O. M. GRUENDER.

CENTRIFUGAL SCREEN.

APPLICATION FILED JULY 30, 1917.

1,284,095.

Patented Nov. 5, 1918.

3 SHEETS—SHEET 1.

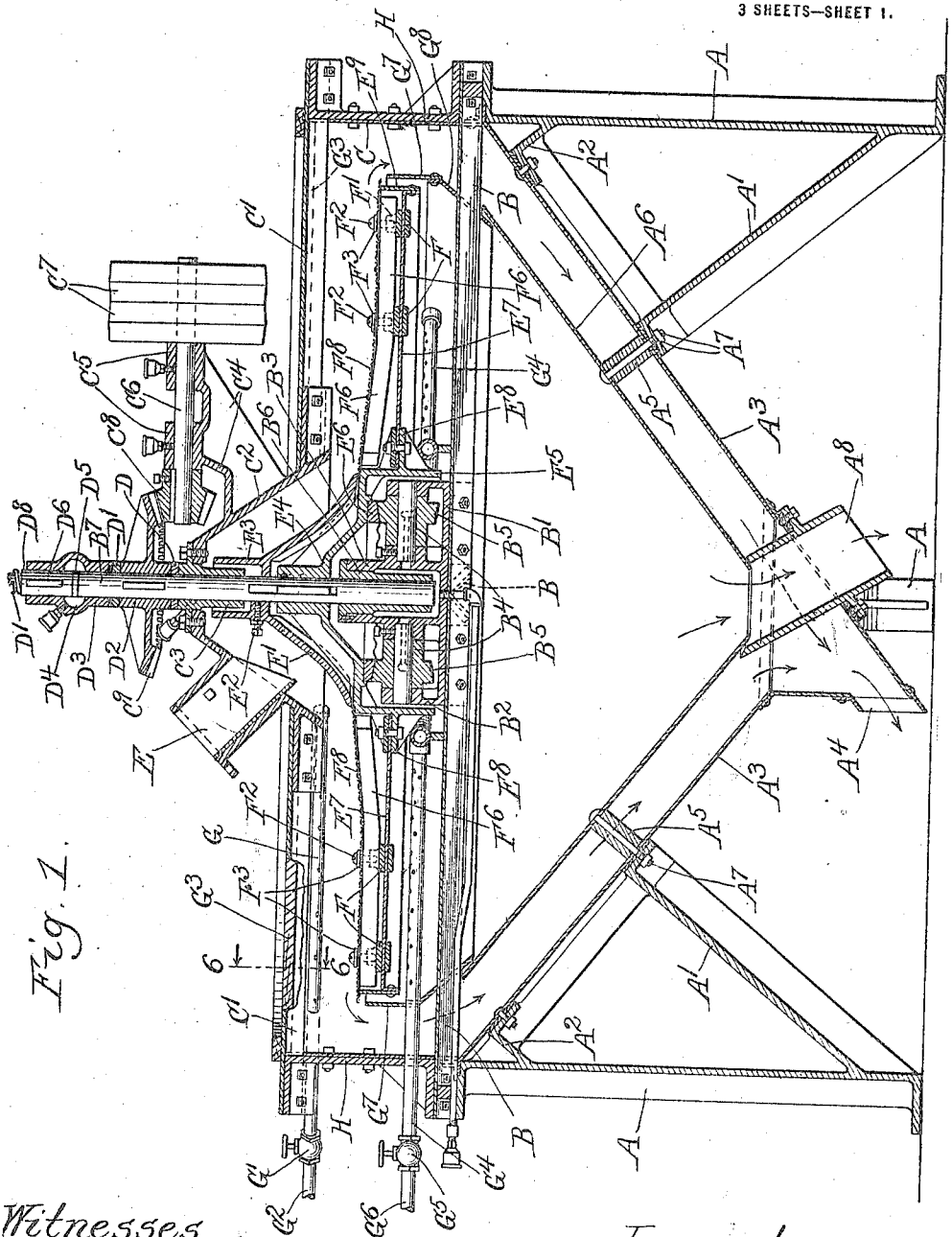


Fig. 1.

Witnesses.
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3 SHEETS—SHEET 2.

Fig. 2.

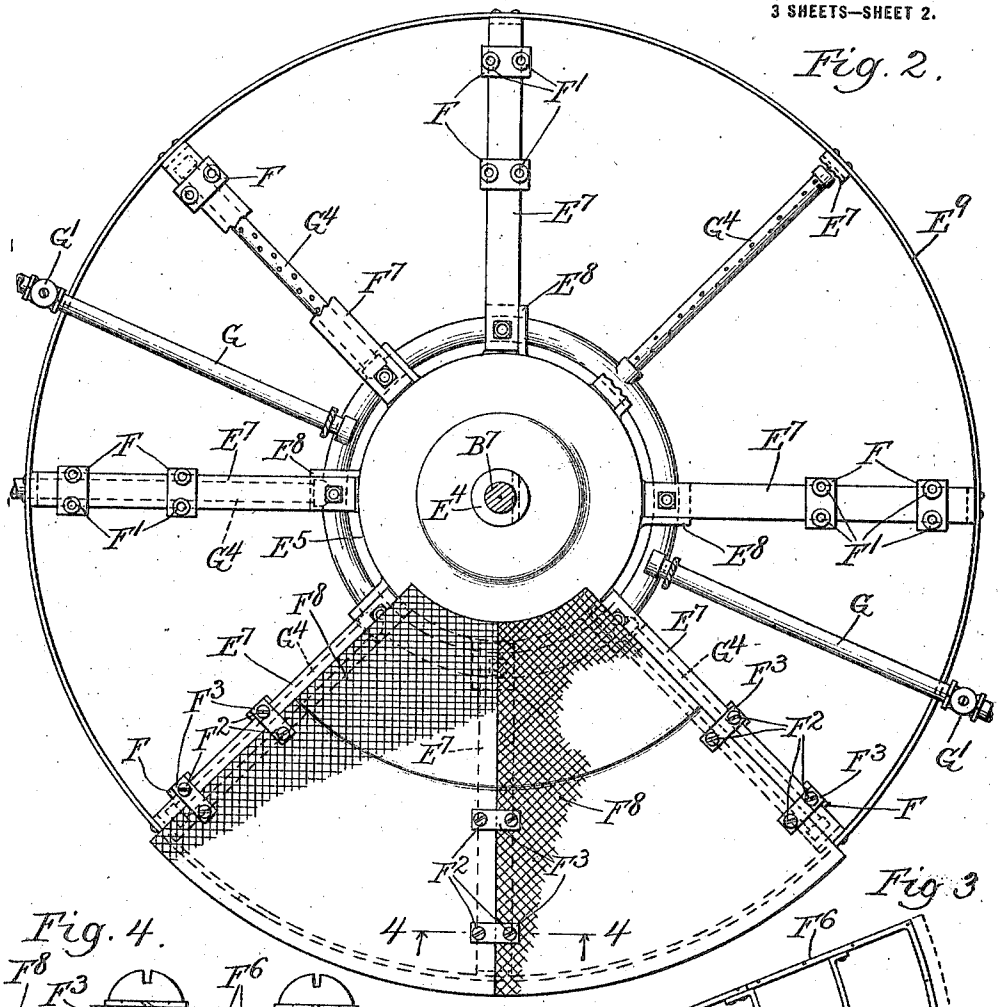


Fig. 4.

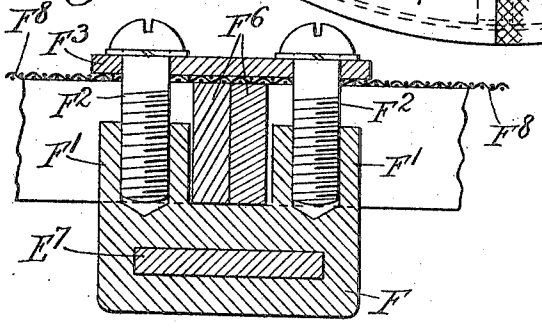
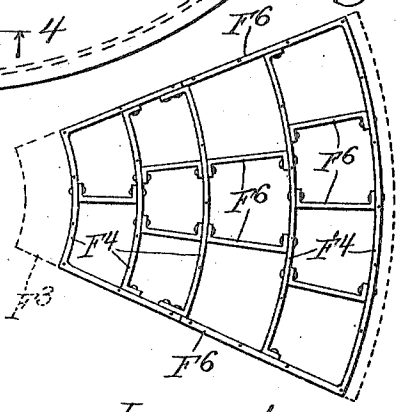


Fig. 3



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3 SHEETS—SHEET 3.

Fig. 6.

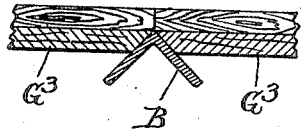


Fig. 5.

Witnesses.
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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

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CENTRIFUGAL SCREEN.

1,284,095. Specification of Letters Patent. Patented Nov. 5, 1918.

Application filed July 30, 1917. Serial No. 183,481.

To all whom it may concern:

Be it known that I, OSCAR M. GRUENDER, a citizen of the United States, residing at Chicago Heights, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Centrifugal Screens, of which the following is a specification.

My invention relates to improvements in centrifugal screens particularly such screens as are provided with means for simultaneously vibrating or oscillating the screen surface to assist in the screening process and to protect the screens against blinding. One object of my invention is to provide a new and improved arrangement whereby the screens themselves may be much more durable and may be protected against undue shocks, jolts and jars and wherein the vibration effect while effective for the purpose of keeping the screen meshes from blinding and for the purpose of assisting in screening will not result in snapping or breaking the screen fabric itself. Another object is to provide a screen of this type which will be simple and easy to manufacture, require a minimum power for operation will be extremely durable and convenient. Other objects will appear from time to time throughout the specification.

My invention is illustrated more or less diagrammatically in the accompanying drawings wherein—

Figure 1 is a vertical section;

Fig. 2 is a plan of the screen with several screen sections removed and parts broken away to show the frame and associated parts;

Fig. 3 is a plan of one of the screen sections;

Fig. 4 is a section on an enlarged scale along the line 4—4 of Fig. 2;

Fig. 5 is a part section in part elevation on an enlarged scale with parts omitted on a plane perpendicular to the plane of the section of Fig. 1;

Fig. 6 is a section along the line 6—6 of Fig. 1.

Like parts are indicated by like letters in all the figures.

A is a base or bed. A^1 A^2 are supporting flanges inwardly projecting from the inner wall of the base A and carrying a conical recovery hopper A^3 discharging into any suitable storage or disposal apparatus not here shown through the discharge port A^4. A^5 A^5 are spacing sleeves interposed between the hopper A^3 and an inner hopper A^6 the parts being held in fixed position by means of the bolts and nuts A^7 as indicated. The hopper A^6 discharges through a pipe A^8 passing through the wall of the hopper A^3. It is understood that the hopper A^3 is expected to catch and carry away the oversize, the hopper A^6 to catch and carry away those particles which come through the screen.

B is a cross frame made up of angle iron as indicated resting upon the bed A. This frame is bolted in position as indicated and carries at its center a cylindrical box or roller housing B^1. This box or roller housing B^1 is provided with an upwardly extending outer flange or wall B^2 and a central upwardly extending boss B^3. Radially arranged shafts B^4 are supported at their inner wall B^2 and boss B^3 and have rotatably mounted thereon the rollers B^5. I have shown these rollers diametrically opposed and two in number. Obviously it might be possible to change the number or arrangement of these rollers depending on the circumstances of the case and particularly upon the weight to be carried by the rollers and the contour of the track which I have subsequently described which rides upon them. The boss B^3 extends up a considerable distance above the bottom wall of the housing B^1 and contains a bearing sleeve B^6 anchored thereon against rotation and held in position on a vertical axis. B^7 is a shaft rotatably and slidable mounted in the bearing sleeve B^6 and extending upwardly therefrom.

C is an annular casing resting upon the bed A. This annular casing carries a frame C^1 made up of angle iron members extending radially inward and rigidly attached to a conical drum C^2. This conical drum has rigidly mounted in it a bearing sleeve C^3 in line with the bearing sleeve B^6 the shaft B^7 being rotatably and slidably mounted in it. C^4 is a bracket integral with the conical drum C^2. It carries bearings C^5 C^5 in which the shaft C^6 is rotatably mounted. One end of this shaft carries driving pulleys C^7 adapted to be driven from any suitable source of power not here shown. On the inner end of this shaft C^6 is a bevel pinion C^8 in mesh with a bevel gear C^9 feathered on the shaft B^7.

D D^1 are bracket members mounted on the

bearing C^3 adapted, engaging as they do the upper and lower surfaces of the hub D^2, to hold the bevel gear C^9 against vertical movement while in no way interfering with its rotation. D^3 is a sleeve projecting upwardly from the member D^1 enlarged as at D^4 to provide an oil chamber. The shaft B^7 terminates at such enlarged portion carrying on its upper end a thrust washer D^5 in rotatable engagement with a stub shaft D^6 which stub shaft is feathered in the sleeve D^3 so that while free to move longitudinally it is held against rotation. D^7 is a spring surrounding the reduced part of such stub shaft engaging a shoulder D^8 at one end and a bracket D^9 at the other, the bracket D^9 being held adjustably toward the sleeve D^3 by the bolts D^{10} whereby the tension on the spring D^7 may be adjusted to yieldingly hold the shaft B^7 in its downward position.

E is a feed chute extending inwardly through the conical drum C^2. It discharges against a distributing cone E^1 which cone is mounted on the shaft B^7 being held in position thereon by means of the set screw E^2. This cone terminates in upwardly extending sleeve E^3 extending up outside of the bearing sleeve C^3 to protect it. E^4 is a screen hub keyed on the shaft B^7. It terminates in a downwardly extending cylindrical flange E^5 extending down outside of the housing B^2. It carries a track E^6 provided with diametrically opposed high and low points as indicated adapted to rest upon the rollers B^5. The track and rollers are inclined so that they tend to center on one another. E^7 E^7 are a series of radially arranged spring bars mounted at their inner ends on brackets E^8 projecting outwardly from the flange E^5 and at their outer ends on a supporting ring E^9 which joins the outer ends of all of the spring bars. This arrangement provides a skeleton frame for the screen upon which the screen sections may be removably supported and by which they are yieldingly supported or sprung so as to modify the sudden jarring action caused by the coöperation of the roller and corrugated track.

F F are a series of supporting dogs slidably mounted on the spring bars E^7. These dogs have upwardly extending bosses F^1 in which are screwthreaded holding screws F^2 which are adapted when tightened on the clamping bars F^3 to hold the screen sections removably in position. The screen sections thus are illustrated in Fig. 3. They comprise a series of concentric rigid segments f^4 f^4 and radial arms f^6 f^6 arranged in any suitable manner as indicated to make a stiff and rigid pie shaped frame upon which the screen cloth f^8 may be stretched and riveted, bolted or otherwise fastened. These screen sections when brought together edge to edge with a spring bar underlying each radial junction line and when bolted in position furnish a continuous circular screening surface. It will be understood that the screen cloth projects inwardly beyond the frame, rests upon the member E^4 and is there clamped in position by means of the member E^1 so that there is a continuous uninterrupted support for the material down the surface of the member E^1 on the screen cloth thence out to the periphery of the screening surface.

G G are spray pipes adapted to spray water or other liquid on the upper surface of the screen. A valve G^1 is provided whereby the supply of liquid through the supply pipe G^2 may be controlled. These spray pipes are located immediately beneath the angle iron member C^1 and are covered by the wood, floor or cover G^3 supported upon such angle frame. G^4 G^4 are lower spray pipes adapted to project a series of jets upwardly against the under surface of the screen. The valve G^5 is provided to control the supply of material through the supply pipe G^6. G^7 is a guard ring surrounding the outer periphery of the screening member but overhung by the screening surface. A cone G^8 is provided leading from such guard ring to discharge inwardly into the hopper A^6 thus preventing the discharge by centrifugal force of any screened material from beneath the screening surface.

The annular casing C is reinforced by bracket members H extending between the frame A and the upper frame part C^1 so as to distribute the load and tie the parts together and hold them rigidly in proper position.

It will be evident that while I have shown in my drawings an operative device, still many changes might be made both in size, shape and arrangement of parts without departing materially from the spirit of my invention and I wish, therefore, that my drawings be regarded as in a sense diagrammatic.

The use and operation of my invention are as follows:—

The screen is rotated by power applied as indicated. It travels at a sufficiently high rate of speed to insure that the material will travel down from the higher center and be discharged away from the periphery. It is not necessary that the speed be very great because there is a sufficient incline to assist the passage of the material and because the vibration which is given to the material reduces the resistance to outward movement. The material is fed to the center of the screen, passes down over the solid conical guide member out onto the screen sections. As the screen rotates the track which supports it travels over a fixed roller and since this track is corrugated or irregular there is a continuous more or less violent up and down movement of the central screen supporting hub. This violent up and down movement

if the whole screen were subjected to it with rigid parts would soon result in completely breaking up the apparatus particularly the screen fabric itself and would very materially add to the power required. In my invention the screen is therefore spring supported on the central vibrating hub by means of the radial spring bars as indicated. It will be noted that the rigid screen sections are supported on the spring bars toward their outer ends, that there is no support adjacent the inner ends but that there is a support at the center of each screen section. The result of this is that the spring bars have sufficient room to operate and there is a continuous dancing movement of the particles as they travel along the screen caused by the vibrating oscillation of the screen surface this resulting from the sprung connection between the vibrated member and the supporting screen frames.

The water jets may or may not be used. The upper jets of course operate to distribute the material and assist in screening it. The lower jets while they also distribute the material outwardly assist in forcing particles back through the screen to prevent blinding or clogging of the apertures in the screen.

It will be clear that the degree of oscillation may be varied for different circumstances. For instance, in treating some materials it might be necessary to have both a very violent oscillation and a very full supply of distributing and cleaning liquid jets. Other materials might be satisfactorily cleaned with very much less vibration or with much less liquid or moisture or with much liquid and little vibration or the reverse. In other words the operator will, depending upon circumstances, supply more or less liquid and will depending on circumstances use a track having greater or smaller corrugations as the case may be.

I have shown the screen section as being a fabric. Clearly the same cleaning result can be obtained with a screen made of other material. It might be metal or wire or wood or it might be merely a perforated plate.

It will be noted that the vibratory movement of the screen sections is along a line substantially perperdicular to the screen itself so that the screen is essentially self-cleaning. The difficulties so frequently arising in connection with screening where the vibratory movement is inclined to the plane of the screen cannot here arise. The centrifugal arrangement, of course, provides an exceedingly large screening area because the material takes a spiral path and does not merely travel along radial lines. It goes from the central point to the discharge area.

I have illustrated my device as a single screen. Obviously this apparatus owing to its relatively low height and light weight can be built each one as a battery. The screens might be arranged one above another on separate or on the same shaft as the case may be.

The spring which holds the shaft down against the supporting track will prevent jumping or jarring of the driving apparatus and hold the parts rigidly in position so that the only springing or dancing or trembling will be a resultant of the movement of the roller and track with respect one to another. There will be no dancing or bobbing about of the central shaft other than the control movement. This makes it possible to closely and accurately control the operation of the screen itself.

The separate screen sections as they wear away or require to be changed can easily be withdrawn from the apparatus merely by releasing the holding bolts when new sections may be inserted to replace them or new screens may be added to the old sections. This is done, of course, without interfering in any way with the support of the screen on the spring bars and does not in any way change the assembly or operation of the device.

The support is at the center, the arms swing free, thus greater amplitude and violence of vibration occurs at the outside or discharge part of the screen. This tends to equalize the amount of work done by the different parts of the screen because in ordinary screening most of the screening is done at the beginning but since the vibration increases in violence outwardly there is a tendency to shake loose all the smaller particles which can otherwise go through into the discard and cause them to be screened toward the outer periphery of the screen.

I claim:

1. A centrifugal screen comprising a horizontally disposed yieldingly supported screening surface means for rotating it, said yielding supporting means being rigidly attached to the driving shaft, means for vibrating it, and means for feeding material to it.

2. A centrifugal screen comprising a horizontally disposed yielding supported screening surface means for rotating it, said yielding supporting means being rigidly attached to the driving shaft, means for vibrating it, and means for feeding material to it said supporting and vibrating means comprising a member and means for moving it vertically and a spring resisting the movement of such member.

3. A centrifugal screen comprising a horizontally disposed yieldingly supported screening surface means for rotating it, means for vibrating it, and means for feeding material to it the yielding supporting means comprising radially arranged spring bars of central anchorage for them and

means for moving it up and down along a vertical line.

4. A centrifugal screen comprising a horizontally disposed yieldingly supported screening surface means for rotating it, said yielding supporting means being rigidly attached to the driving shaft, means for vibrating it, and means for feeding material to it the screen member being free to oscillate about the central spring support.

5. A centrifugal screen comprising a horizontally disposed yieldingly supported screening surface means for rotating it, said yielding supporting means being rigidly attached to the driving shaft, means for vibrating it and means for feeding material to it said supporting means and vibrating means comprising a member and means for moving it vertically and a spring resisting the movement of such member, the screen member being free to oscillate about the central spring support.

6. A centrifugal screen comprising a horizontally disposed yieldingly supported screening surface means for rotating it, means for vibrating it, and means for feeding material to it the yielding supporting means comprising radially arranged spring bars of central anchorage for them and means for moving it up and down along a vertical line the screen member being free to oscillate about the central spring support.

7. A centrifugal screen comprising a hub, spring arms projecting outwardly from it, a ring engaging the outer ends of said arms, means for rotating said hub, means for oscillating it along a vertical line and a screen surface mounted on the arms of the ring.

8. A centrifugal screen comprising a hub, spring arms projecting outwardly from it, a ring engaging the outer ends of said arms, means for rotating said hub, means for oscillating it along a vertical line and a screen surface mounted on the arms of the ring such surface made up of a series of separate segments which are removably mounted.

9. A centrifugal screen comprising a hub, spring arms projecting outwardly from it, a ring engaging the outer ends of said arms, means for rotating said hub, means for oscillating it along a vertical line and a screen surface mounted on the arms of the ring such surface made up of a series of separate segments which are removably mounted each segment being in engagement with adjacent segments on either side there being a spring arm between each engaging line.

10. A centrifugal screen comprising a hub, spring arms projecting outwardly from it, a ring engaging the outer ends of said arms, means for rotating said hub, means for oscillating it along a vertical line and a screen surface mounted on the arms of the ring such surface made up of a series of separate segments which are removably mounted such segments being themselves rigid.

11. A centrifugal screen comprising a hub, spring arms projecting outwardly from it, a ring engaging the outer ends of said arms, means for rotating said hub, means for oscillating it along a vertical line and a screen surface mounted on the arms of the ring such surface made up of a series of separate segments which are removably mounted each segment being in engagement with adjacent segments on either side there being a spring arm between each engaging line such segments being themselves rigid.

12. A centrifugal screen comprising a hub, spring arms projecting outwardly from it, a ring engaging the outer ends of said arms, means for rotating said hub, means for oscillating it along a vertical line and a screen surface mounted on the arms of the ring such surface made up of a series of separate segments which are removably mounted such segments being themselves rigid each segment being attached to each arm at two separated points.

13. A centrifugal screen comprising a hub, spring arms projecting outwardly from it, a ring engaging the outer ends of said arms means for rotating said hub, means for oscillating it along a vertical line and a screen surface mounted on the arms of the ring such surface made up of a series of separate segments which are removably mounted each segment being in engagement with adjacent segments on either side there being a spring arm between each engaging line such segments being themselves rigid, each segment being attached to each arm at two separated points.

14. A centrifugal screen comprising a horizontally disposed yieldingly supported screening surface means for rotating it, said yielding supporting means being rigidly attached to the driving shaft, means for feeding material to it, and means for vibrating it separate from the yielding supporting means.

15. A centrifugal screen comprising a horizontally disposed yieldingly supported screening surface means for rotating it, said yielding supporting means being rigidly attached to the driving shaft, means for vibrating it, means for feeding material to it said supporting and vibrating means comprising a member and means for moving it vertically and a spring resisting the movement of such member, and means for vibrating it separate from the yielding supporting means.

16. A centrifugal screen comprising a horizontally disposed yieldingly supported screening surface means for rotating it, said yielding supporting means being rigidly attached to the driving shaft, means

for vibrating it, means for feeding material to it the screen member being free to oscillate about the central spring support, and means for vibrating it separate from the yielding supporting means.

17. A centrifugal screen comprising a horizontally disposed yieldingly supported screening surface means for rotating it, said yielding supporting means being rigidly attached to the driving shaft, means for vibrating it and means for feeding material to it, said supporting means and vibrating means comprising a member and means for moving it vertically and a spring resisting the movement of such member, the screen member being free to oscillate about the central spring support, and means for vibrating it separate from the yielding supporting means.

In testimony whereof, I affix my signature in the presence of a witness this 11th day of July, 1917.

OSCAR M. GRUENDER.

Witness:
MINNIE M. LINDENAU.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."