L. E. WARNER.

REVOLUBLE SIZING SCREEN.

APPLICATION FILED APR 11, 1910.

973,149.

Patented Oct. 18, 1910.

2 SHEETS—SHEET 1.

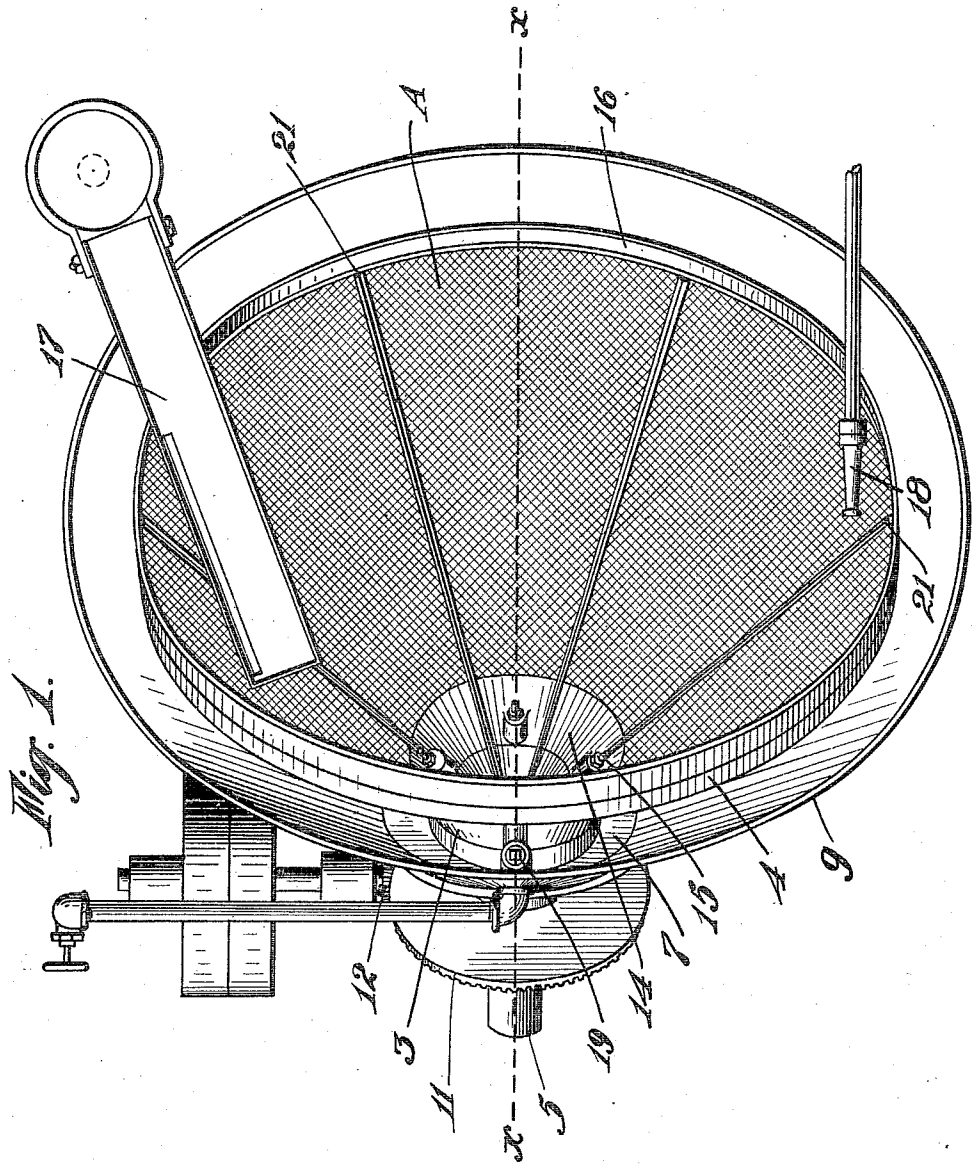

Fig. 1.

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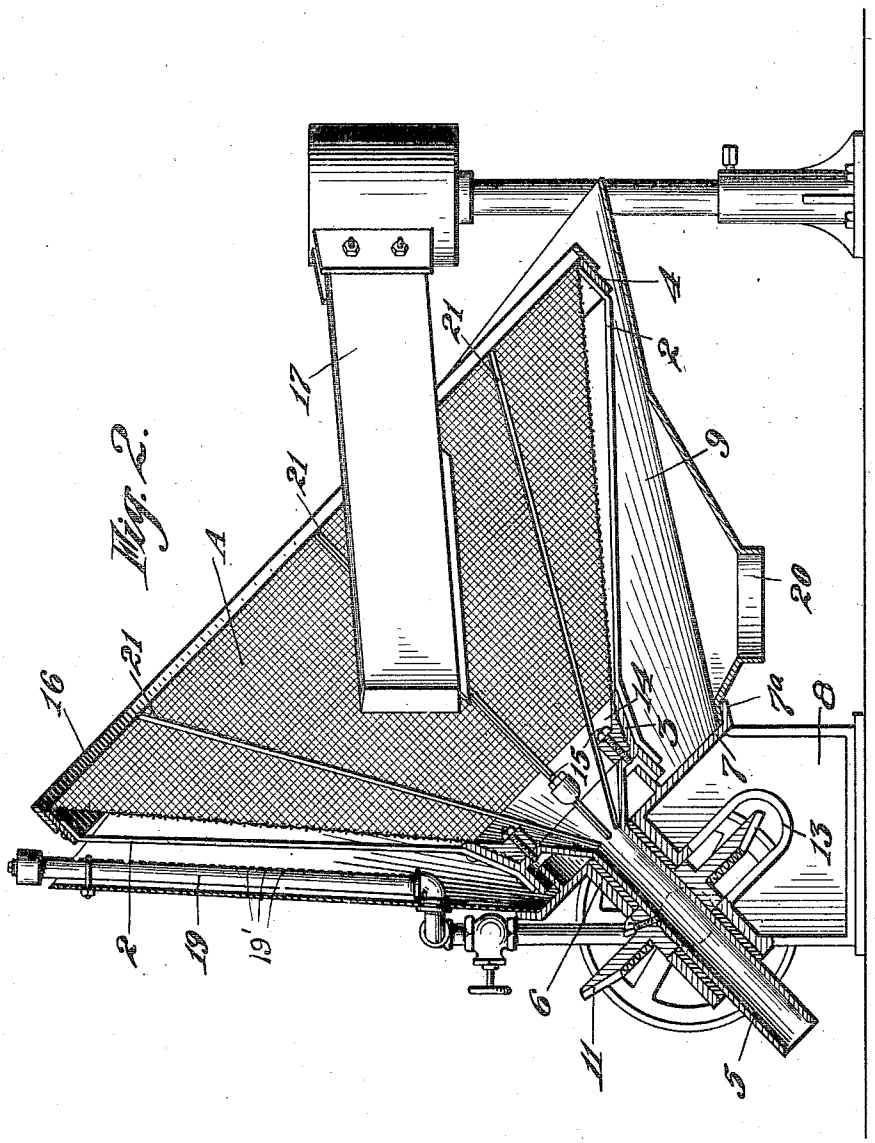
2 SHEETS—SHEET 2.

Fig. 2.



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UNITED STATES PATENT OFFICE.

LEWIS E. WARNER, OF KELLOGG, IDAHO.

REVOLUBLE SIZING-SCREEN.

973,149. Specification of Letters Patent. Patented Oct. 18, 1910.

Application filed April 11, 1910. Serial No. 554,804.

To all whom it may concern:

Be it known that I, LEWIS E. WARNER, a citizen of the United States, residing at Kellogg, in the county of Shoshone and State of Idaho, have invented new and useful Improvements in Revoluble Sizing-Screens, of which the following is a specification.

My invention relates to an apparatus which is especially designed for the screening, grading and separation or sizing of pulverized ore particles.

It comprises combinations of parts and details of construction which will be more fully explained by reference to the accompanying drawings, in which—

Figure 1 is a plan view. Fig. 2 is a vertical section taken through the axis of the apparatus on the line *x*—*x* of Fig. 1.

It is the object of my present invention to provide an apparatus by which the material to be screened is deposited upon a conical screen, the axis of which is at such an angle that during its revolution, the material will be constantly raised along the side of the screen, and allowed to drop back toward the lower portion of the side, and in such movements to be constantly advanced by small steps until the oversized material has reached the apex and point of discharge, while the finer material which has passed through the screen has been received in a collecting launder disposed beneath the screen.

A is the conical screen of my apparatus supported by a suitable frame-work which may be composed of arms 2 diverging from a central funnel-shaped support 3, and 4 is an annular rim to which the outer ends of the arms are bolted. The funnel 3 converges from its outer periphery to a plane surface transverse to the axis of the funnel, which surface forms an annular ledge, and the part 3 then continues to converge until at the smaller end it terminates in a hollow shaft 5 which serves for the discharge of oversized material as will be hereafter described. This shaft extends through a sleeve 6, and has its bearings therein. From the sleeve 6 extends a portion 7 at right angles with the axis, this portion having an outwardly turned divergent flange 7^a. The sleeve and the part 7 and 7^a thus described, may be cast or otherwise formed, and are mounted on a suitable stationary base 8, and the extension 7^a serves for the attachment of an exterior hood or shell 9, which thus forms a stationary conical inclosure for the screen previously described.

The axis of revolution of the screen is disposed at such an angle with reference to the divergence of the cone that the lower side of the screen will always stand at a slight angle above the horizontal plane, this angle being determined by the rapidity with which it is desired to advance the material through the screen. The screen and parts to which it is connected are revolved by means of a bevel-gear 11 driven by a pinion 12 upon a horizontal drive-shaft, or by equivalent driving means.

13 is a yoke-shaped frame carried by the support 8, and within which the gear 11 revolves as shown.

In order to secure the screen and give it proper tension, a cone-shaped annular clamp 14 fits substantially within the cone 3, and the screen having been properly formed to fit, has its smallest portion inserted into the cone 3, the interior of which it fits. The clamp 14 is then inserted against the inner surface of the screen, and by means of bolts 15 which extend through the clamp and through the edge previously described as being formed in the side of the cone 3, this edge of the screen will be firmly locked to the part 3. The outer edge of the screen may be bent over the rim 4, being given a sufficient tension, and an exterior clamping ring 16 is then forced down over the edge of the screen, thus locking it between this clamping ring and the rim 4, and holding it firmly in place, and as shown, having its surface out of contact with the ribs 2 of which the frame-work is formed.

17 indicates a means by which the pulp or material to be separated is delivered into the interior of the screen. As here shown it consists of an inclined chute or trough extending into the screen cone.

18 is a nozzle through which water is discharged against the side of the screen, and approximately tangential to its inner surface; and 19 is a pipe exterior to the screen, and here shown as approximately vertical, and contiguous to the corresponding highest side of the screen. This pipe has sufficient perforations so that water discharged through these perforations 19′ will impinge against the outside of the screen and wash off any material which may have adhered to the screen up to this point. It will be seen

that this side of the screen stands at an angle little less than 90 degrees, so that material which has washed therefrom will fall into the central discharge cone, and be thence carried out through the hollow shaft.

In the operation of my apparatus, the cone being caused to revolve, and material being supplied through the chute 17 will fall upon the continually passing lowest surface of the screen which is, as before described, at a small angle above the horizontal line. The material falling upon the screen will be carried up by adhesion, and by centrifugal force to some point where the adhesion will not be sufficient to cause it to longer cling to the screen. The material will then fall from this point down upon the lower part of the screen, but the plane of travel of the inclined surface of the screen will continually advance the material by reason of the angular position of the screen, so that when the material drops, it will strike a portion of the screen which is nearer to the apex than the point from which it fell. Thus the material will be gradually advanced toward the center, and the current of water discharged through the pipe 18 will sweep around the interior of the screen, and thus thin the material so that everything that is fine enough will pass through the screen, and the oversized material will be gradually separated therefrom by its continuous step by step progress from the outer to the inner portion of the screen. When it reaches the inner termination of the screen, it will be received within the cone 3, and the operation of gradual step by step advance will continue until the remaining material will finally be delivered into the inclined tubular passage 5, whence it is discharged to any suitable receiver.

The lower surface of the hood or casing 9 has formed in it a launder or receiving passage 20 through which the fine material which has passed through the screen may be properly collected. By reason of the angle of the axis to the conical screen, taken in conjunction with the angle of divergence of the sides, and the means for delivering the material upon the surface of the screen, and the constant raising and dropping back, it will be seen that the material is slowly advanced and intermittently raised and deposited upon the screen surface, each step bringing the material somewhat nearer to the eventual point of discharge.

The distance to which the material may be raised, and its consequent rate of advance from the outside to the center may be controlled by fixing radially disposed ribs upon the surface of the screen, and upon the interior of the cone 3; these ribs being of any suitable shape, such as V-shaped, and serving to retain the material until it has been carried to a higher point upon the screen before it is finally caused to fall back to the bottom. Such ribs are indicated at 21 on the interior of the cone 3.

It will be manifest that the screen may be secured in any manner to insure its rigidity and tension.

Having thus described my invention, what I claim and desire to secure by Letters Patent is—

1. A sizing apparatus consisting of a revoluble funnel-shaped screen mounted at an incline and with walls converging downwardly, the lower wall of the screen having a small inclination with relation to the horizontal line, and the smaller end of the screen having a tubular extension of substantial length forming a discharge for oversize material and also an axis about which the screen is revoluble, the upper and lower ends of the screen being arranged at an angle to the vertical.

2. A sizing apparatus consisting of a funnel-shaped screen, a support or spider by which said screen is carried, a revoluble hollow shaft forming a continuation and discharge from the smaller end of the screen, and serving as the axis about which the screen is revoluble, said shaft being journaled at such angle to the horizontal and vertical that the lower surface of the screen will have a downward inclination from the periphery to the point of discharge.

3. In a sizing apparatus, a conical screen, a funnel-shaped support by which said screen is carried, said support having an annular exterior ring, means for securing the screen to said support, said means including a central wedge-shaped clamp on the inner surface of the screen between which and the funnel-shaped support the inner edge of said screen is secured, and a ring-shaped clamp adapted to compress the exterior periphery of the screen about the annular exterior ring of the support.

4. The combination in an ore-sizing apparatus, of a frame consisting of a central funnel-shaped member having tubular central discharge, radiating arms secured to said member, a ring to which the outer ends of said arms are bolted, a conical screen and a wedge-shaped clamp on the inner surface thereof by which the inner end of the screen is secured to the central member, and a ring by which the outer periphery is clamped to the peripheral frame ring, said screen having its intermediate portion unsupported and spaced from said arms.

5. The combination in an ore sizing apparatus of a conical frame having a tubular, central discharge shaft, divergent supporting arms and exterior peripheral rim, bearings in which said shaft is turnable at an angle between the horizontal and vertical, a conical screen and means whereby the opposite portions of the screen are secured to the

corresponding portions of the frame, said means including a wedge-shaped clamp on the inner surface of the smaller end of the screen between which and the supporting arms the inner edge of the screen is secured, the intermediate portion of the screen being out of contact with the frame.

6. The combination with a funnel-shaped revoluble screen having a central discharge opening, and an inclined tube of substantial length connecting with said opening and forming an axis about which the screen is revoluble at an incline to the horizontal and vertical, of a means to distribute material across the descending portion of the screen, and means for discharging water substantially tangential to the ascending portion of said screen.

7. The combination with a funnel-shaped screen having a tubular extension from the smaller end, said extension being of substantial length and being inclined and adapted to form an axis of revolution between the horizontal and vertical, means for supplying material and water to the interior of the screen, and a central opening through which over-sized material escapes into the tubular extension, of a funnel-shaped hood inclosing the revolving part of the apparatus, and having a launder or receiver in approximately the lowest portion thereof to receive the material which passes through the screen.

8. In a screening apparatus, a conical revoluble screen having its axis of revolution inclined to the horizontal and vertical whereby the lower side of the screen has a slight downward inclination from the outer periphery to the center, and a central inclined hollow shaft through which discharge takes place, said shaft forming the axis about which the screen is revoluble, ribs radiating from the center outwardly, and means to supply material upon the descending portion of the screen.

9. In an apparatus for grading or sizing material, a conical screen having an axis of revolution inclined to the vertical and horizontal, and a means for supplying material and water to the interior of the screen, means for continually advancing the material toward the center of the cone by repeatedly raising the material, and allowing it to drop back, and a central inclined tubular discharge through which over-sized material is delivered, said tubular discharge forming the axis about which the screen is revoluble.

10. A grading and sizing apparatus, consisting of a revoluble, conical screen having an inclined tubular extension of substantial length projecting from the smaller end and forming the axis about which the screen is revoluble, and through which screen material is advanced from the outer periphery to said extension during the revolution of the screen, the upper and lower ends of the screen being disposed at an angle to the vertical.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

LEWIS E. WARNER.

Witnesses:

CHARLES W. SIMMONS,

ROBERT O. JONES.