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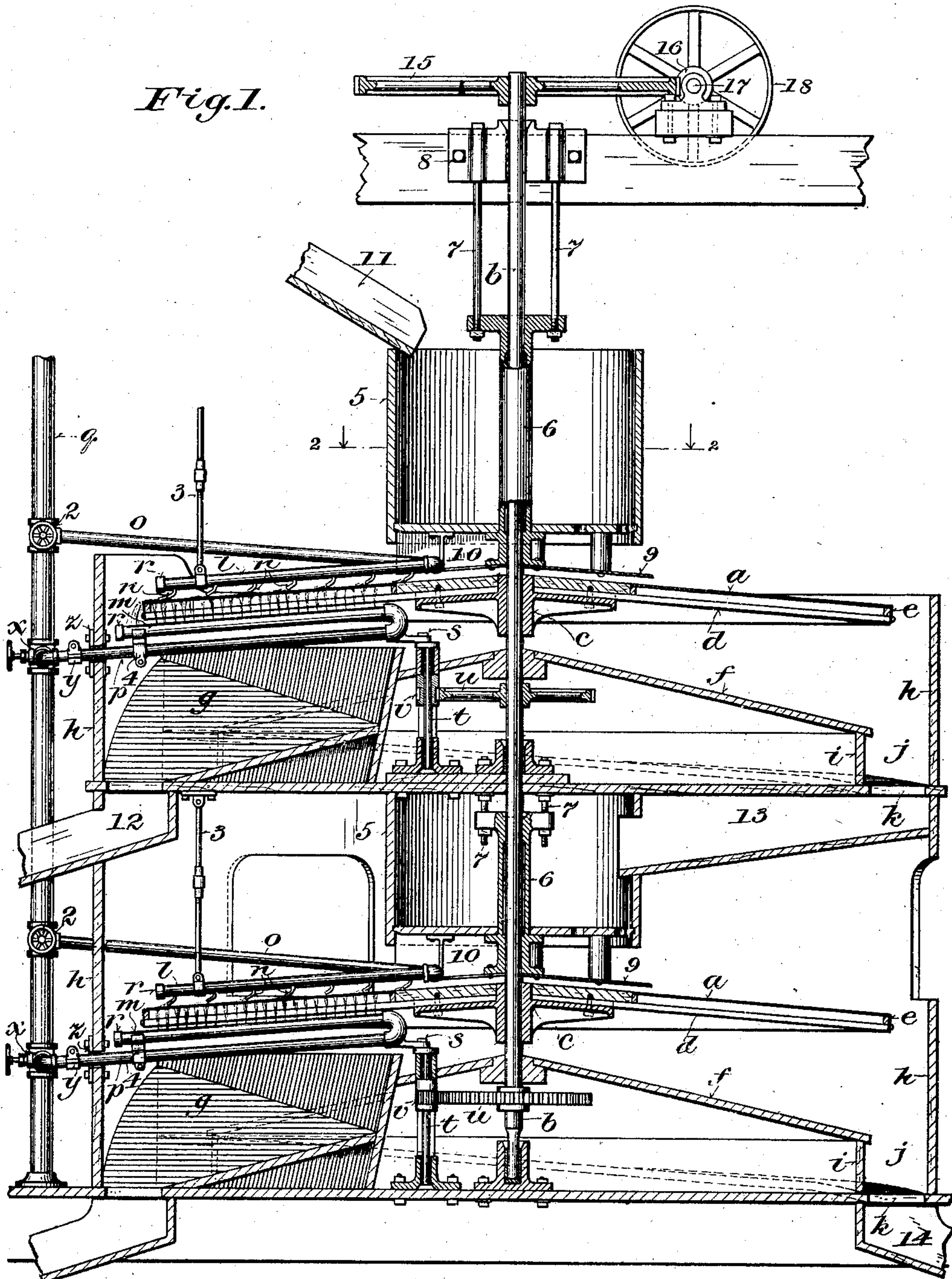
PATENTED JULY 9, 1907.

W. A. KIDNEY.
SCREENING MACHINE.

APPLICATION FILED MAY 10, 1906.

4 SHEETS—SHEET 1.

Fig. 1.



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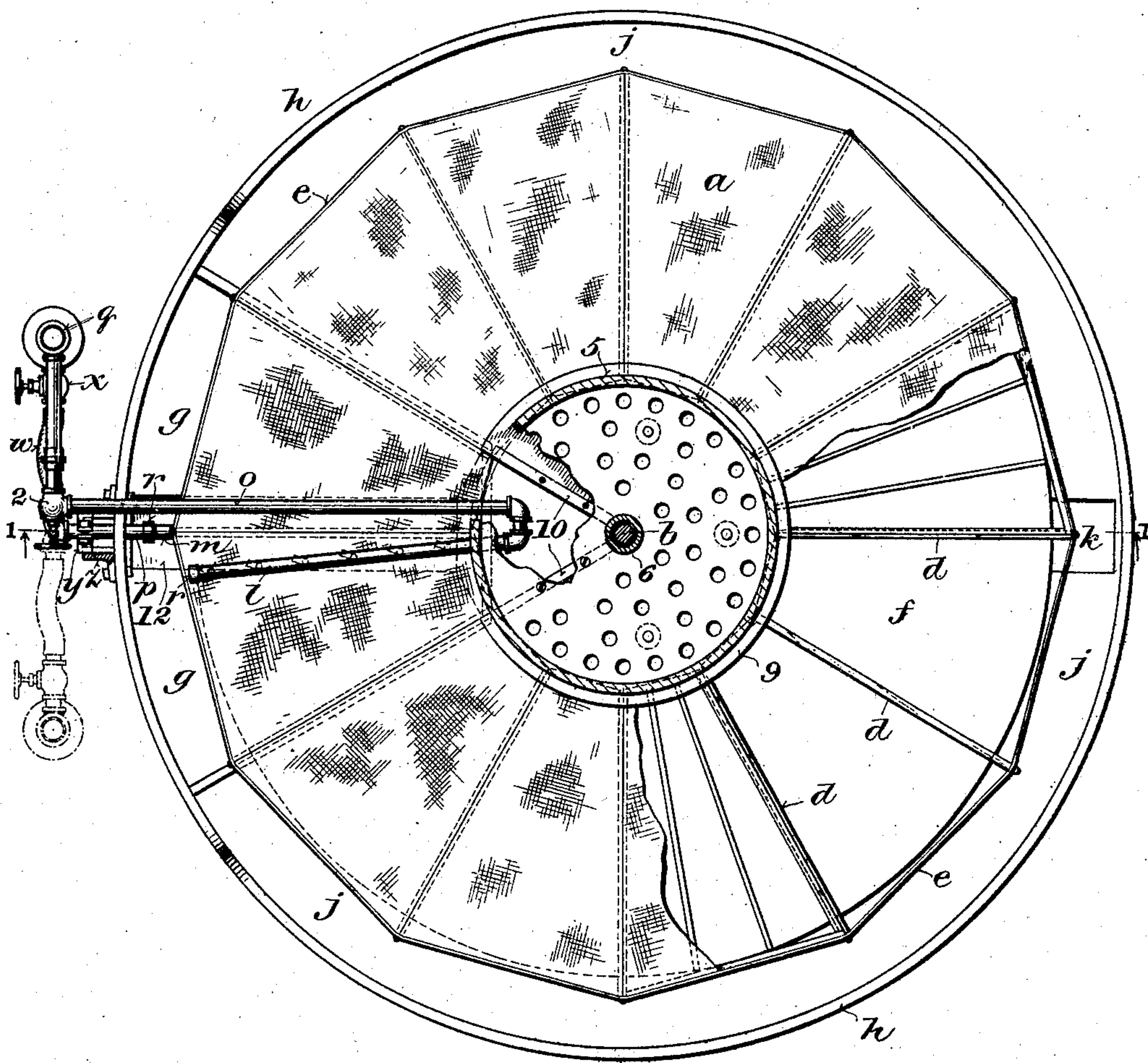
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4 SHEETS—SHEET 2.

Fig. 2.



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4 SHEETS—SHEET 4.

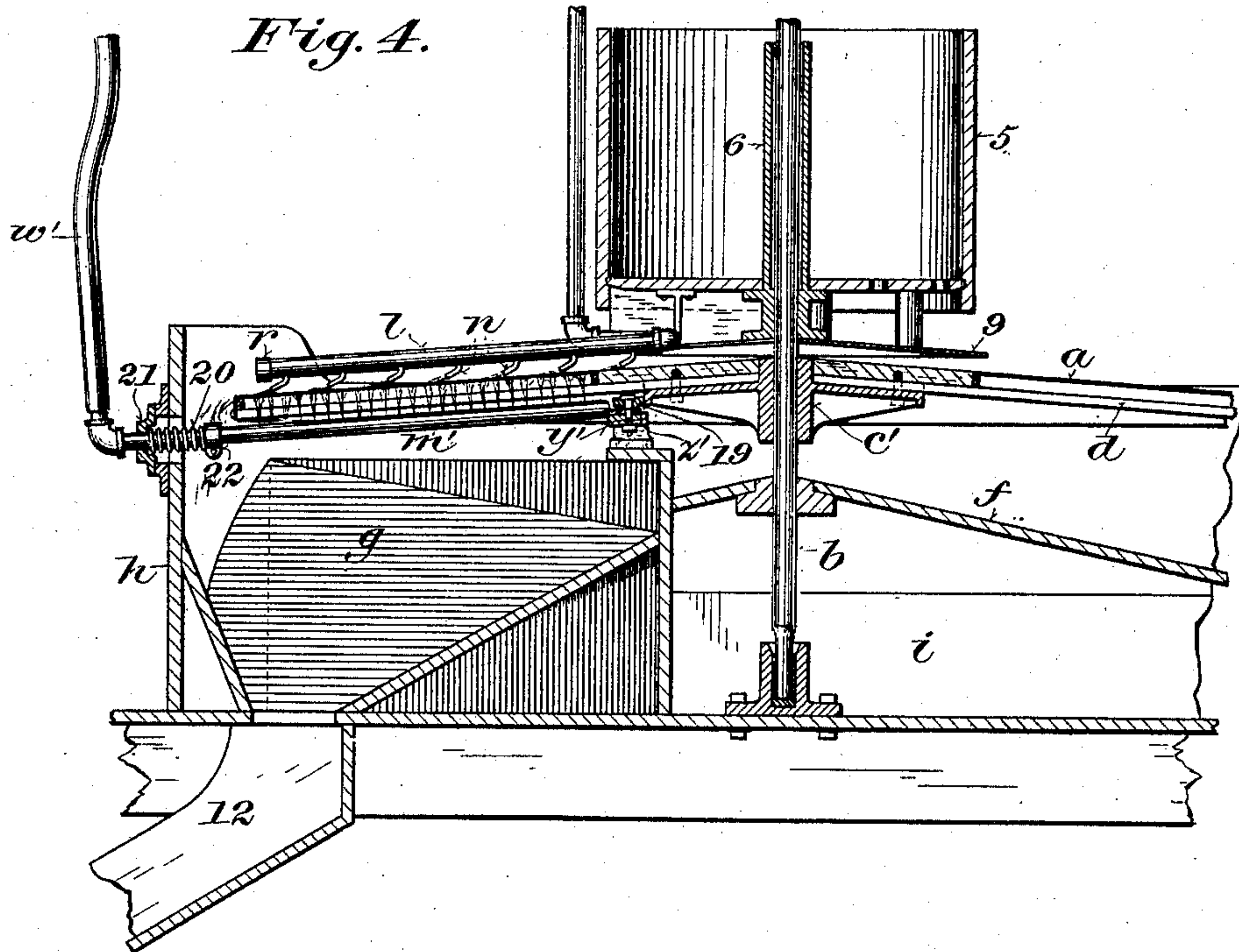
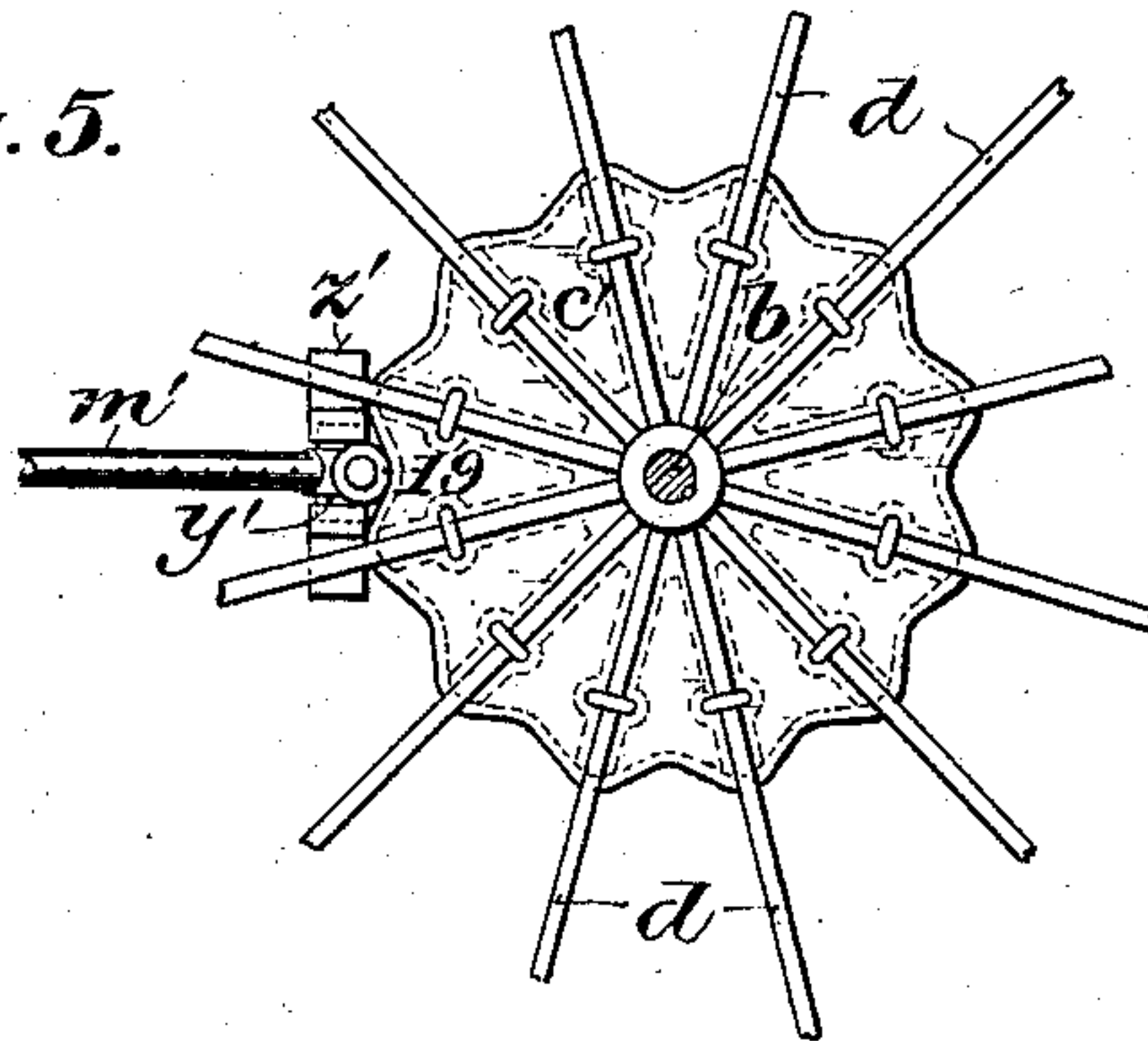


Fig. 5.



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UNITED STATES PATENT OFFICE.

WILLIAM A. KIDNEY, OF BUTTE, MONTANA.

SCREENING-MACHINE.

No. 859,669.

Specification of Letters Patent.

Patented July 9, 1907.

Application filed May 10, 1906. Serial No. 316,076.

To all whom it may concern:

Be it known that I, WILLIAM A. KIDNEY, a citizen of the United States, residing at Butte, in the county of Silverbow and State of Montana, have invented certain new and useful Improvements in Screening-Machines, of which the following is a specification, reference being had to the accompanying drawing, forming a part thereof.

The main objects of this invention are to wash or clean ore, to classify ore according to size, to separate paper pulp after washing from water, to separate foreign matter from various substances or to grade or classify such substances according to size, and generally to improve the construction and operation of machines designed for this class of work.

It consists in certain novel features of construction and in the peculiar arrangement and combinations of parts as hereinafter particularly described and pointed out in the claims.

In the accompanying drawing like characters designate the same parts in the several figures.

Figure 1 is a vertical section on the line 1 1, Fig. 2, of a two-screen machine embodying the invention; Fig. 2 is a plan view and horizontal section on the line 2 2, Fig. 1; Fig. 3 is a plan view of that portion of the machine below the upper screen; Fig. 4 is a vertical medial section of a one-screen machine, showing modifications of certain parts; and Fig. 5 is a plan view of the central portion of the screen frame and of the mechanism for imparting a reciprocating movement to the lower jet pipe according to Fig. 4.

For various kinds of work and for operation on different kinds of material, the machine may be provided with a single screen or with a number of screens, arranged one above another.

Referring to Figs. 1 to 3 inclusive, showing a machine having two screens, *a* designates the screens which are of pyramidal or of approximately conical form. They are mounted one above the other upon a vertical shaft *b*, and are preferably constructed in approximately sector shaped sections, as shown in Fig. 2, the individual sections having separate frames, which are fitted together and carried by a main frame of polygonal or circular form, consisting of a central hub *c*, radial arms *d*, and a rim *e* attached to and connecting the outer ends of the arms. The arms *d* are fitted and secured by staple bolts in radial grooves in the flange of the hub *c*. The space between the inner ends of the screen sections, which are preferably truncated, and the hub, has an imperforate filling of wood or other suitable material, flush with the upper surface of the screen. Below each screen a conical roof or table *f* is provided to catch the material falling through the screen. This table, which is stationary and preferably of somewhat steeper pitch than the screen, may be conveniently constructed of

wood. A sector shaped hopper *g*, is formed in one side of each table and extends above it, forming a cut-off for the screenings and a discharge for the tailings or coarse material passing over the periphery of the screen. Each of the several screens with the table below it, is surrounded by a casing *h*, which is preferably of cylindrical form and may be conveniently constructed of wooden staves bound together by metal hoops or bands, as usual in structures of this kind.

The casing *h* with the vertical cylindrical wall *i* carrying each table *f*, forms a channel or launder *j* around and below the periphery of the table from opposite sides of the cut-off hopper *g* to a discharge opening *k*, the bottom of this channel being inclined downwardly from said hopper to the discharge opening. Adjacent to the upper and lower sides of each screen over the cut-off hopper *g*, radial jet pipes *l* and *m* are arranged. The upper pipe *l* is provided with downwardly and outwardly directed nozzles *n*, which are also preferably set obliquely to a vertical plane passing through the axis of the pipe, as shown in Fig. 2. The lower pipe *m* is formed in its upper side with a series of small orifices, as shown in Fig. 3, arranged to direct jets of fluid against the under side of the screen. These jet pipes are preferably connected at their inner ends by radial pipes *o* and *p* with a fluid supply or standpipe *q*, located outside of the machine. This admits of providing the outer ends of the jet pipes with removable caps or closures *r*, for the purpose of blowing out any sediment or foreign matter which may accumulate therein, into the hopper *g*.

An endwise reciprocating movement may be imparted to either or both of the jet pipes. In the present case means are shown for imparting such a movement to the lower pipe *m*, such means consisting of a crank *s* connected with the inner end of said pipe and mounted on a vertical shaft *t*, which is driven from the screen shaft *b* by a gear *u* and pinion *v*. The outer end of the pipe *p*, which passes through an opening in the casing *h*, is connected by a piece of hose or flexible pipe *w*, with the standpipe *q* through a valve *x*. A winged collar *y* secured on the outer end of the pipe *p* and engaging grooves in a guide *z* attached to the casing *h*, prevents the pipe from turning and relieves the crank *s* of twisting strain. Each pipe *o* is connected at its outer end through an angle valve *2* with the supply pipe *q*. The outer end of each of the upper jet pipes *l* is suspended by an adjustable hanger *3* from an overhead support. The outer ends of the lower pipes *m* are supported by yokes *4* secured on the pipes *p* below them.

A feed tub *5*, having a perforated bottom, is carried above each screen by a sleeve *6* surrounding the shaft *b* and adjustably suspended by bolts or rods *7* from an overhead support. In the present instance the upper tub *5* is suspended from the box *8* at the upper end of

the shaft *b*, and the lower tub is suspended by shorter bolts from the floor or horizontal partition below the upper table *f*. Below each tub 5 a conical spreader 9 is attached to and carried by the sleeve 6. Between
 5 the spreader 9 and the bottom of the tub 5, radiating partitions 10 are secured and form a sector shaped cut-off corresponding in position and extent with the hopper *g* below. Above this cut-off the bottom of the tub 5 is imperforate, and below it the spreader is cut away
 10 to afford room for the inner end of the jet pipe *l* and its supply connection, which are supported, as shown in Fig. 1, by a hook or hanger from the bottom of the tub 5.

The material to be treated in the machine may be conducted into the upper feed tub 5 by a spout or
 15 launder 11. The lower part of each hopper *g* opens into a discharge spout 12, the discharge opening *k* of the upper channel *j* is connected by a spout 13 with the feed tub 5 of the lower screen, and the discharge opening *k* of the lower channel *j* communicates with a
 20 discharge spout 14. The screen shaft *b* may be turned by means of any suitable driving connection, such as that shown in Fig. 1, comprising a worm gear 15, fixed on the upper end of said shaft and meshing with a worm 16 on a horizontal shaft 17, which is provided
 25 with a driving pulley 18.

Referring to Figs. 4 and 5, showing a one-screen machine of a slightly modified form, the jet pipe *m'* below the screen extends at its outer end through the casing and is connected directly by a hose or flexible
 30 pipe *w'* with the source of fluid supply, water, air or steam as the case may be. At its inner end said pipe *m'* is provided with a roller 19, which is held by a spring 20 against the scalloped periphery of the flange on the screen hub *c'*. At its outer end the pipe *m'* has
 35 a sliding bearing and is guided in a casting 21 attached to the casing *h*, and the spring 20 bears at one end against this casting and at the other end against a collar 22, adjustably fastened on said pipe. At its inner end said pipe is supported and held against turning by
 40 a winged plate or collar *y'* attached thereto and engaging grooves in a guide *z'*. The scalloped flange of the hub *c'* operates in the present case in connection with the spring 20 to impart a reciprocating movement to the pipe *m'*. In other respects this single screen ma-
 45 chine is essentially like a single section or story of the two-screen machine shown in the preceding figures.

For washing or cleaning ore and other material, for separating water from paper pulp and for classifying or grading ore or other material requiring but one separation or classification, a machine having a single
 50 screen is sufficient, but for grading or classifying ore or other material requiring more than one separation or classification, and for washing or cleaning and classifying or grading ore or other material by the same or a
 55 continuous operation, a machine having two or more screens is required. For example, to wash or clean ore and to classify or grade it according to size, a machine having two screens as shown in Figs. 1 to 3 inclusive, operates as follows: Water under sufficient
 60 head or pressure being supplied from the standpipe *q* to the jet pipes *l* and *m*, the ore to be treated is supplied with water to the upper feed tub 5. Flowing through the holes in the bottom of said tub, the ore with refuse and foreign matter carried with it, is distributed by
 65 the spreader 9 upon the inner ends of the sections of

the upper screen *a*, which is of coarser mesh than the lower screen. The ore tending to spread towards the periphery of the screen, falls through its meshes upon the conical table *f* below, from the periphery of which it is discharged into the channel *j*. The refuse de-
 70 livered upon the upper screen, such as bits of steel broken from mining tools, bolts, nails, pieces of wood, candle grease, cotton waste, etc., too large to pass through the meshes of the screen, is carried thereon
 75 over the hopper *g*, where it is subjected to the action of the jets of water directed against the upper and lower sides of the screen from the pipes *l* and *m*. The jets from the lower pipe *m* tend to lift the refuse material from the screen, while the jets from the upper pipe *l* force it outwardly over the periphery of the screen
 80 into the hopper *g*, from which it is discharged and conducted away by the spout 12. The ore discharged from the upper channel *j* through the opening *k* is conducted by the spout 13 into the lower tub 5, from which it is delivered to the spreader 9 below, and thence
 85 distributed to the lower screen *a*. The particles of ore which are small enough to pass through the meshes of this screen fall upon the lower table *f* and are discharged therefrom into the channel *j* around it and thence through the opening *k* into the spout 14. The
 90 coarser particles of ore too large to pass through the screen, are carried around upon it over the cut-off hopper *g*, where they are subjected to the action of the water jets issuing from the pipes *l* and *m*, and are thereby washed into said hopper, from which they are dis-
 95 charged into the lower spout 12. The reciprocating movement of the lower jet pipes *m* causes the jets issuing therefrom to traverse the entire area of the screens and to more effectively cooperate with the jets issuing from the upper pipes *l* in loosening and removing the
 100 refuse or coarser material from the screens into the hoppers *g*. It will thus be seen that with a two-screen machine the ore may be cleaned and separated into two grades or classes according to size.

With a machine having three screens the ore can be
 105 separated into three grades or classes in addition to the preliminary removal of refuse therefrom. It will be apparent that the ore may be washed or cleaned in one machine having a single screen and then classified or graded in another machine having one or more
 110 screens, according to the number of separations or classifications to be made.

For certain kinds of work and the treatment of certain kinds of material, the jet pipes may be supplied with air, steam or other fluids or they may be supplied
 115 with different kinds of fluid. For example, water may be supplied to the upper pipes *l*, while steam or air is supplied to the lower pipes *m*. For this purpose an additional supply or standpipe may be provided, as indicated by dotted lines in Fig. 2.
 120

For separating the water from paper pulp, the jet pipes are supplied with compressed air or steam. The pulp mixed with the water is delivered into the feed tub 5 in a fluid condition and flows therefrom over the spreader 9 to the screen. The screen being of suffi-
 125 ciently fine mesh, retains the pulp thereon while the water drains therefrom, and falling upon the table *f*, flows therefrom into the channel *j*, from which it is discharged through the opening *k*. The pulp fiber retained upon the screen is carried thereby over the
 130

hopper *g*, where it is subjected to the action of the air or steam jets from the pipes *l* and *m*, and is thus forced off from the screen into said hopper, from which it is conducted off through the discharge spout 12.

5 Various modifications in the details of construction and arrangement of parts of the apparatus may be made within the principle and intended scope of the invention.

I claim:

10 1. In a screening machine the combination of a rotary conical screen having a vertical axis, a conical table located below the screen and having a cut-off on one side, and a jet pipe arranged to deliver a fluid against the screen adjacent to said cut-off, substantially as described.

15 2. In a screening machine the combination of a rotary conical screen having a vertical axis, a conical table located below the screen and having a cut-off on one side, a jet pipe arranged to deliver a fluid against the screen adjacent to the cut-off, and a channel running around said table below its periphery from opposite sides of said cut-off, substantially as described.

20 3. In a screening machine the combination of a rotary screen having a vertical axis, a conical table arranged below said screen and having a hopper extending above it and forming a cut-off on one side, and a jet pipe arranged to direct a fluid against the screen over said hopper, substantially as described.

25 4. In a screening machine the combination of a rotary screen having a vertical axis, a conical table located below the screen and having a cut-off hopper in one side, a radial jet pipe adjacent to the screen over the hopper, and means for imparting a reciprocating movement to said pipe, substantially as described.

30 5. In a screening machine the combination of a rotary screen having a vertical axis, a table located below said screen having a cut-off hopper in one side, and jet pipes arranged radially above and below the screen over said hopper, substantially as described.

35 6. In a screening machine the combination of a rotary screen having a vertical axis, a table located below said screen and having a cut-off hopper in one side, jet pipes arranged radially above and below the screen over said hopper, and means for imparting a reciprocating movement to one of said pipes, substantially as described.

40 7. In a screening machine the combination of a rotary screen having a vertical axis, a table located below said screen and having a cut-off hopper in one side, and a jet pipe arranged radially above the screen over said hopper and having nozzles directed downwardly and outwardly towards the periphery of the screen, substantially as described.

45 8. In a screening machine the combination of a rotary conical screen, a conical table located below the screen and having a cut-off hopper in one side, and jet pipes arranged radially above and below the screen over said hopper, the upper pipe having downwardly and outwardly directed nozzles and the lower pipe having upwardly directed orifices, substantially as described.

50 9. In a screening machine the combination of a rotary conical screen having a vertical axis, a conical table located below said screen and having a cut-off hopper in one side, jet pipes arranged radially above and below the screen adjacent to the hopper, the upper pipe having downwardly and outwardly directed nozzles and the lower pipe having upwardly directed orifices, and means for imparting a reciprocating movement to one of said pipes, substantially as described.

55 10. In a screening machine the combination of a rotary conical screen, a conical table located below said screen and having a cut-off hopper in one side, a jet pipe adjacent to the screen over said hopper, and a channel running from opposite sides of said hopper around said table below its periphery to a discharge opening, substantially as described.

60 11. In a screening machine the combination of a rotary conical screen, a conical table arranged coaxially below said screen and having a sector-shaped cut-off hopper in one side, and a radially arranged jet pipe adjacent to the screen over said hopper, substantially as described.

12. In a screening machine the combination of a rotary 80 conical screen having a vertical axis, a conical table located coaxially below said screen and having a sector-shaped cut-off hopper in one side extending outwardly beyond the periphery of the screen, and a channel running around the table below its periphery from opposite sides 85 of said hopper to a discharge opening towards which it descends, substantially as described.

13. In a screening machine the combination of a rotary conical screen having a vertical axis, a conical table arranged coaxially below said screen and having a cut-off 90 hopper in one side, a jet pipe arranged to discharge a fluid against the screen over said hopper, a feed tub arranged centrally over said screen, and a cut-off between said tub and screen on the side next to the hopper, the bottom of said tub being perforated outside of the cut-off, 95 substantially as described.

14. In a screening machine the combination of a rotary conical screen, a conical table located below the screen and having a cut-off hopper in one side, a jet pipe adjacent 100 to the screen over said hopper, a feed tub located centrally above the screen, a cut-off between said tub and screen on the side next to said hopper, the bottom of the tub being perforated outside of the cut-off, and a conical spreader between said tub and screen, substantially as described. 105

15. In a screening machine the combination of a rotary conical screen, a conical table located below the screen and having a cut-off hopper in one side, a jet pipe adjacent 110 to the screen over said hopper, and a feed tub and conical spreader centrally and adjustably suspended one above the other over said screen, substantially as described.

16. In a screening machine the combination of a rotary conical screen, a conical table located below said screen and having a cut-off hopper in one side, a jet pipe adjacent 115 to the screen over said hopper, and a feed tub and conical spreader centrally suspended one above the other over the screen by a sleeve surrounding the screen shaft, substantially as described.

17. In a screening machine the combination of a rotary conical screen, a conical table located below said screen 120 and having a sector-shaped cut-off hopper in one side, a feed tub having a perforated bottom and a conical spreader arranged one above the other centrally over said screen, and a sector-shaped cut-off between the tub and screen corresponding in position with said hopper, the bottom of 125 the tub being imperforate over said cut-off, substantially as described.

18. In a screening machine the combination of a rotary conical screen mounted on a vertical shaft and inclining 130 downwardly from the center towards its periphery, a sleeve suspended from an overhead support and surrounding said shaft, and a feed tub having a perforated bottom and a conical spreader centrally supported by said sleeve one above the other with a space between them over the 135 central portion of the screen, substantially as described.

19. In a screening machine the combination of a rotary conical screen having a vertical shaft and inclining downwardly from the center towards its periphery, a vertically 140 adjustable sleeve surrounding said shaft and suspended from an overhead support, and a feed tub having a perforated bottom and a conical spreader carried by said sleeve one above the other with a space between them over the central portion of the screen, substantially as described.

20. In a screening machine the combination of a rotary 145 screen mounted on a vertical shaft, a conical table located below said screen and having a cut-off hopper in one side, a sleeve surrounding said shaft above the screen, a feed tub carried by said sleeve and having a perforated bottom, a conical spreader attached to said sleeve below said tub, 150 and a cut-off between said tub and screen on the side next to said hopper, the bottom of said tub being imperforate over said cut-off and the spreader being cut away below it, substantially as described.

21. In a screening machine the combination of a num- 155 ber of rotary conical screens arranged coaxially one above another, a conical table located below each screen and having a cut-off hopper in one side, a jet pipe adjacent to each screen over the hopper next below it, a feed tub arranged 165 centrally over each screen, a channel leading around each

table below its periphery from opposite sides of the associated hopper to a discharge opening, and a spout leading from the discharge of each upper table into a feed tub below, substantially as described.

- 5 22. In a screening machine the combination of a number of rotary screens arranged one above another, a conical table located below each screen and having a cut-off hopper in one side, a fluid supply pipe, a reciprocating jet pipe arranged adjacent to each screen over the hopper next
10 below it and having a flexible connection with said supply pipe, a channel leading around each table below its periphery from opposite sides of its cut-off hopper to a discharge opening, a spout leading from the discharge of each upper table towards the center of a screen below, and means for
15 feeding the material to be treated to the upper screen, substantially as described.

23. In a screening machine the combination of a number of rotary screens arranged one above another, a conical table located below each screen and having a cut-off
20 hopper in one side, a fluid supply pipe, jet pipes arranged one above and another below each screen over the associated hopper and having valve controlled connections with said supply pipe, means for feeding the material to be treated to the upper screen, a channel leading around
25 each table below its periphery from opposite sides of the associated hopper, and a spout leading from each upper channel towards the central part of a screen below, substantially as described.

24. In a screening machine the combination of a rotary
30 conical screen, a conical table located below said screen and having a cut-off hopper in one side, a channel leading around the table below its periphery from opposite sides of its hopper to a discharge opening, and a jet pipe arranged radially over said hopper adjacent to the screen
35 and connected at its inner end by a radial pipe with a source of fluid supply outside of the machine, substantially as described.

25. In a screening machine the combination of a rotary
40 conical screen turning on a vertical axis, a conical table located below said screen and having a cut-off hopper in one side, radial jet pipes arranged one above and the other below the screen over said hopper, and pipes leading from an outside source of fluid supply to the inner ends of the jet pipes, substantially as described.

26. In a screening machine the combination of a rotary
45 conical screen having a vertical axis, a conical table located below said screen and having a cut-off hopper in one side, radially disposed jet pipes one above and the other below the screen over said hopper, a fluid supply pipe at one side of the screen, and pipes having valve controlled
50 connections at their outer ends with said supply pipe and leading therefrom to the inner ends of the jet pipes, substantially as described.

27. In a screening machine the combination of a rotary
55 conical screen, a conical table located below said screen and having a cut-off hopper in one side, radial jet pipes arranged one above and the other below the screen over said hopper, means for imparting a reciprocating movement to one of said pipes, a fluid supply pipe located at one side of the machine, and pipes leading from said supply
60 pipe to the inner ends of the jet pipes and provided with valves, the pipe leading to the reciprocating jet pipe having a flexible connection with the supply pipe, substantially as described.

28. In a screening machine the combination of a conical
65 screen, a conical table located below said screen and having a cut-off hopper in one side, a radial jet pipe arranged adjacent to the screen over said hopper and having a removable closure at its outer end, a fluid supply located outside of the machine, and a pipe connecting said supply
70 with the inner end of the jet pipe, substantially as described.

29. In a screening machine the combination of a rotary
75 conical screen, a conical table located below said screen and having a cut-off hopper in one side, a radial jet pipe arranged adjacent to the screen over said hopper and having a removable closure at its outer end, means for imparting an endwise reciprocating movement to said pipe, a fluid supply located outside of the machine, and a pipe
80 having a flexible connection at its outer end with said supply and connecting it with the inner end of the jet pipe, substantially as described.

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

WILLIAM A. KIDNEY.

Witnesses:

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