Aug. 30, 1949. H. G. CRAM 2,480,119

DISK PULP SCREEN

Filed Feb. 25, 1946 4 Sheets-Sheet 1

Fig. 1

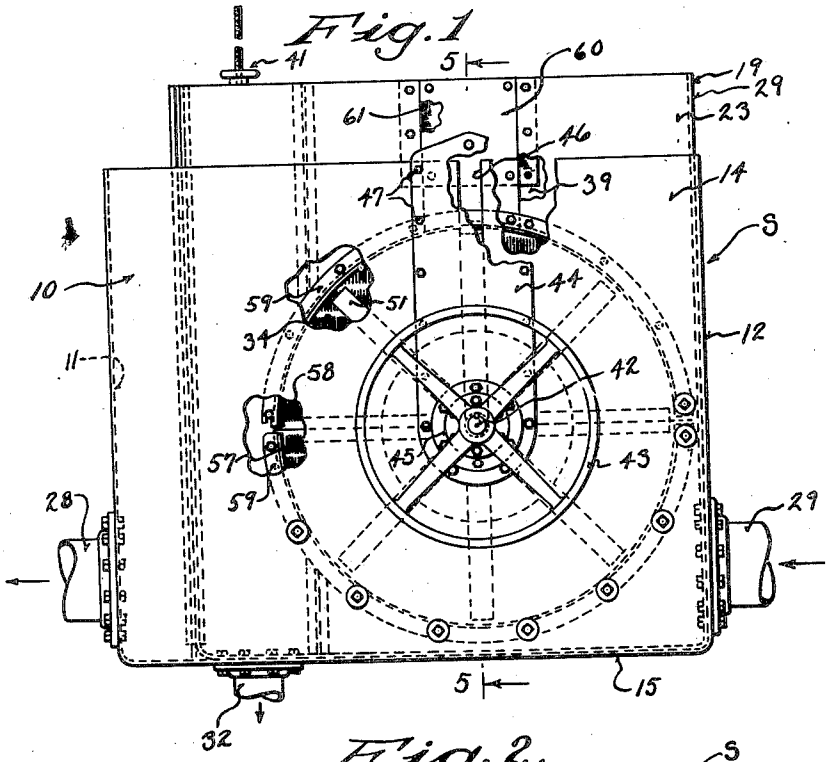
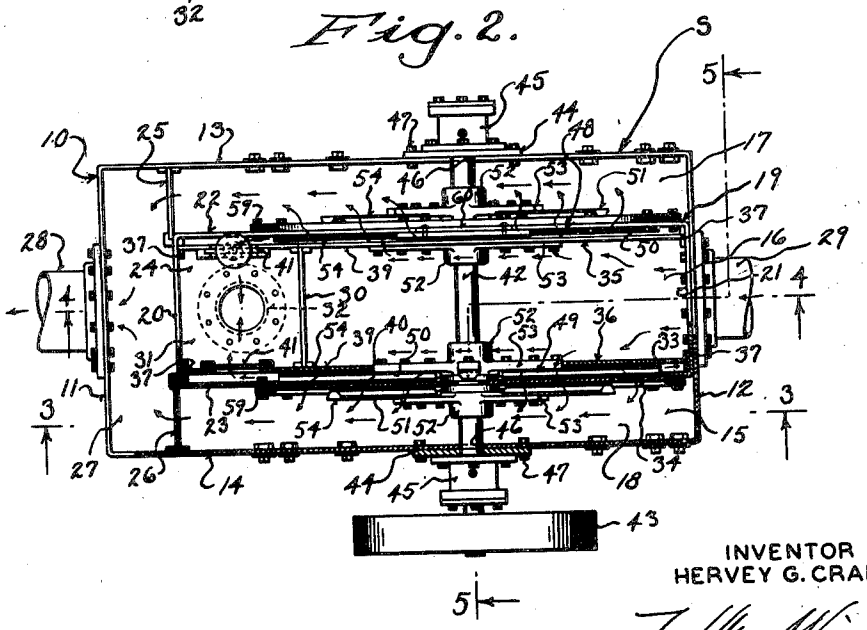


Fig. 2.



INVENTOR
HERVEY G. CRAM

BY

ATTORNEYS

Aug. 30, 1949. H. G. CRAM 2,480,119

DISK PULP SCREEN

Filed Feb. 25, 1946 4 Sheets-Sheet 2

Fig. 3.

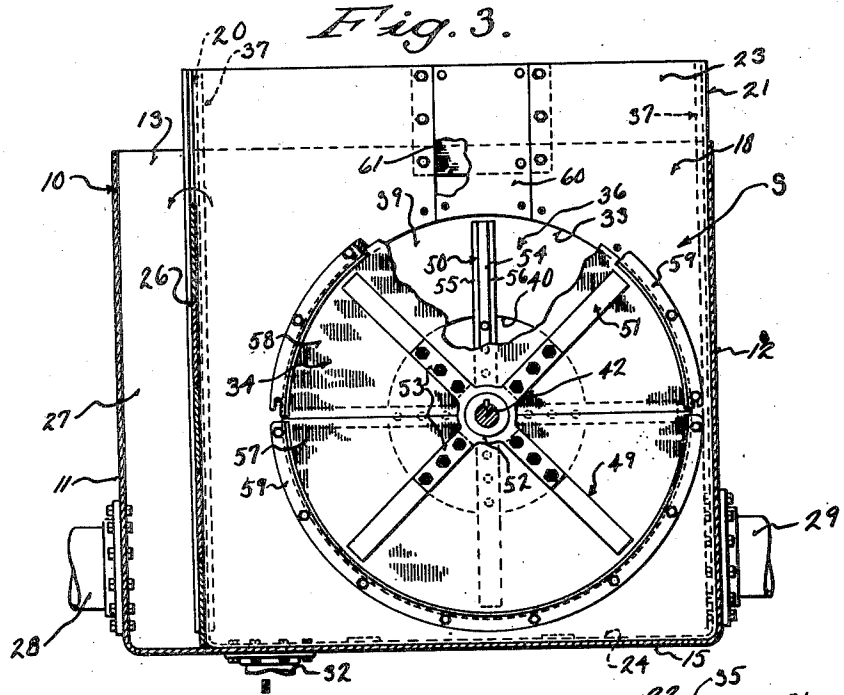
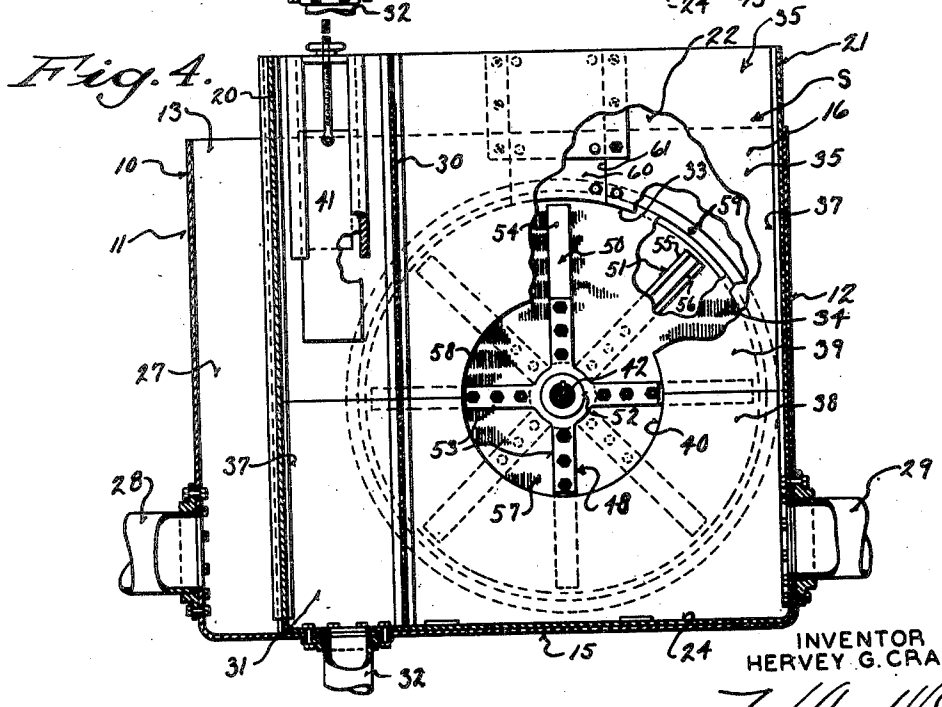


Fig. 4.



INVENTOR
HERVEY G. CRAM

BY

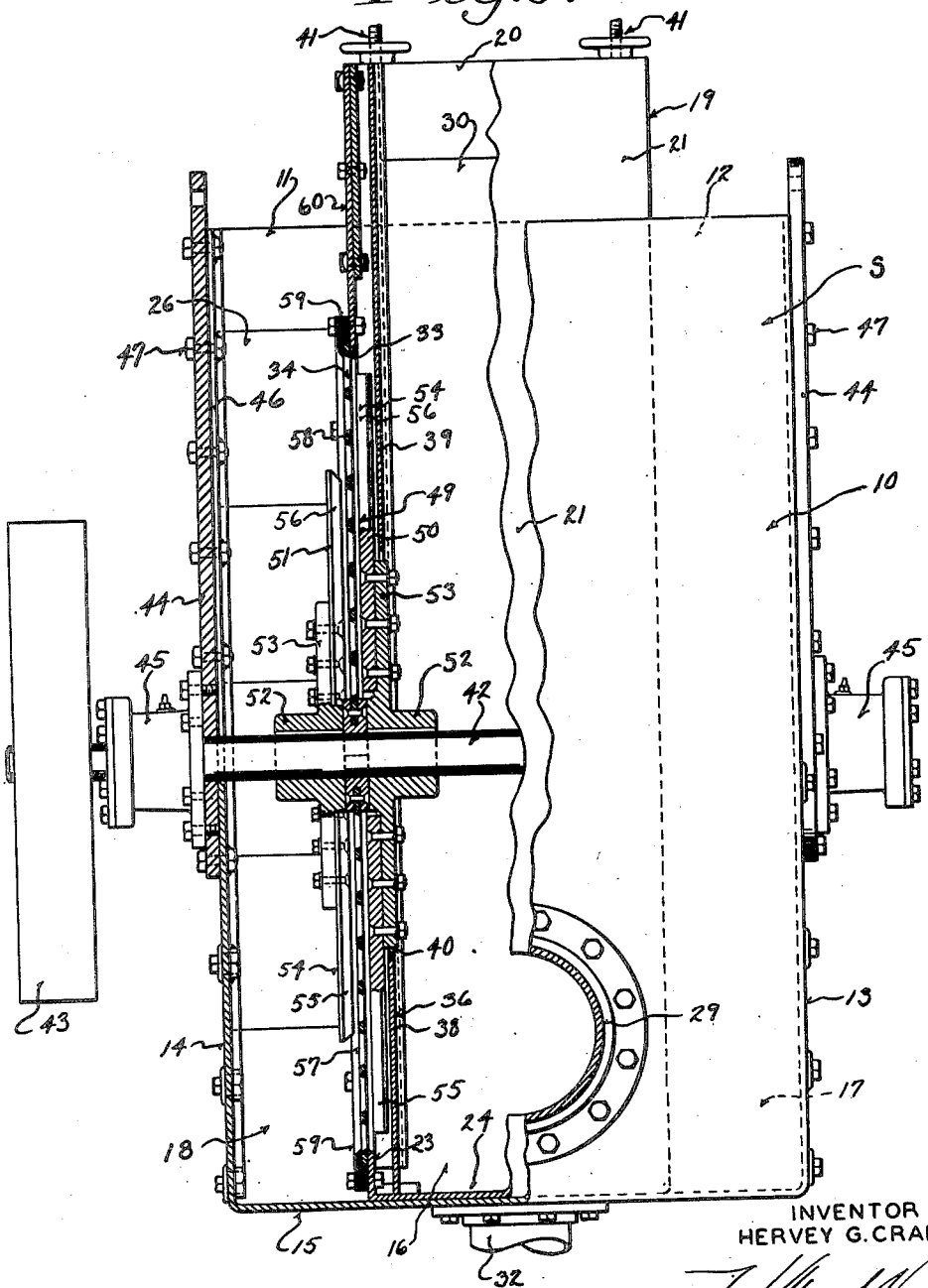
ATTORNEYS

Aug. 30, 1949. H. G. CRAM 2,480,119

DISK PULP SCREEN

Filed Feb. 25, 1946 4 Sheets-Sheet 3

Fig. 5.



INVENTOR
HERVEY G. CRAM

BY

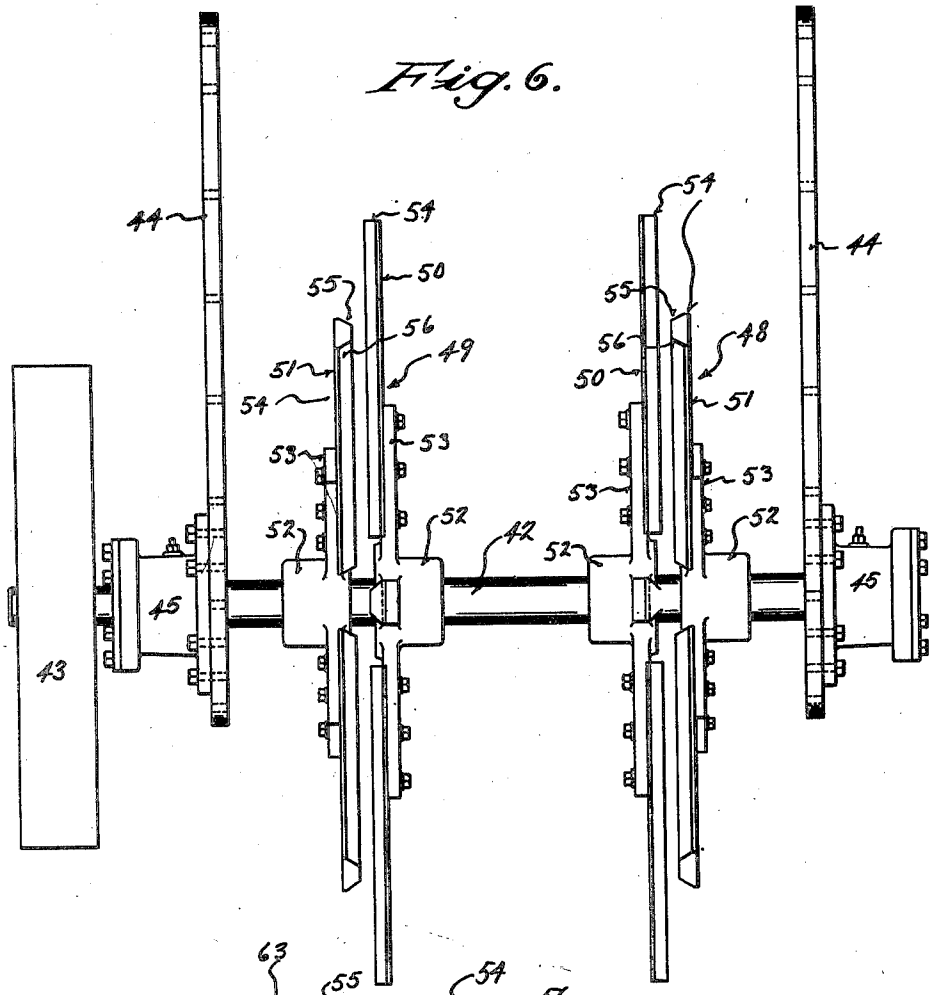
ATTORNEYS

Aug. 30, 1949. H. G. CRAM 2,480,119

DISK PULP SCREEN

Filed Feb. 25, 1946 4 Sheets-Sheet 4

Fig. 6.



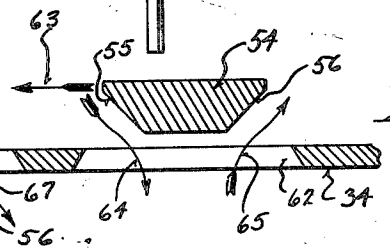
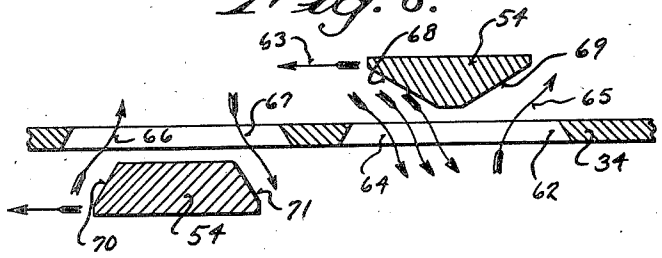


Fig. 7.

Fig. 8.



INVENTOR
HERVEY G. CRAM

BY Wright

ATTORNEYS

Patented Aug. 30, 1949 2,480,119

UNITED STATES PATENT OFFICE

2,480,119

DISK PULP SCREEN

Hervey G. Cram, Appleton, Wis.

Application February 25, 1946, Serial No. 649,925

4 Claims. (Cl. 92—30)

1

This invention appertains to the screening of pulp, paper stock, and the like, and more particularly to a novel machine of the type embodying stationary screen plates for the pulp or stock with mechanical means for directing the pulp or stock through the screen plates.

One of the primary objects of my invention is to provide a disc pulp screen in which a positive pulsation of the pulp through the screen plates is had, so as to effectively dislodge any foreign material, such as slivers, and the like, thereon, which, if allowed to collect on the plates, would retard the flow of acceptable pulp through the screen.

Another salient object of my invention is to utilize the means for obtaining the pulsation of the pulp through the screen plates for maintaining a uniform suspension of the solids in the pulp mixture, which is in proximity to the screen plates.

A further important object of my invention is to provide means for insuring a very rapid passage of unscreened pulp over the surface of the screen plates whereby to insure the maximum amount of flow of pulp through the screen plates; said rapid flow of pulp being equivalent to a relative increase in plate area.

A further important object of my invention is to provide a means for screening pulp which is adjustable, so as to duplicate the high capacity of the centrifugal type of screening and the superior quality of the acceptable pulp of the flat screen type.

A still further object of my invention is to provide a pulp screen which can be efficiently operated with a minimum of power consumption and at a comparatively low speed rate without vibration, whereby to effectively reduce wear and tear and maintenance cost.

A still further important object of my invention is to provide a pulp screen which is visibly open as to operation and for inspection and one which can be assembled or disassembled in a short space of time.

With these and other objects in view, the invention consists in the novel construction, arrangement and formation of parts, as will be hereinafter more specifically described, claimed and illustrated in the accompanying drawings, in which drawings:

Figure 1 is a side elevational view of my improved pulp screen, parts of the figure being

2

shown broken away to illustrate structural detail.

Figure 2 is a top plan view of the pulp screen with parts thereof broken away and in section.

Figure 3 is a vertical longitudinal sectional view through the screen taken substantially on the line 3—3 of Figure 2, looking in the direction of the arrows.

Figure 4 is a view similar to Figure 3 but taken on the line 4—4 of Figure 2, looking in the direction of the arrows.

Figure 5 is an enlarged end elevational view of the pulp screen with parts thereof in section, the part in section being taken substantially on the line 5—5 of Figure 2, looking in the direction of the arrows.

Figure 6 is a front elevational view of the removable unit employed for directing the pulp through the screen plates.

Figure 7, an enlarged fragmentary detail sectional view through the runner blades and a screen plate, the view also illustrating the direction of flow of the pulp through a screen plate, and

Figure 8 is a view similar to Figure 7, but showing one of the runner blades provided with a different angularity of blade edges to obtain a desired difference in the intensity of the pressure through the screen plates.

Referring to the drawings in detail, wherein similar reference characters designate corresponding parts throughout the several views, the letter S generally indicates my improved pulp screen, and the same includes a vat 10. This vat 10 can be constructed from any preferred materials, but as illustrated, the same is preferably formed from metal and this vat includes end walls 11 and 12, side walls 13 and 14 and a bottom wall 15. The vat is so constructed as to provide an inner chamber 16 for unscreened pulp and side chambers 17 and 18 for accepted or screened pulp. These chambers can be formed in the vat in any desired way, but I preferably place in the vat a hollow tank-like body 19. This body 19 also includes end walls 20 and 21, side walls 22 and 23, and a bottom wall 24. The body is placed directly in the vat with its bottom wall 24 resting on the bottom wall 15 of the vat, and with its end wall 21 in facial abutment with the end wall 12. The side walls 22 and 23 of the body are arranged in spaced parallel relation to the side walls 13 and 14 of the vat, and this forms the acceptable pulp compartments 17 and 18. The end walls 20 of the

body is arranged in spaced relation to the end wall 11 of the vat and weirs 25 and 26 extend across the chambers 17 and 18, and in effect form a continuation of the end wall 20 of the body. It is to be noted, however, that the top edges of the weirs 25 and 26 extend below the upper edges of the walls of the vat, and these weirs can be made adjustable as to height, if such should be desired. The weirs 25 and 26 and the end wall 20 of the body form, in connection with the vat, a common chamber 27 for acceptable pulp and a discharge pipe 28 communicates with the chamber 27 adjacent to the lower end thereof.

An inlet pipe 29 for unscreened pulp communicates with the chamber 16. The chamber 16, itself, is provided with a transversely extending overflow dam 30 and it is to be noted that this dam is of a considerable greater height than the weirs 25 and 26, and consequently a greater head of pulp will be in the chamber 16 than in the chambers 17 and 18. If desired, this dam 30 can be made adjustable and the dam in effect divides the chamber 16 into a main compartment for receiving unscreened pulp and a relatively small compartment 31 for rejected pulp and this chamber or compartment 31 has communicating with the lower end thereof, a pipe 32 for carrying rejected material from the rejection compartment.

The side walls 22 and 23 of the chamber 16 forwardly of the dam 30 are provided with pulp openings 33 of relatively great diameter and these openings are covered by the disc shaped screen plates 34 which will be hereinafter more fully described. At this point, however, it is to be noted that the disc screen plates 34 are held stationary in the vat and completely cover the openings 33.

Arranged within the chamber 16 in spaced parallel relation to the walls 22 and 23 thereof, but in close proximity thereto, are upright baffle plates 35 and 36. These baffle plates are slidably mounted in guideways 37 carried by the end walls 20 and 21 of the compartment 16. Each baffle plate consists of a lower section 38 and an upright section 39. The baffle plates are also provided with pulp openings 40 which are of a considerable less diameter than the openings 33. It is to be noted, however, that the openings 40 and the openings 33 are axially aligned and that the removable top section 39 of each baffle plate meets the lower section 38 at the horizontal diameter line of the openings 40. Thus, it can be seen that the unscreened pulp will initially flow through the openings 40 toward the screen plates 34.

The dam 30 is carried by the baffle plates 35 and 36 and the baffle plates in rear of the dam 30 carry adjustable dams 41 and rejected material, between the baffle plates 35 and 36 and the side walls 22 and 23 of the chamber, flows over these dams 41 and into the rejection compartment 31.

In conjunction with the screen plates 34, I utilize novel means for forcing acceptable pulp through the screen plates 34 from the unscreened pulp chamber 16 into the acceptable pulp chambers 17 and 18 and this means also provides for a pulsation of pulp through the screen plates to prevent the collection of slivers and the like thereon and to insure a uniform suspension of solids in the pulp at the intake of the slots or perforations in the screen plates. This mechanism includes a transversely extending drive shaft 42. The shaft can be driven in any preferred manner and I have shown one end thereof provided with a pulley wheel 43 whereby the shaft can be operated from a prime mover. It is to be also understood that the shaft is to be driven at different speeds, for a purpose, which will also later appear.

One of the important features of my invention is the provision of means whereby the operating parts of my screen can be quickly removed and consequently this shaft and its appurtenances is so mounted that the same can be instantly lifted from the vat. To bring this about, I provide like side bearing plates 44, and these bearing plates, adjacent to their lower ends, carry bearings 45 in which the shaft 42 is rotatably mounted. The side walls 13 and 14 of the vat are provided with vertical slots 46 which extend down to the axial centers of the openings 33 and 40, and these slots 46 are closed by the side bearing plates 44. If desired, a packing gasket can be utilized between the side bearing plates 44 and the side walls of the vat. Removable fastening elements 47 are provided for detachably connecting the side bearing plates to the vat.

Keyed or otherwise fastened to the shaft 42 are pairs 48 and 49 of pulp mixing and pulsating members and each pair of these members include inner and outer sets of pulp agitators 50 and 51. It is to be noted that the pulp agitators 50 are located in close proximity to the screen plates and between the side walls of the chamber 16 and the baffle plates 35 and 36. The outer pulp agitators 51 are located in the side acceptable pulp chambers 17 and 18 but in close proximity to the screen plates 34. Each of the inner and outer pulp agitators 50 and 51 include a hub 52 having radially extending spider arms 53 to which are bolted the runner blades 54. The spider arms 53 of the inner agitator 50 can be located within the openings 40 and the runner blades 54 of this agitator are arranged between the baffle plates and the screen plates.

Great importance is laid on the cross-sectional configuration of the runner blades 54 and it is to be noted that (see Figure 7) the runner blades are provided with beveled leading edges 55 and beveled following edges 56. The function of these edges will also be later described. By referring to Figure 6, it can be seen that the shaft and the pulp agitators with the side bearing plates 44 form a complete removable unit.

To aid in the removal of this unit, each screen plate 34 includes a lower half section 57 and an upper half section 58. These sections are confined in place by sectional retaining rings 59 and these rings are detachably bolted to the side walls of the chamber 16.

When it is desired to disassemble the screen, it is merely necessary to remove the bolts 47 for the bearing plates 44 and to remove the upper half sections of the rings 59. The upper half sections 58 of the screens can then be pulled out. All that now remains is to remove the upper sections 39 of the baffle plates 35 and 36 and to remove the closing plates 60 for slots 61 formed in the upper ends of the side walls 22 and 23 of the compartment 16. The entire unit can now be pulled out by merely lifting up on the bearing plates 44. The closing plates 60 can be held in place for closing the slot 61 in any preferred way. When it is desired to remove the lower half sections 57 of the screen plates, it is merely necessary to turn the sections in the remaining half sections of the retaining rings 59 and when these lower half sections of the screen plates ride out of the rings these lower sections can be pulled out. Obviously, the screen plates 34 can be provided with any preferred type of slots 62 or open-

ings, and the nature of these slots will vary according to the character of the pulp or stock being screened.

In operation of my screen, the unscreened pulp is delivered through pipe 29 to the chamber 16 and this pulp flows through the axial openings or orifices 40 in the baffle plates 35 and 36 to contact with the screen plates 34 and the inner runner blades 54 in the vicinity of the axis of the screen plates.

The function of the inner runner blades 54 is to rotate the pulp rapidly across the screen plates, both circumferentially and radially, with the acceptable pulp being passed through the plates to the compartments or chambers 17 and 18 and thence over the weirs 25 and 26 to the common discharge chamber 27. This accepted pulp then flows through the pipe 28.

Rejected material is ejected radially along the inner runner blades 54 to compartment 31 over the adjustable dams 41. The function of the adjustable dams is important, in that the head maintained in the rejection compartment 31 determines the speed of radial movement across the screen plates, and therefore, the cleanliness of the rejected material and the quality of the accepted pulp.

Movement of the inner runner blades 54 (see Figure 7) in the direction of the arrow 63 provides a forcing action at the lead edge 55 of the blade in the direction of the arrow 64, with a somewhat reverse action at the following edge 56 as indicated by the arrow 65.

The outer runner blade 54 of the pulp agitator 51 located on the opposite side of the screen plate 35 and submerged in the accepted pulp, and traveling in the same direction as the inner runner blade, provides a reverse flow of screen pulp back through the plate, as indicated by the arrows 66 and 67, to stir up the pulp so as to insure a uniform suspension of solids at the intake of the openings in the screen plates.

It is apparent that by varying the angle 55 of the lead edge of the inner runner blades 54, the intensity of the pressure differential across the screen plates will be effected, also, that this angle may be at variance in the opposing blades to effect a proper balance of flow for most efficient screening. In Figure 8, I have shown an inner runner blade 54 provided with leading and following edges 68 and 69 of a relatively great angle, and at a greater angle than the leading and following edges 70 and 71 of the runner blades located in the accepted pulp.

In this connection, it is well to note that with identical runner blades operating on each side of a screen plate, that the flow through the screen plate will be relative to the differential in head between the unscreened chamber 16 and the screened pulp chambers 17 and 18, and, a change in this relation may be effected by changing the angle of the blades as brought out above.

Obviously, the speed of rotation of the blades, as well as the angle of the blades, will effect the flow of pulp across the screen plates.

While in the drawings I have shown one set of screen plates on each side, it is to be understood that any number of sets of screen plates can be used along the length of the vat.

From the foregoing, it can be seen that I have provided a screen which can be placed at any preferred point in a plant, and that due to the fact the vat is open, an operator can view at all times the operation of the machine and the pulp being screened. Likewise, as the device is open at its top, supplementary dilution may be had at any required point along the vat or compartments therein through pipes (not shown) as may be indicated by observation and experience of the operator.

Changes in details may be made without departing from the spirit or the scope of my invention, but what I claim as new is:

1. In a device for screening paper pulp stock, a vat having a chamber for unscreened pulp and a chamber for accepted pulp, a screen plate between said chambers, means for maintaining a differential in head of pulp in said chambers, a rotatable driven shaft, inner and outer sets of runner blades carried by and rotatable with said shaft located on the unscreened pulp side of the plate and on the accepted pulp side of the plate setting up a reverse flow of pulp through the screen plate from the opposite sides thereof, said runner blades of each set having inclined leading and following edges, the angle of the runner blades of the inner set being greater than the angle of the runner blades of the other set.

2. In a device for screening paper pulp stock, a vat having a chamber for unscreened pulp, a chamber for accepted pulp, and a chamber for rejected pulp, a dam between the unscreened pulp chamber and the rejected pulp chamber, a screen plate between the unscreened pulp chamber and the accepted pulp chamber, a baffle plate extending through the unscreened pulp chamber and the rejected pulp chamber, an adjustable dam carried by the baffle plate for controlling the flow of rejected pulp between the baffle plate and the screen plate into the rejected pulp chamber, a rotatable driven shaft extending through the vat and chambers, a set of runner blades rotatable with said shaft and movable past the inner face of the screen plate and located between the screen plate and the baffle plate, said runner blades having inclined leading and following edges and said baffle plate having an axial orifice leading toward the screen plate, and a similar set of runner blades rotatable with said shaft located on the outer side of said screen plate having oppositely inclined leading and following edges.

3. In a device for screening paper pulp stock, a vat having a centrally disposed unscreened pulp chamber and side accepted pulp chambers, the sides of the vat having vertical slots, bearing plates closing said slots and freely removable from the vat, a drive shaft extending through the vat rotatably carried by the bearing plates, the side walls of the unscreened pulp chamber being provided with large axially aligned openings and slots communicating with the openings and leading out the top of said compartment, removable plates closing said slots, disc shaped screen plates for the openings, said screen plates being made in companion half sections, means releasably securing the screen plates in position, and inner and outer sets of runner blades carried by the shaft for movement past the opposite faces of the screen plates.

4. In a device for screening paper pulp stock, a vat having a centrally disposed unscreened pulp chamber and side accepted pulp chambers, the sides of the vat having vertical slots, bearing plates closing said slots and freely removable from the vat, a drive shaft extending through the vat rotatably carried by the bearing plates, the side walls of the unscreened pulp chamber being provided with large axially aligned openings and slots communicating with the openings and leading out the top of said compartment, removable

plates closing said slots, disc shaped screen plates for the openings, said screen plates being made in companion half sections, means releasably securing the screen plates in position, inner and outer sets of runner blades carried by the shaft for movement past the opposite faces of the screen plates, and baffle plates arranged in the unscreened pulp chamber in close proximity to said openings having removable upper sections, said baffle plates having axial inlet orifices of relatively small diameter.

HERVEY G. CRAM.

REFERENCES CITED

The following references are of record in the file of this patent:

Number	Name	Date
501,214	Reinicke	July 11, 1893
1,421,664	Brown et al.	July 4, 1922
1,670,473	Milne	May 22, 1928
1,722,874	Wells	July 30, 1929
1,864,818	Haug	June 28, 1932
2,033,123	Cowles	Mar. 10, 1936

FOREIGN PATENTS

Number	Country	Date
127,217	Austria	Mar. 10, 1932
464,660	France	Jan. 19, 1914
383,859	Germany	Oct. 20, 1923