No. 777,702. PATENTED DEC. 20, 1904.

S. W. TRAYLOR.

SCREEN.

APPLICATION FILED FEB. 12, 1904.

NO MODEL. 3 SHEETS—SHEET 1.

Fig. 6.

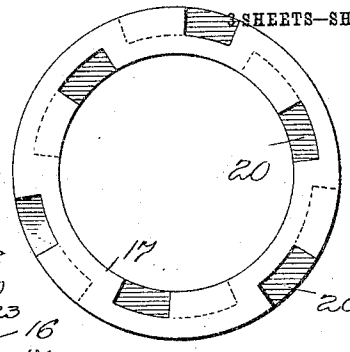


Fig. 1.

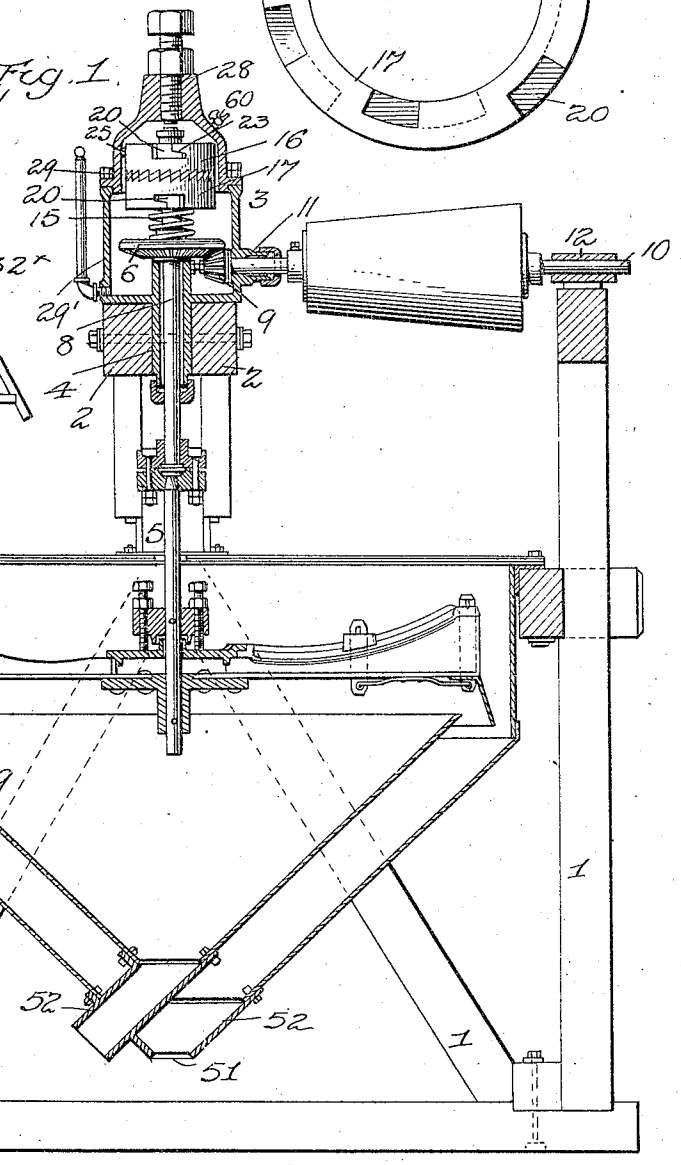
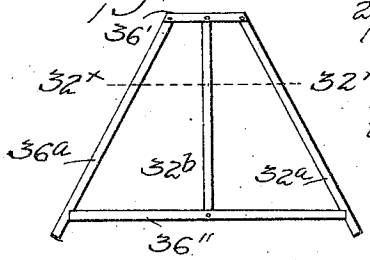


Fig. 4.



Attest:
C. F. Macletton
Edward Sarton

Inventor.
SAMUEL W. TRAYLOR
By Ellis Spear & Company
ATTYS.

No. 777,702. PATENTED DEC. 20, 1904.

S. W. TRAYLOR.

SCREEN.

APPLICATION FILED FEB. 12, 1904.

NO MODEL. 3 SHEETS—SHEET 2.

Fig. 2.

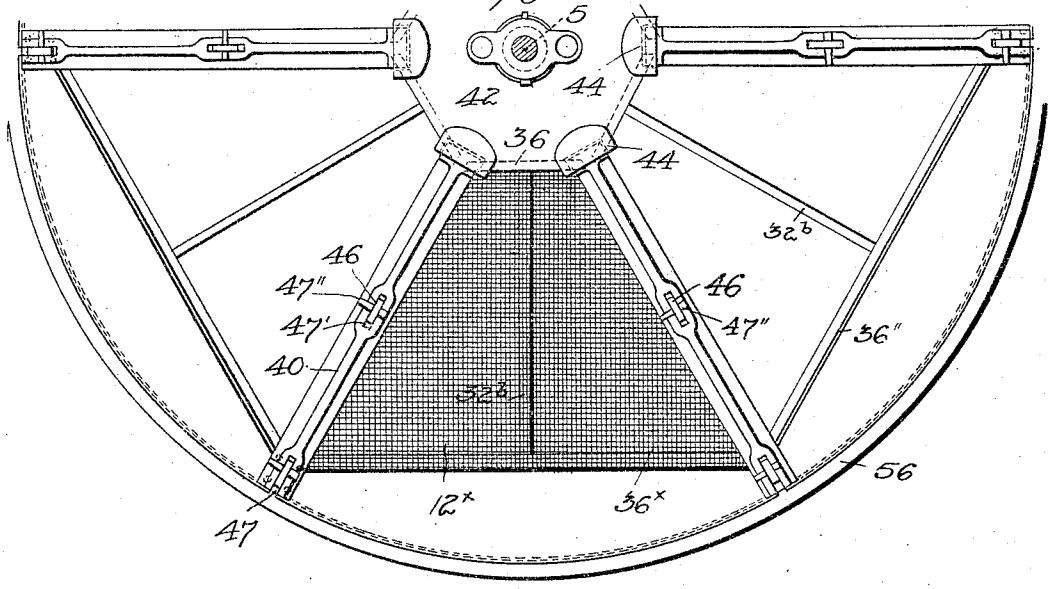


Fig. 3.

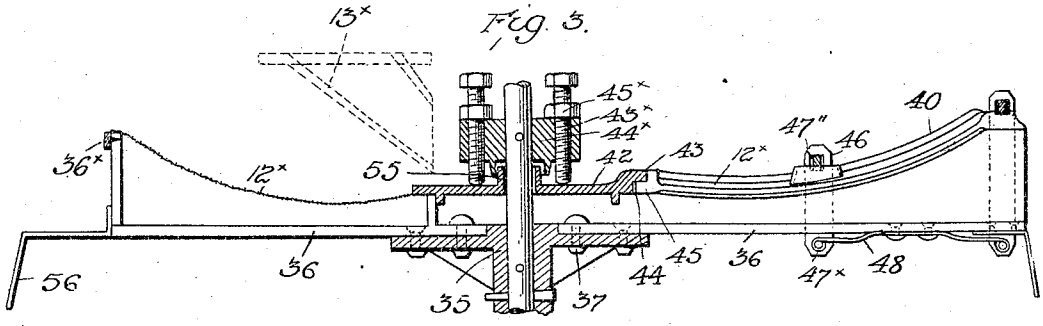
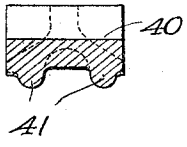


Fig. 8.



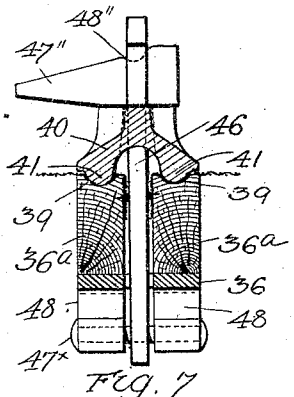
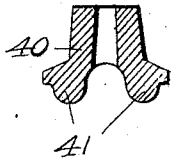


Fig. 7.

Fig. 9.



Attest:

C. Middleton

Edward Sarton

Inventor

SAMUEL W. TRAYLOR.

By Duncan Spear & Company

Atty's.

No. 777,702. PATENTED DEC. 20, 1904.

S. W. TRAYLOR.

SCREEN.

APPLICATION FILED FEB. 12, 1904.

NO MODEL. 3 SHEETS—SHEET 3.

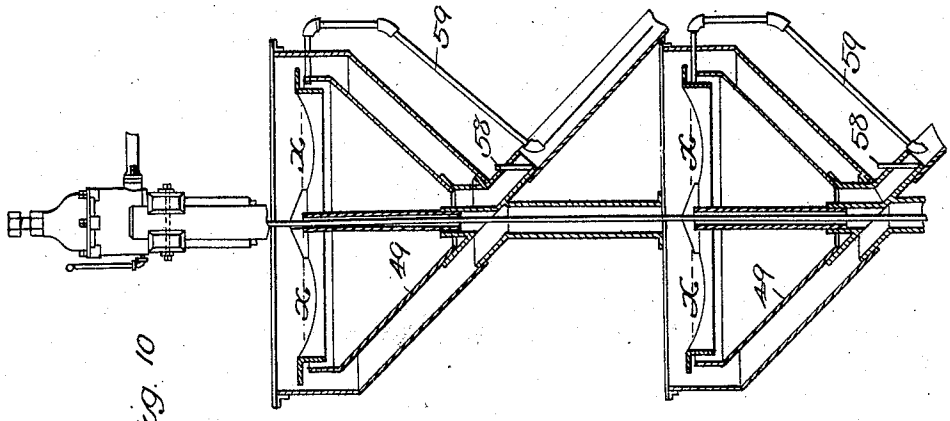


Fig. 10

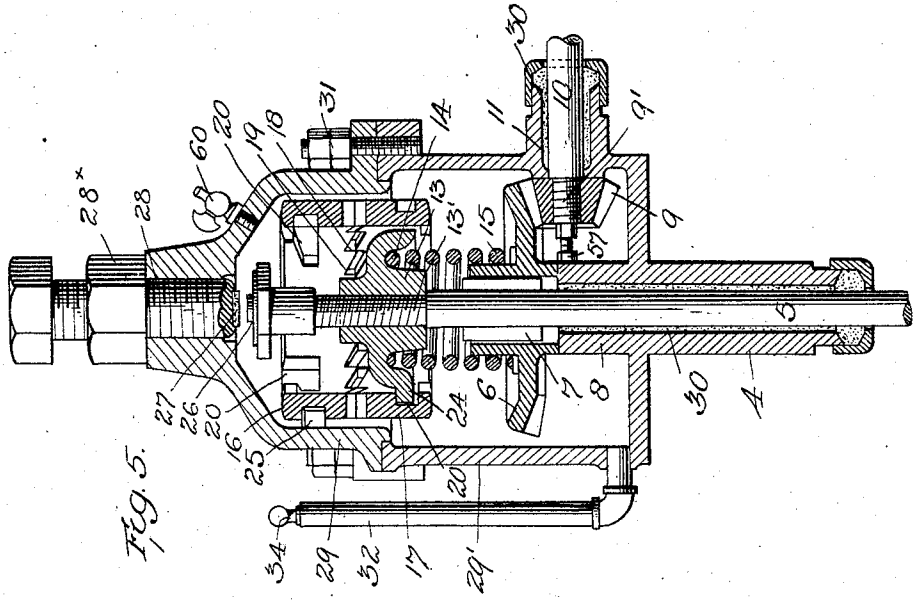


Fig. 5.

Attest:
C. Middleton
Edward Sarton

Inventor:
Samuel W. Traylor
Ellis Spear Company
By
Atty's.

No. 777,702. Patented December 20, 1904.

UNITED STATES PATENT OFFICE.

SAMUEL W. TRAYLOR, OF NEW YORK, N. Y.

SCREEN.

SPECIFICATION forming part of Letters Patent No. 777,702, dated December 20, 1904.

Application filed February 12, 1904. Serial No. 193,241.

To all whom it may concern:

Be it known that I, SAMUEL W. TRAYLOR, a citizen of the United States, residing at New York city, county of New York, State of New York, have invented certain new and useful Improvements in Screens, of which the following is a specification.

My invention includes among its features a rotating screen to which a vertical vibratory movement is given.

It is one of the objects of my invention to increase the efficiency of the screen over all existing screening apparatus, and to this end I arrange to give an impact to the screen on its upward movement, the effect of which is to cause the material being screened to be thrown up from the meshes of the screening-cloth, clearing the same and preventing clogging of the said meshes by the material, and this action coöperating with the centrifugal force to which the material is subjected causes an even distribution of the material over the screening-surface and a maximum screening effect is derived.

I aim to so construct and assemble certain of the parts that when in place the working of the apparatus will tend to hold or tightem them in their respective positions. Thus I avoid the use of fastening devices, which are liable to work loose.

I also aim to provide a screen with special means for holding the screening-cloth stretched tightly and to prevent leakage of the material between the screen-frames and to render it possible to quickly remove and replace the said cloth.

My invention consists in the features and combination and arrangement of parts hereinafter described, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a central vertical section of an apparatus embodying my improvements. Fig. 2 is a plan view of part of the screen. Fig. 3 is a detail sectional view of a part of the screen. Fig. 4 is a detail view of one of the screen-frames. Fig. 5 is a detail view of the impact head or casing with the gearing and impact devices contained therein. Fig. 6 is a detail plan view of one of the cam-rings. Figs. 7, 8, and 9 are views showing details of the means for holding the screening-cloth in place and in stretched condition, the figures being sections at different points on the clamping-bars. Fig. 10 is a view in the nature of a diagram, showing a plurality of screens arranged on one shaft and also shows the arrangement of a screen as combined in an apparatus designed to handle wet material or to which water may be supplied.

In the drawings, 1 indicates a suitable supporting-frame, comprising, among other parts, a pair of cross-beams 2, arranged at a slight distance apart and supporting a hollow casing or head 3, the neck 4 of which extends down between the two beams. A vertical shaft 5 extends up through the said neck and into the head or casing, said shaft having on its upper end a beveled gear 6, splined thereto, as at 7. Said gear rests upon the hollow boss 8, formed with and extending up within the hollow head or casing. A pinion 9 meshes with the gear, said pinion being located within the hollow head on a shaft 10, journaled at 11 in the wall of the hollow head and journaled also at 12 on a part of the frame. This shaft may be driven in any suitable manner, and through it the vertical shaft is rotated, which latter carries the screen $12^{\times}$, the special features of which will be described hereinafter. The material to be treated is fed to the screen near its central part through a chute $13^{\times}$, Fig. 3, and said material is subjected both to the centrifugal force derived from the rotary movement and to a vertical vibratory movement of the screen derived through impact devices now to be described.

As before stated, the vertical shaft is splined to the gear 6, and thus is permitted vertical movement. At a point above the gear 6 I fix on the shaft a block 13 by means of a screw-thread 13′. Said block has a seat or groove 14 in its under side to receive the upper end of a spiral spring 15, which rests at its lower end upon the bevel-gear 6. This spring therefore supports the shaft and screen, and when the shaft is moved downwardly and is then released, as will be presently described, the

spring imparts thereto a quick upward movement for the impact action.

For forcing the shaft together with the screen downwardly I employ a pair of cams 16 17, surrounding the upper end of the shaft. These cams are duplicates of each other, and each consists of a ring having on one of its edges a series of teeth, in this instance twenty in number, said teeth having vertical faces 18 and inclined faces 19. Each cam-ring has a series of bayonet-slots 20 on the outer side thereof and a second series on the inner side, each series in the present instance being composed of three such slots, though there may be any number. Each slot has its open mouth at the edge of the cam-ring opposite the toothed edge, and the horizontally-extending portion of each slot has an inclined wall or portion 23. As shown in Figs. 1 and 5, two of these cams are arranged in the impact head or casing. They are arranged with their teeth in contact, the lower cam-ring being connected with the shaft through the block 13, which has lugs 24 thereon engaging the inner series of bayonet-slots on the lower cam-ring, and the upper cam-ring is held to the casing of the head by lugs 25 on the said casing engaging the outer series of bayonet-slots on the upper cam-ring. The arrangement is such that the rotary movement of the vertical shaft locks the lower cam-ring thereto by the lugs 24, working against the inclined walls 23 of the slots in the ring, and the rotation of this ring, which bears against the upper ring, causes the latter to be turned to secure a similar locking or wedging effect between itself and the lugs 25 of the casing. The effect of the rotation of the vertical shaft with the screen is to cause the teeth of the lower cam-ring carried by the shaft to ride over the teeth of the upper non-rotary cam-ring, thus causing a depression of the shaft and screen as the high points of the teeth engage each other and causing also the compression of the spring, and when these high points pass each other the shaft is lifted under the force of the compressed spring and the impact action results. As one way of securing this impact action I extend the shaft up through the cam-rings and provide it with a head 26 of any desired form adapted to come in contact with an impact-piece 27, preferably of rawhide, seated in the end of a screw 28, which is threaded through the upper end of the casing or head and is locked in position by a nut 28. The impact head or casing I prefer to make in two parts 29 29', held together by bolts 31 and having a packed joint, and suitable packing is employed around the shafts, and stuffing-boxes 30 are also provided for the shafts. The head or casing thus constructed is dust-tight and is adapted to contain a body of oil for lubricating the parts contained therein, and as an indicator for the depth of oil within the head or casing I employ a pipe 32, connecting with the lower part of the head and reaching vertically outside the same and having a suitable stopper 34. By introducing a rod into this tube the amount of oil in the head may be ascertained by the extent to which the rod is immersed in the oil.

I prefer to fix the pinion 9 on its shaft by a screw-thread connection 9', said thread being of a direction to tighten the pinion on the shaft by the revolution thereof. The block 13 may also be screw-threaded upon its shaft, the direction of this thread also being such as to tighten the block on the shaft by the rotation of the latter, and the thread of this impact-screw is of a direction to tighten said screw when the head of the rotary shaft contacts therewith.

The screen consists of a central lower hub 35, secured to the vertical shaft, to which radiating arms 36 are fastened, as at 37. These arms carry the screen-frames, one of which is shown in Fig. 4. The screen as a whole is of preferably hexagonal form made of six sections or frames, each of which is composed of outer and inner parallel strips or pieces 36' 36'', the diverging side strips or pieces 36^a, and the central strip 32^b. Said side strips or pieces have grooves 39 in their upper edges, Fig. 7, to receive the screen-cloth, which is placed over each frame independently and tacked to the outer sides of the side strips and to the outer side of the inner strip 36', while it is held to the outer face of the outer strip or piece 36'' by a clamp-strip $36^\times$, which is screwed in place. The frames with the screen-cloth attached are placed on the radiating-arms, each arm supporting the adjacent side strips of contiguous screen-frames at a slight distance apart, and then clamping-bars 40 are placed in position. These clamping-pieces, as shown in Figs. 7, 8, and 9, have each two ribs 41 on the under side, which ribs engage the stretched cloth and force it down into the grooves, thus subjecting the screen-cloth to an additional stretching action.

The screen-holding frames and the clamping-bars are held to the radiating-arms 36 by a central clamping-plate 42, which rests upon the inner ends of the frames at 43, and which also has pockets 44, receiving the lugs 45 at the inner ends of the clamping-bars. This clamping-plate is forced down by screw-bolts $43^\times$, passing through a block $44^\times$, pinned onto the vertical shaft, said screw-bolts being held in adjusted position by the nuts $45^\times$. The clamping-bars are held at their outer ends and also at their central portions by links 46, passing vertically through openings 47 and slots 47', arranged centrally in the said clamping-bars, said link passing down between the parallel sides of frames and through openings in the lower radially-arranged arms 36. The lower ends of the links are provided with pins $47^\times$, engaged by arms of a spring 48, riveted to the lower side of the radiating arms. The links 46 have transverse openings through

them at their upper ends, and wedge-shaped keys 47″ are driven through these openings, said keys having recesses 48″ in their upper edges forming seats for the links. The spring 48 yields as the wedges are driven into place, and when the recess or seat arrives at the link the said link is seated therein by the spring-pressure and the parts are thus locked together until intentionally removed by a blow. The springs 48 are sufficiently strong to hold the clamp-bars down tightly to securely clamp the screening-cloth.

It will be noticed that the clamping-bar bridges the space between the two frames and its ribs force and hold the adjacent edges of the sections of screen-cloth within the grooves of said frames, and the clamping-bar not only performs the function of holding the screening-cloth in place, but it holds the frames in proper relation to each other and in proper radial position on the arm 36, as said clamping-bar being held centrally above the arm by the links and its socketed connection with the central clamp-plate acts by its ribs to hold the frames in place. The said clamp-bar, moreover, acts to prevent any of the coarse material from passing down between the screen-frames and mixing with the fine screened material in the hopper.

It will be noticed that the screen-supporting frames curve downwardly from their inner ends and thence the curve is continued outward and upward, the outer end of the curve being in a considerably higher plane than the inner end. This I have found is the most efficient curve for the screen. The slight downward curve at the inner end of the screen gives the material fed near the center of the screen an initial tendency outward, and after the material has been brought well under the influence of centrifugal force it is made to climb the outer steep incline of the screen-surface, thus retarding the radial velocity of the material and causing more efficient screening.

The curve plane or surface of the screen considered as a whole is not such as would be derived by rotating one of the curved lines (represented by the curved upper edge of the middle frame-strip 32^b) around the axis of the screen; but, on the contrary, said screen is curved symmetrically or similarly on lines parallel to the said central strip 32^b. In other words, the curve plane or surface of each screen-section is that which would be produced by moving a curved line (represented by the upper curved edge of the center strip 32^b) along a line 32^x at right angles to itself (reference being made to Fig. 4) to the right and left over the whole area covered by the section. The importance of this particular curved plane of the screen is that the screen-cloth can be stretched over the frame without wrinkling or buckling, the lines of strain being straight across the frame at all points at right angles to the central strip 32^b. The finer material dropping through the screen falls into a funnel-shaped receiver 49, from which it passes out through a spout, while the oversize material falling over the edge of the screen is caught by the outer hopper or receiver, from which it is discharged through a central opening 51 thereof. These two receivers are connected together by a casting 52, which casting also forms a part of the discharge-pipe leading from the inner receiver. This casting serves as a support for the inner receiver, the outer receiver being supported from the main frame of the machine in any suitable manner. The inner receiver is further supported from the outer receiver by bolts 53, passing through ferrules 54 near the upper edge of the receivers. The clamp-plate 42 is provided with a large central opening affording clearance for the shaft, and a flange 55 extends up around this opening, so as to prevent any material fed to the center portion of the screen from passing through said hole.

An apron 56 is attached to the rotary screen, so as to depend therefrom and obstruct the space or opening around the top of the inner receiver, and thus prevent any heavy pieces of the material which may be thrown against the upwardly-extending wall of the outer receiver from rebounding through the said space into the inner receiver.

In order to hold the horizontal drive-shaft in position against longitudinal displacement without the use of collars or the like fixed thereon and engaging with a portion of the wooden frame, the effect of which is rendered uncertain owing to the liability of the frame warping or getting out of true, I provide the said shaft with an extension 57 within the impact-head bearing on a part of the casing or shell of the said head. This extension runs in oil, and there is practically no wear at this point. This extension forms a stop against inward movement of the shaft, while outward movement of the shaft is prevented by the pinion bearing against the inner wall of the casing. As before stated, the pinion and the block on the vertical shaft are self-tightening, and there are no parts to work loose or get out of order within the head. This self tightening or fastening effect is present also in the cams, and, as before stated, these cams are counterparts of each other and may be used indiscriminately as upper or lower cams.

From the above it will be seen that I have provided a rotary screen moving substantially in a horizontal plane and having a vertical vibratory movement, and that this vibratory movement is given by depressing the shaft which carries the screen against spring-pressure and then releasing the said shaft to be thrown violently upward, together with the screen, by the said spring-pressure and abruptly arresting the upward movement by impact devices, so that the material on the screen besides being subjected to the centrifugal

force derived from the rotation of the screen will be thrown violently upward by the said impact arresting the upward movement of the screen, and as a result of this perfect distribution of the material will be secured and the meshes of the screen will be kept free from the clogging of the material and a maximum efficiency will result.

It may be said that the particles of material proceed from the inner portion of the screen to the outer portion by a series of steps or bounds, and at all times the screen will have its meshes kept clear from clogging by the material. This bounding action besides aiding in the perfect distribution of the material over the screen and keeping the meshes clear also prevents the wear on the said screen-cloth which heretofore has resulted from the abrading action of the material in passing over the same in a sliding movement. This saving of wear on the screen is a material desideratum owing to the expense of screening-cloth.

As shown in Fig. 10, I may arrange a plurality of screens on the same vertical shaft, one impact-head being common to them all, although each screen is provided with its own receivers, the outer receiver of one screen discharging onto the screen next below.

As shown in Fig. 10, the invention may be used with very wet material or water may be supplied to the apparatus, so as to partially immerse the screen with its material, and in this case I provide for the inner receiver a gate 58 for closing the spout, and when this is opened the fine material will pass out and will be subjected to a current of water which may be derived from an overflow-pipe 59, connected with the outer tank or receiver and extending to the said spout.

It will be understood that the various features heretofore described are employed in connection with the apparatus shown in Fig. 10. In this figure the line *x x* indicates the extent to which the screen is immersed. In screening wet material liable to clog the meshes of the cloth the immersion of the screen in water, as shown, provides a lubricating effect between the material and the cloth, and as the screen rotates in the water and is subjected to the upward impact vibration or action the water will aid materially in keeping the meshes clear and in the distribution of the material over the screen-surface. The screen is not wholly immersed and the water-level is maintained by the overflow-pipe heretofore mentioned. The coarser material will pass over the edge of the screen; but in order to do this it must rise along the incline surface of the screen above the water-line and will not be aided in its ascent by the water. This dry zone on the screen will prevent the fine wet material from being washed over the edge thereof, thus retaining it to be subjected to an effective screening action.

I do not wish to limit myself to the particular embodiment of my invention shown herein, as this has been chosen as a representative form of the invention, many features of the apparatus being susceptible of change without departing from the principle which I desire to disclose. The impact-piece may be dispensed with, if desired, and reliance may be had for this purpose upon the ring-cams above described coming together under the spring-pressure after the high parts of their teeth pass each other, and I do not limit myself in this respect.

When the impact-screw is adjusted, it is necessary to provide for the escape of the air from the interior of the air-tight impact head or casing, and for this purpose I provide a cock at 60.

The screw 28 may be adjusted not only to take up wear, but to vary the length of impact-stroke.

It will be seen from the above that I provide a mechanism for operating the screen, the principal parts subjected to wear of which are entirely inclosed in a cast-iron case, thus excluding all dust and foreign substances which would otherwise cause rapid wear and destruction of the parts in rubbing contact. I also partially fill this case with oil, as stated, so that all such parts shall at all times be copiously lubricated, and thus seldom require attention.

I claim—

1. A screening apparatus comprising a screen having a concave upper surface, means for rotating the said screen, means for vibrating the screen vertically and arresting only its upward movement by impact, and means for feeding the material to the central portion of the screen, said screen subjecting the material to centrifugal force and causing the material to traverse the low part and upward-inclined portion of the screen while subjected to the vibration due to the upward impact, the discharge from the said screen taking place over the outer edge of the same, substantially as described.

2. In combination with a shaft, a screen supported thereon, means for rotating the shaft, and means for giving the same longitudinal movement comprising a pair of cam-rings, one of said rings having a lug-and-slot connection with the shaft and the other of said rings having a lug-and-slot connection with a frame part of the machine, and a spring for pressing the shaft in one direction, substantially as described.

3. In combination with a shaft, a screen carried thereby, a spring for pressing the shaft in one direction and means for pressing the shaft in the other direction comprising a pair of cam-rings, each having teeth on one of its edges and each having inner and outer slots, one of said cam-rings being connected with the shaft by a lug and a lug connection be-

tween the other cam-ring and a frame part, the said cam-rings being duplicates of each other, substantially as described.

4. In combination with a screen, a shaft connected therewith, a block secured to the shaft, a spring pressing the said block upwardly, a cam-ring surrounding the block and shaft and connected to the said block by a lug projecting from the block to engage the interior of the ring, and a fixed cam-ring engaging the cam-ring first mentioned, and means for rotating the shaft, substantially as described.

5. In combination with the screen and its shaft, a block on the shaft, a cam-ring surrounding the block, said cam-ring having a slot on its inner side and the said block having a lug entering said slot, a second cam-ring having a slot on its outer side, and a lug on a part of the frame entering the said slot, substantially as described.

6. In combination with the screen-shaft, a pair of duplicate cam-rings having means on their inner and outer sides for engaging with holding devices carried respectively by a part on the shaft and a part on the frame, said cam-rings being interchangeable to connect with either the shaft or the frame, substantially as described.

7. In combination with the screen-shaft, a spring for pressing the same in one direction and means for pressing the same in the other direction including a cam-ring having a bayonet-slot therein with means for engaging the said slot to hold the cam-ring in position, substantially as described.

8. In combination, with the screen-shaft, a spring for pressing the same in one direction, means for pressing the same in the opposite direction including a pair of cam-rings having slots in their side faces, a lug on the frame engaging the slot in the outer face of one ring and a lug on the shaft engaging the slot on the inner face of the other ring, said slots extending in opposite directions in respect to each other, the lugs being tightened in the slots by the revolution of the shaft.

9. In combination with the screen-shaft, a block fixed thereon, having a seat on its under side for a spring, a spring engaging said seat, a cam-ring surrounding the block and having a lug-and-slot connection therewith and a second cam-ring engaging the first with means for holding the same to the frame, substantially as described.

10. In combination with the screen-shaft, a spring for moving the same in one direction, a block threaded on the screen-shaft and upon which the spring presses, a cam-ring surrounding the block and connected thereto and a second cam-ring engaging the first, and means for holding the second cam-ring to the frame, the said screw-thread connection for the block being such as to tighten the block on the shaft by the revolution of the parts, substantially as described.

11. In combination with the screen and its shaft, gearing for driving the shaft, an oil-tight casing inclosing the said gearing and from which the shaft depends, said shaft, being vertically movable within the said casing and means for vibrating the shaft including cam-rings and a spring, and an impact-block to arrest the upward movement of the shaft, said block and vibrating means being inclosed within said oil-tight casing, substantially as described.

12. In combination with the screen-shaft, a gear splined thereon, driving means for the said gear, a spring resting on the gear and holding it in position, said spring serving to force the shaft in one direction, means for forcing the shaft in opposition to the spring, and a support on which the gear rests and through which the shaft reciprocates, substantially as described.

13. In combination with a screen and its shaft, a casing or head, a gear splined to the shaft and resting on a part of the head or casing through which part the shaft reciprocates, a block fixed on the shaft, a spring interposed between the said block and the gear, means for driving the gear and means for pressing the shaft in one direction in opposition to the spring, said means acting through the said block, substantially as described.

14. In combination with the screen and its shaft, a head or casing, impact mechanism therein including an adjustable impact-piece against which the end of the shaft strikes, means for operating the screen-shaft, and an air-escape valve leading from the casing, substantially as described.

15. In combination with a shaft, a screen comprising a pair of radially-extending frame-pieces arranged adjacent to each other and having grooves in their upper edges to receive the screen-cloth, and a clamping-bar having ribs to engage the said grooves and extending across from one piece to the other, and means for holding the said clamping-bar, said means extending down between the frame-pieces and consisting of links, springs engaging the lower ends of the said links and wedges passing through openings in the upper ends of the links, said wedges bearing the clamping-bars, substantially as described.

16. In combination with a shaft, a screen comprising supports for the screen-cloth, a series of radiating clamping-bars for holding the screen-cloth, a central clamping-plate with means for holding the same said plate engaging the clamping-bars removably at their inner ends, and means for holding the clamping-bars removably at their outer portions, substantially as described.

17. In combination with the shaft, a support secured thereto, having radiating arms, a pair of frame-pieces on each radiating arm, having grooved upper sides, clamping-bars extending over adjacent frame-pieces cover-

ing the space between them on the upper or receiving side of the screen and having ribs to hold the screen-cloth in their grooves, means for holding the clamping-bars to the radiating arms, said means passing down between the grooved frame-piece and a central clamping-plate secured to the shaft adjustably and engaging the inner ends of the clamping-bars to hold the inner ends of the clamping-bars removably, substantially as described.

18. In combination, the shaft, a plurality of pairs of radial arms carried thereby with a space between the arms of each pair, a plurality of screen-frames on the radial arms, a clamping-plate covering the inner ends of the frames and means for holding the outer portions of the said frames to the supporting means consisting of clamping-bars extending along the frames on the upper side of the screen and means extending from said bars to the radial arms below the screen and through the space between said arms.

19. In combination with the screen and its shaft, means for rotating the shaft, impact means arranged to be struck by the end of the shaft including an impact-piece and an adjusting-screw therefor having its thread running in a direction opposite to that of the rotation of the screen-shaft to be tightened in its support by the rotary movement of the shaft, substantially as described.

20. In combination with a housing containing water, a rotary screen having a curved surface forming an upwardly and outwardly inclined screen-surface with its outer edge over which the material is discharged in a higher plane than the inner parts of the screen, said screen being partially submerged to leave its outer upwardly-inclined portion permanently above the water-line, means for moving the screen vertically and arresting its upward movement by impact, and a receiver for the fine material, substantially as described.

21. In combination, with a vertical shaft, a plurality of screens carried thereby, means for rotating the shaft, means for reciprocating the shaft vertically and arresting its upward movement by impact, and housings for each screen, each of said screens discharging over the outer edge thereof substantially as described.

22. A screening apparatus of the rotary type, comprising in combination a screen having a concave upper surface providing inclined, raised, central and peripheral portions, means for rotating the screen, means for feeding the material to the inclined raised central portion, down which portion it will feed by gravity into the zone of centrifugal force, and means for subjecting the screen while in rotation to a vertical vibration and arresting, by impact, only its upward movement, the material being distributed over the screen from the center to the periphery by the centrifugal force aided by the upward impact, and the oversize discharging over the outer edge of the screen, substantially as described.

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

SAMUEL W. TRAYLOR.

Witnesses:
P. E. VAN SANN,
R. H. VAIL.