the vessel towards the discharge. During this agitation and movement of the material, the heavier elements will move down through the lighter elements and settle in a layer on the screen. In order to remove the heavier materials suitable traps are arranged adjacent to the main discharge, said traps being connected with the chamber in which the gravity separation occurs by openings adjacent to the screen. In the operation of the washers now in use, the movement of the heavier material through these openings into the traps is due to the pressure of the superincumbent material forcing the layer on the screen into the openings. The movement of the heavier material under such conditions is slow and uncertain requiring frequent attention.

The object of the invention described herein is to maintain a constant flow of water through the opening into the trap and from the trap to a secondary or return compartment or chamber, thereby accelerating the movement of the heavier material or elements.

It is a further object of the invention to cause a lifting or easing up of the material in the traps so that it can be acted on more effectively by the current flow therethrough.

The invention is hereinafter more fully described and claimed.

In the accompanying drawings forming a part of this specification Figure 1 is a top plan view of my improved apparatus; Fig. 2 is a sectional plan on a plane indicated by the line II—II Fig. 4; Figs. 3 and 4 are sectional elevations on planes indicated respectively by the lines III—III, IV—IV Fig. 1; Fig. 5 is a view partly in side elevation and partly in section of a double washer illustrating certain modifications of my improvement; Fig. 6 is a top plan view of one of the washers shown in Fig. 5; and Fig. 7 is a sectional elevation on a plane indicated by the line VII—VII Fig. 6.

In the practice of my invention I provide a suitable tank or receptacle 1, preferably rectangular in cross section, as shown in Figs. 1 and 2. A portion, preferably the upper portion of this tank or receptacle is divided into a main or central separating chamber A and two secondary or return compartments B, B, by partitions 2. Within the main compartment is arranged a screen 3 formed of wire or perforated sheet metal, and supported in position by brackets 4. Traps or receptacles 5 are formed preferably at one end of the screen adjacent to the discharge shelf 6, over which water and washed material can pass outside of the receptacle. Openings 7 are formed through the inner walls of the traps adjacent to the screens, said openings being controlled by gates 8, which can be moved up and down, and held in position by any suitable means, as the nuts 9. Outlets 10 are formed through the partitions 2 so as to permit the discharge of material from the traps into the outside or secondary compartments B, B. It will be observed that the floors or bottoms of these traps are constructed to permit of the passage of water, as for example they may be formed by portions of the screen 3. A plunger 11 provided with valves of any suitable construction and adapted to open by pressure of water, when the plunger is shifted in a direction the reverse of that when forcing water through the screen, is arranged to operate between the partitions 2, as clearly shown in Figs. 3 and 4. This plunger is connected to rods 12 extending up through the compartments B and connected at their upper ends to shaft 13, which is mounted in bearings formed on the traps 14, surrounding eccentrics 15 on the main

driving shaft 16. By this construction the plunger can be given the desired up and down movement within the compartment A below the screen. Guides 17 are formed on or secured to the inner walls of the tanks for the ends of the plunger 11. While any suitable form or construction of valve may be employed, it is preferred to employ that shown in Figs. 3 and 4, consisting of plates 18, arranged over the openings through the plunger and guided in their movements by lugs 19. The upward movement of these plates or valves is controlled by straps 20 secured to the upper ends of the lugs 19.

It is preferred that the bottom of the tank or receptacle should be inclined towards the center, or a common line, so that the material dropping down through the compartments B will flow into a circular channel 21 in which is arranged a screw conveyer 22, whereby the material can be continuously forced outward into a box 23, in which are arranged elevating buckets 24, whereby the material can be raised and discharged into a spout 25. As is customary, the chamber or receptacle is provided with a charging shelf or spout 26, which directs the material to be washed onto the screen at the side opposite the shelf 6.

In the operation of the washer, the latter is filled with water under pressure through the supply pipe 27 up to the level of the shelf 6, the pipe being preferably connected to the washer at a point between the screen 3 and the upper limit of movement of the plunger 11. After the chamber has been filled with water, material is charged through the spout 26 onto the screen, and the plunger set into operation. On the upward movement of the plunger, water is forced upwardly in the compartment A, and through the screen. By this upward movement of the plunger the water in the compartments B will be lowered to a considerable extent for the reason that the openings 7 and 10 from the main compartment A through the trap into compartments B will not permit a sufficient return flow to compensate for the water drawn from compartments B on the upward movement of the plunger. As the plunger moves down the valves 18 open so that the plunger will not displace much water in a direction to cause its flow up into the chamber B. The tendency of the water to lower in the compartment A during the downward movement of the plunger is prevented either wholly or to a great extent by this water flowing into the chamber A through the supply pipe 27. It follows from the proportioning of the ports 7 and 10, and the construction of the plunger, whereby little water is displaced during its downward movement, that the water in the compartment A is maintained at a higher level than in compartments B so that there will be a constant flow of water through the

ports 7 and 10 into compartments B. On every upward movement of the plunger the level of the water in chamber A will be raised above the outlet or shelf 6, and there will be a gush of water carrying the lighter elements of the material being treated, from the chamber A. By reason of this upward movement of the plunger and the water carried thereby, any material lying upon the screen, whether within or without the traps, is lifted or eased up, and in settling will tend to spread itself uniformly over the screen. In this up and down movement of the material, there will be a gravity separation of the elements composing the material, the heavier elements settling down onto the screen. As the material is discharged onto the screen in a pile immediately under the chute 26, the spreading due to the lifting of the material, will be towards the discharge shelf 6. This movement will be accelerated or assisted by the flow of water over such shelf. As soon as sufficient material has been discharged onto the screen to reach the level of the discharge shelf, there will be a movement of the lighter elements over the shelf with the water. The heavier elements, which have settled onto the screen will move forward with the other materials, and the pressure of the superincumbent mass, will tend to force such heavier material out through the openings 7 into the traps. As by my construction there will be a constant flow of water from the main portion of the chamber through the openings 7, this movement of the materials will be accelerated. At each upward movement of the plunger, water will be forced through the portions of the screens inclosed by the traps, thereby lifting the material contained therein. By reason of the lower of the level of the water in the chambers B, there will be a strong outward flow of water from the traps through the openings 10, thereby accelerating the movement of the heavier materials from the traps.

In the construction shown in Figs. 1 to 4, inclusive, the heavier portions of the material being washed are discharged into the secondary compartments B with the water, there being a constant flow of water from the compartment A above the screen into the compartment B. In lieu thereof I have shown a construction in Figs. 5, 6 and 7, whereby the heavier material is discharged into a compartment C, which is connected by a port 10 with the space above the screens. This compartment C is connected by a passage 30 with a tube 31, in which is arranged a screw conveyer 32, adapted to move the heavier material along the tube 31 into the lower end of an elevator 23. The water from the compartment C will flow over the walls 33 into the passages 34 which are connected with the main compartment A below the level of the plunger 11. By this con-

struction only water is returned to the compartment A, the heavy materials being separated in the compartments C from the water. The said compartments B are provided as heretofore described, but their principal function in this construction is to provide space into which the water can be raised when the plunger descends an amount sufficient to produce a water column of sufficient height to raise the valves 18 of the plunger. In the construction shown in Figs. 5, 6 and 7, the trap for the heavier materials, is formed by a box 35 preferably extending from one wall of the compartment A towards or beyond the middle portion of the screen forming the bottom of such compartment. The box or shell forming the trap may or may not be provided with openings in its side, but is made vertically movable to afford a space below its lower edge through which the heavier material or slate may pass. This vertical adjustment of the box or shell can be effected in any suitable manner, as for example by means of screws 36 passing through lugs secured to the shell, and bearing on a stationary portion of the washer. In practice it is preferred to adjust the inner end of the box or case a little higher than the opposite end so that the larger pieces of the heavy materials which sink quickest may pass freely thereinto, the material to be washed being discharged onto the screen from the chute 26, as shown in Fig. 7. In order to prevent a sudden rush of the heavy materials through the trap, I provide an adjustable baffle-plate 38, arranged across the trap adjacent to its outer end, and by changing the position of this baffle-plate any thickness of the heavy material may be maintained on the screen, the material in addition to such thickness being washed along the bed so prepared for it.

A desirable construction and arrangement of baffle-plate is shown in Figs. 7 and 8. The baffle is supported by two side plates 39 resting on the screen inside of the sides of the trap and held in proper relative position by bolts 40. The position of this baffle-plate can be shifted as shown, to vary the height of its upper edge above the screen. In addition to the intermittent current starting in the space between the plunger and the screen, through the screen and over the front shelf 6, there is another current maintained that passes also from the space mentioned, through the screen, but into the trap, or traps, and thence either directly into the secondary compartments, as in Figs. 1, 2, 3, & 4, or by way of ports into the space below the plunger as in Figs. 5, 6 and 7. The secondary compartments, as well as the space below the plunger are supplied with water indirectly, that is, through the leaks around the plunger, and also through the traps as mentioned. The purpose of the valves in

the plunger is to prevent the entire filling of the secondary compartments on the return or down stroke of the piston; in other words, by means of those valves the level of the water in these compartments is kept at a considerably lower height than that over the screen where it is even, or approximately even, with the overflow shelf. As the water passes through the traps and secondary into the space below the plunger, thence through the valves in the latter into the space between the plunger and the screen, thence through the screen into the trap, or traps, thence again by way of ports, or secondary compartments, into the space below the plunger, and again through the valves etc. *ad infinitum* there is a continuous circulation of this secondary current and the purpose of this current is to urge the onward movement of the heavy matter in the trap, or traps, to the point whence it moves by gravity into a special compartment from which it is periodically discharged, or it drops into some automatic conveying device from which it is continuously removed as for instance by a conveying screw combined with an elevator, as shown in the several figures referred to.

It was found during the operation of a machine as shown in Figs. 1, 2, 3, and 4, that if the leakage around the plunger is small, that is, that the clearance between the edges of the plunger and the surrounding lining of the tank is not over a quarter of an inch wide, a difference in the height of water levels up to eight inches can be maintained between main and secondary compartments. A trap of the form shown in Figs. 5, 6 and 7 and, if desired having gates similar to those shown on the trap in Figs. 1 and 3, may extend to or beyond the middle of the screen but so constructed that either end of it may be raised or lowered independently of the other, thus permitting an adjustment of the opening under the lower edge of the shell, conforming to the order in which the various sizes of the heavy material are precipitated upon the screen.

It will be understood by those skilled in the art that the slides 8 are closed or the shell 35 is lowered onto the screen until there has been an accumulation of heavier material on the screens, as otherwise there would be a discharge of mixed materials through the trap at the beginning of the operation. In treating coal, the slate being the heavier element, will settle onto the screen; but in treating ore, the quartz or foreign material being the lighter, would be washed out and pass over the shelf 6, and the ore would be discharged through the traps.

It is characteristic of my improved washer, that there is maintained a constant flow of water and material from the space above the screen out through the trap, but that a

pulsating movement is imparted to the water moving from the lower portion of the washer up through the screen, so as to cause a lifting of the load of the screen, thus facilitating the movement of the material towards the discharge ports.

I claim herein as my invention:

1. In a machine for washing coal, ore, etc., the combination of a tank having a main and one or more secondary compartments, the main compartment having an outlet for the discharge of light material, a screen arranged transversely of the main compartment below the level of the outlet therefrom, the main and secondary compartments being connected by open ports located above the screen and permitting a free flow of water from the main to the secondary compartments and means for maintaining a flow of water up through the screen and through ports leading to the secondary compartment or compartments, substantially as set forth.

2. In a machine for washing coal, ore, etc., the combination of a tank having a main and one or more secondary compartments, the main compartment having an outlet for the discharge of light material, a screen arranged transversely of the main compartment, the main and secondary compartments being connected by open ports arranged above and adjacent to the screen and means for producing an upward surging of the water in the main compartment and adapted to maintain a constant flow of water from the main compartment unto the secondary compartment, substantially as set forth.

3. In a machine for washing coal, ore, etc., the combination of a tank having a main and one or more secondary compartments, the secondary compartments being adapted to receive the heavy material, said main and secondary compartments being connected at the lower ends, a screen arranged transversely of the main compartment, the main and secondary compartment or compartments being connected by open ports arranged above and adjacent to the screen and means for causing a constant movement of water up through the screen and from the main to the secondary compartments through said port or ports, substantially as set forth.

4. In a machine for washing coal, ore, etc., the combination of a tank, a horizontally arranged screen within said tank, a trap having inlet and outlet ports or openings in or approximately in the plane of the screen, said trap being connected with the tank by an unobstructed passage for the return of water to the tank, means for causing a pulsating flow of the water through the screen and maintaining the water above the screen at a higher level than that in the return passage, substantially as set forth.

5. In a machine for washing coal, ore, etc., the combination of a tank, a screen arranged transversely of the tank, a trap having its bottom formed by a portion of the screen and provided with inlet and outlet ports or openings and means for causing a pulsating flow of the water through the screen and maintaining a constant flow of water through such ports, substantially as set forth.

6. In a machine for washing coal, ore, etc., the combination of a tank having a main and one or more secondary compartments, a screen arranged transversely of the main compartment, a trap having its bottom formed by a portion of such screen and provided with ports connecting respectively with the main and secondary compartments and arranged adjacent to the screens, and means for producing a pulsating but constant flow of the water up through the main compartment and the trap and into the secondary compartment, substantially as set forth.

7. In a machine for washing coal, ore, etc., the combination of a tank having a main and one or more secondary compartments connected at the lower ends, screens arranged transversely of the main compartment, a trap having its bottom formed by a portion of said screen and provided with ports communicating respectively with the main and secondary compartments, and means for causing a pulsating constant flow of water through the main and into the secondary compartments, substantially as set forth.

8. In a machine for washing coal, ore, etc., the combination of a tank having a main and one or more secondary compartments communicating at their lower ends, a screen arranged transversely of the main compartment, a trap having its bottom formed by a portion of said screen and provided with ports communicating respectively with the main and secondary compartments, a plunger movable vertically in the main compartment below the screen and provided with upwardly opening valves, means for delivering a supply of water between the screen and plunger, said means and plunger being adapted to maintain a constant, but pulsating flow of water through the screen and trap into the secondary compartment.

9. In a machine for washing coal, ore, etc., the combination of a tank having a main compartment and a secondary compartment connected to the upper and lower ends of the main compartment, a screen arranged transversely of the main compartment, a trap having its bottom formed by a portion of said screen and connected with the main and secondary compartments, a plunger for forcing water up through the screen; said plunger having valves adapted to open on the return movement of the plunger, and a sup-

ply pipe connected to the main compartment intermediate of the screen and plunger.

10. In a machine for washing coal, ore, etc., the combination of a tank, a screen arranged transversely of the tank, a shell arranged above the screen and provided with an outlet an adjustable baffle plate arranged within the trap formed by the screen, means for moving the shell relative to the screen,

and means for causing a flow of water up 10 through the screen.

In testimony whereof, I have hereunto set my hand.

ALFRED J. DIESCHER.

Witnesses:

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