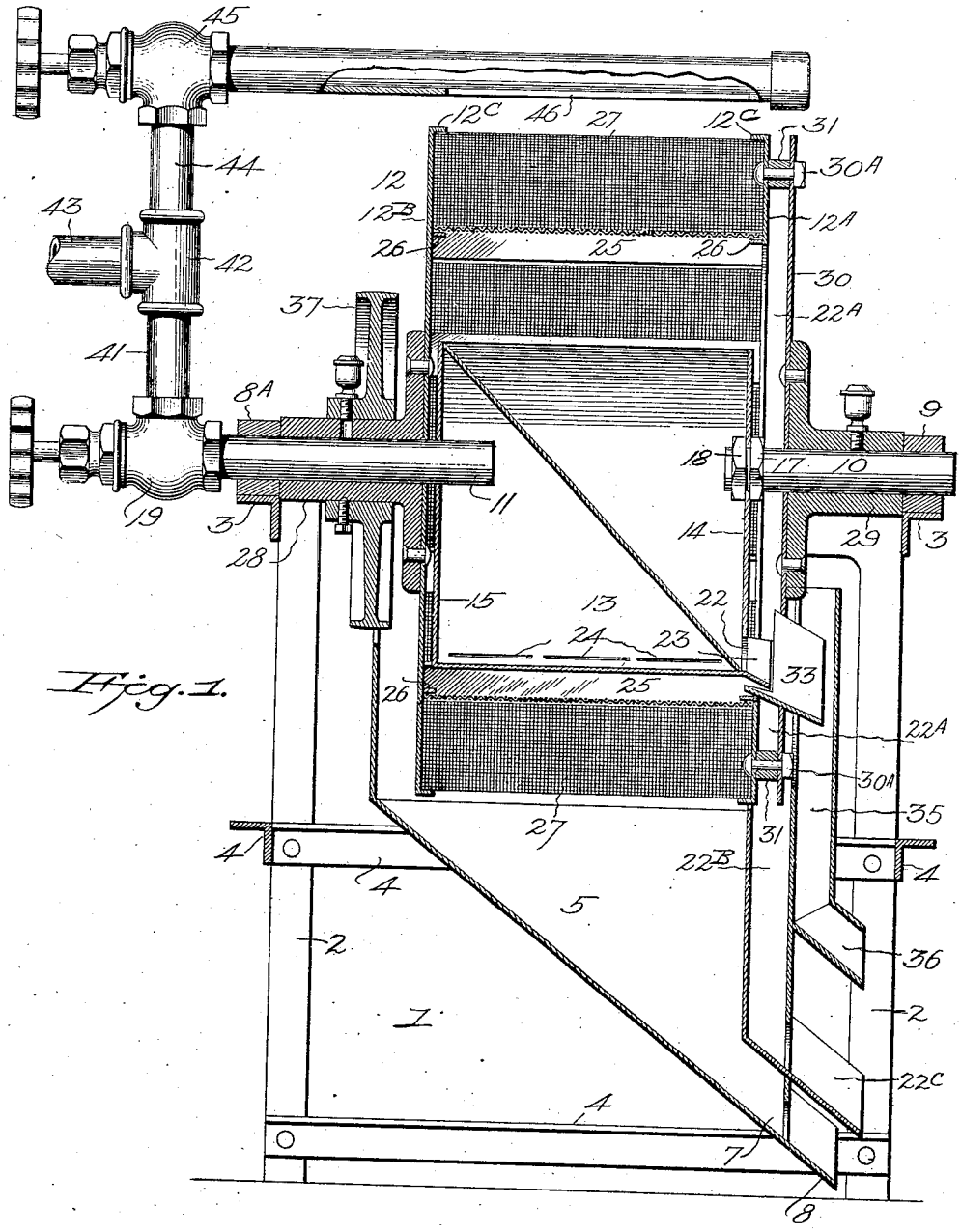
No. 854,744. PATENTED MAY 28, 1907.

H. G. KING.

ROTARY SCREEN, ORE SIZER, AND SAMPLER.

APPLICATION FILED APR. 24, 1906.

3 SHEETS—SHEET 1.



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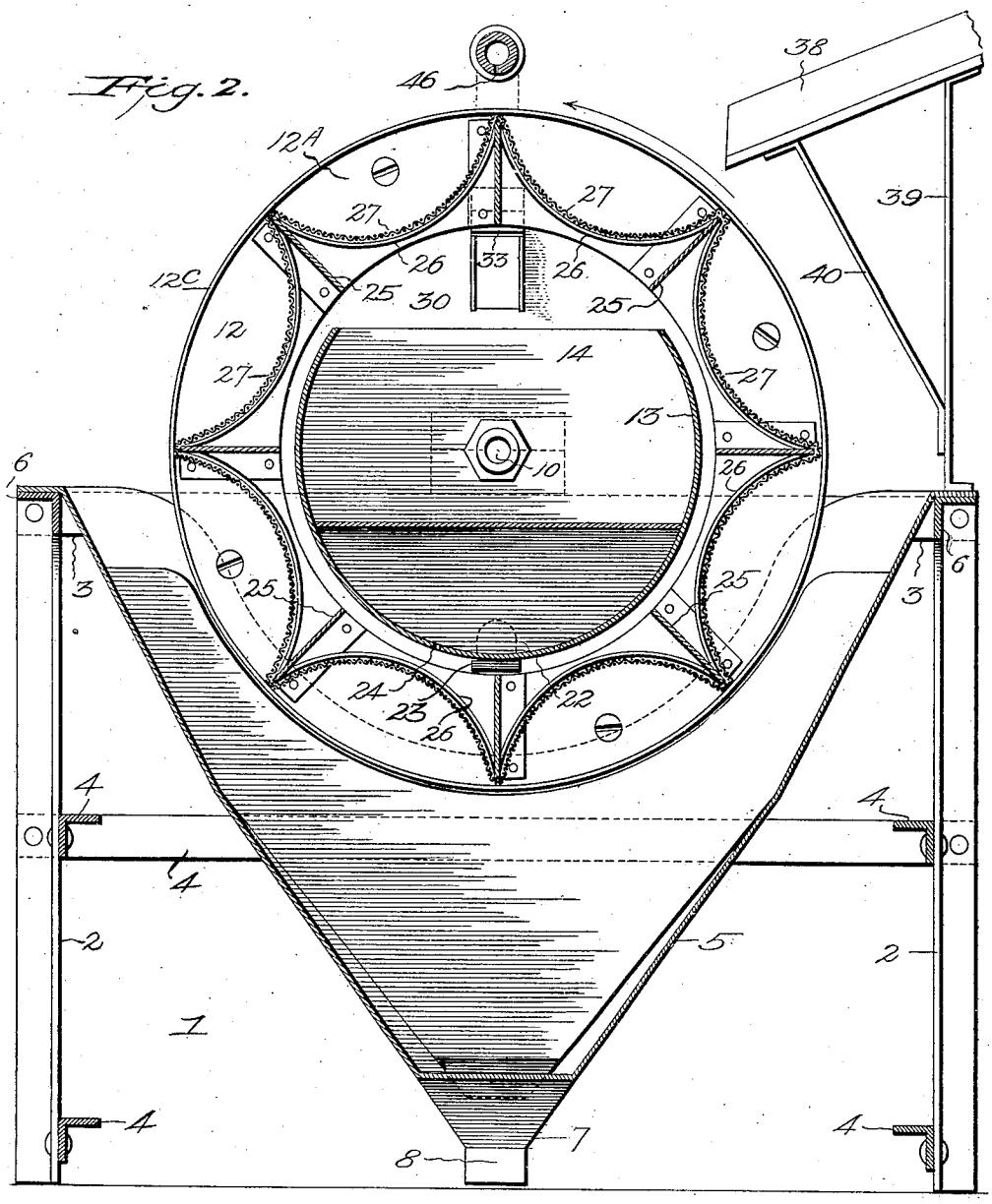
3 SHEETS—SHEET 2.

Fig. 2.



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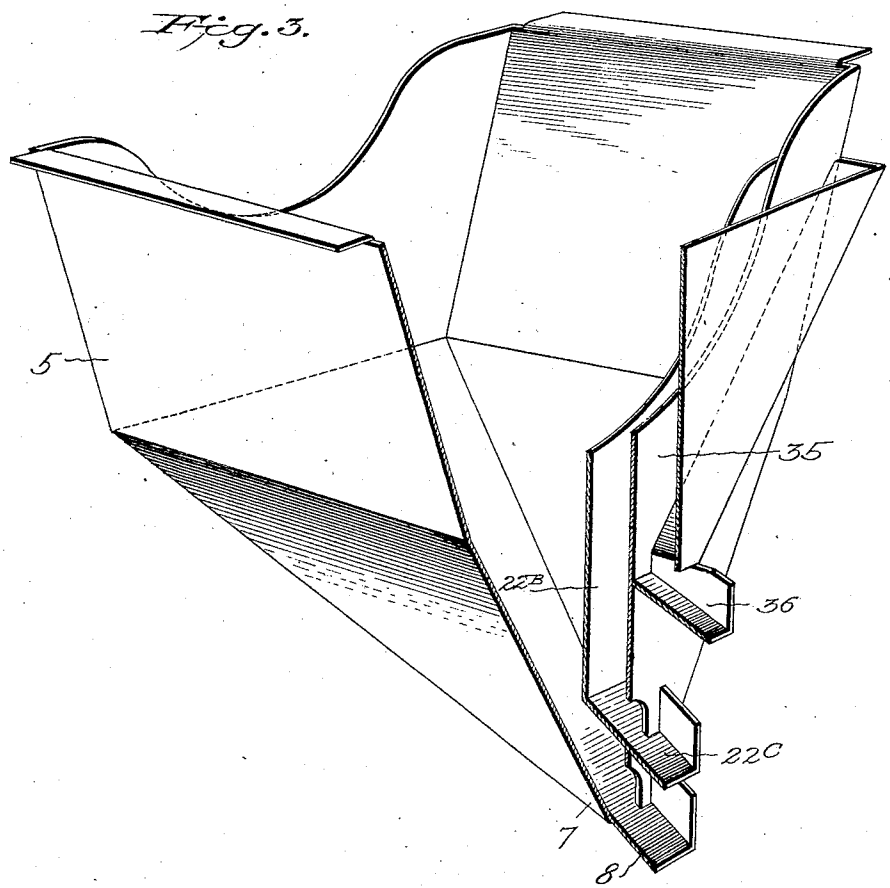
3 SHEETS—SHEET 3.

Fig. 3.



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UNITED STATES PATENT OFFICE.

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ROTARY SCREEN, ORE SIZER, AND SAMPLER.

No. 854,744. Specification of Letters Patent. Patented May 28, 1907.

Application filed April 24, 1906. Serial No. 313,421.

To all whom it may concern:

Be it known that I, HOWARD G. KING, a citizen of the United States of America, residing in the city and county of Denver and State of Colorado, have invented a new and useful Rotary Screen, Ore Sizer, and Sampler; of which the following is a specification.

My invention relates to a new and improved rotary screen, ore sizer, and automatic sampler, and the objects of my invention are: First, to provide a simple, continuously rotating screen, that is divided up into a plurality of independent screen surfaces. Second, to provide a rotating ore screening machine arranged to take a sample of screened ore at each revolution. Third, to provide a rotary screen in which the over-size and the screenings and the samples are discharged by different spouts. I attain these objects by the mechanism illustrated in the accompanying drawings, in which:

Figure 1, is a vertical, sectional elevation of my improved rotary screen. Fig. 2, is a vertical, sectional view on the line 2—2 of Fig. 1. And Fig. 3, is a perspective view of the over-size hopper, a portion of the front side being broken away, to better illustrate the construction of the same.

Similar letters of reference refer to similar parts throughout the several views.

Referring to the drawings, the numeral 1, designates in general the supporting frame of my rotary screen and sampler. This frame may be made of any suitable material, but I preferably make it of metal and preferably use angle iron in its construction. It is composed of the vertical posts 2, the top rails 3, and 6, the side rails 4, all securely riveted or bolted together. Outside of the frame, I place an oversize receiving and discharging hopper 5, the top edges of which rest on and are bolted to the top of the top side rails 6. This hopper is a tapering square shaped conical hopper, and tapers to a discharging point 7, where a projecting discharging spout 8, is formed on it. To the central portion of the top rails 6, I secure two boxes 8A and 9, in which I rigidly secure two short independent trunnion or tubular shafts 10 and 11. These two shafts are in axial alinement with each other, but are clamped rigidly and non-rotatably in the boxes, and form trunnion shafts for the screen drum 12. They also support a combined screening discharge hopper and a water jet receptacle 13, which consists of a cylinder having its ends closed by heads 14 and 15. The inner end of the trunnion shaft 10, is threaded, and it is extended through an aperture in the adjacent end head 14, of the cylinder 13, centrally of its width, but a little above the center of its depth, and nuts 17 and 18, are threaded on the end of the shaft on opposite sides of the head, and are screwed tightly against the opposite sides of the head, thus securing the cylinder rigidly to the trunnion shaft. The opposite trunnion shaft is a tubular or hollow shaft, preferably a piece of pipe, the inner end of which is open, and to its outer end I threadedly secure an angle valve 19. This hollow shaft forms the opposite support for the opposite end of the cylinder, the head 15 of which is provided with an aperture which fits loosely on this shaft 11, and is in alinement with the aperture in the head 14. This cylinder is thus held rigidly by the trunnion shaft 10. The top of this cylinder is provided with an opening which is positioned directly under the upper portion of the screen drum, and is large enough to receive the screenings from the upper section of the screen drum as it moves over it.

Diagonally across the cylinder from the upper end of the head 15, to the lower edge of the head 14, a diaphragm 21, is placed, which forms a chute for the screenings that drop into the cylinder from the screen, and at the point where it joins the head 14, an aperture 22, is formed through the head, and a discharge spout 23, is formed on the outside of the head around the aperture, which discharges the screenings into an inclosed hopper space 22A, from which it drops into a hopper, the space 22B of which is provided with a discharge spout 22C, from which the screenings discharge into a receptacle or a conveyer, as desired. The cylinder below the diaphragm is fully inclosed and hollow, and forms a water receptacle, the water being fed into it through the hollow trunnion shaft 11, as will be described fully hereinafter. Through the bottom portion of the cylinder, at each side of its lower central portion, I form two narrow rows of water distributing slots 24, from which water jets discharge against the inner side surface of the rotary drum, as will be described hereinafter. The water after passing through the screens falls into the over-size hopper and washes the over-size ore or material out of it, thus preventing clogging.

The screen drum 12, comprises two side disks 12A and 12B, the disk 12A of which is a ring disk that is enough larger in diameter than the screenings chute cylinder to fit loosely over it. The peripheral edges are turned toward each other to form a short flat right angle rim 12C. The disks are connected together by radial plates 25, the outer ends of which are positioned a slight distance from the inturned rim of the disks sufficient to receive the opposite edges of the screen sections, and they extend toward the center of the drum to the inner edge of the ring disk 12A. On the inner sides of both disks 12A and 12B, between each two radial ribs, I form projecting convex shelves 26, and these convex sleeves and the upper edges of the radial ribs form supports for the ends and side edges of the screen sections 27. The screen drum is preferably made of a width between its side disks to receive screens of any desired width, but I preferably use for ore in mill work screens eighteen inches wide, as I have found in practice that ore pulp will distribute more evenly over screens of about this and less widths than over much wider screen surfaces. And while I could use a strip or length of screen that would encircle the drum, I preferably employ separate screen sections between each pair of radial plates, and each screen is made of a width to fit closely but loosely between the disks under the peripheral flanges and to rest on top of the convex shelves, and they are made long enough to permit of a few inches of their ends being folded down over the upper edges of the radial ribs over into the next screen compartment. The peripheral flange of the disks under which the side edges of the screen is placed at the top edge of the radial plates, holds the screen down against the top edge of these radial plates. The advantage of this arrangement is that a plurality of independent screen surfaces are formed around the drum, and if a screen is cut through or wears through, it can be very easily and quickly removed, and replaced by a new one without removing the others, it being only necessary to raise the adjacent ends of the two adjacent screens in case the screen to be removed happens to be underneath their ends. The screen drum is rotatably mounted on the trunnion shafts 10 and 11, by means of flanged journal boxes 28 and 29. The box 28, is secured to the side of the disk 12B, and the box 29 is detachably secured to an independent disk 30, by bolts 30A the two disks being spaced apart by spacing thimbles 31, which are adapted to hold this disk at a distance from the disk 12A sufficient to form the space 22A, for the discharge spout 23, that projects from the discharge aperture 22, of the screenings hopper. This disk is also placed at a distance from the disk 12A, in order to form a space between them for a sampling spout 33, which is carried by the disk 30 and extends from said disk a distance substantially equal to the distance between the disk and the wall of the oversize hopper, and is arranged to just clear the discharge spout 23 of the screenings hopper and register therewith at each revolution of the drum. The sampling spout is adapted to catch a small portion of the screenings as they are continuously discharged from the hopper and its spout 23, each time it passes it, and it discharges this small sample into a hopper 35, which is formed on the oversize hopper 5, outside of the hopper spaces 22A, and 22B, and at its bottom a discharge spout 36 is formed, which is preferably arranged above the spouts of the screenings and oversize hoppers. On the hub of journal box 28, I secure a driving pulley 37, to which a belt may be applied from power shaft to rotate the drum screen.

On one end of the frame, I secure in any suitable manner a feeding spout 38, which is preferably supported by a standard 39, and a bracket 40, and is arranged to feed either wet or dry crushed, granulated, ore or other material to be screened onto the top upward moving portion of the screen, as the drum rotates in the direction of the arrow, which is carried over the top of the drum in the screen, and that portion of the ore or other material that is fine enough to pass the meshes of the screen, drops through it into the screenings hopper, while the oversize or that portion of the ore or other material that is too coarse to pass through the meshes of the screen is carried down the opposite side of the drum as it rotates and falls off of the screen into the oversize hopper. When treating wet ore-pulp, the ore carries with it sufficient water to make it flow easily through the feed spout, and in addition to the water of the ore pulp, I provide a jet of clear water that is arranged to fall vertically onto the screens as they move by it. I preferably carry out this feature of my invention by connecting a vertical piece of pipe 41, to the angle valve, to the top of which I connect a tee 42, from which a pipe 43, extends to a source of water supply. To the top of the tee 42, I connect a pipe 44, to the upper end of which I connect an angle valve 45, and to this valve I connect a pipe which extends over the center of the screen, and along the bottom of this pipe I form a slot 46, from which a long narrow jet of water, which in volume can be regulated by the valve 45, is discharged continuously on the ore or material on the screen as it is revolved.

The operation is as follows: When screening ore in concentrating mills, the ore is crushed by rolls or stamps or other granulating machinery, and it is often desired to separate the finer portion of this crushed product from the coarser, and to this end it

is passed over screens of a known mesh; thus screens of any desired mesh may be placed on the drum and the product be run over it. That portion of the crushed ore that is finer than the mesh of the screens, will pass through the screen and fall on to the diaphragm of the screenings hopper below, and will flow through the spout 22, and out of the spout 22C, while the oversize will fall into the oversize hopper 5, and feed out of its spout, while the sampler spout as the drum rotates cuts the discharging stream of screenings from the spout 23, and it is discharged onto the spout 33, and out of the spout 36. The screening action of these convexed screens, as they rise and pass over the vertical center of the drum screen and down its opposite side from the feed spout, is as follows: As the ore pulp, which is finely crushed ore mixed with water enough to flow as a running stream, discharges onto the screen, the ore pulp rolls over and over down the screen, which action carries the fines to the bottom, and in contact with the screen surface, while the coarse works to the top. The screenings are also carried to the bottom of the ore pulp by the falling wash water, as well as by its own water, which passes through the screen. One of the good features of this arrangement of screens is that the convex form of screen surface contracts the meshes of the upper surface of the screen, and stretches and opens the meshes on the under side of the screen; consequently, the fine particles that can enter the meshes readily pass through them without clogging, and in case a certain amount of the screenings do stick in the mesh of the screen, the jets from the water receptacle falling on the back surface of the screen at the under side of the drum will wash it out, as the screens move past them.

My improved screen makes a very simple, practical, and durable screen, of very large capacity.

Having described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a rotary screen, a pair of opposing disk shaped screen drum heads rotatably mounted and arranged to form a screen supporting frame, a plurality of concave screens arranged in a circle and rotatably mounted, shelves and ribs arranged on said supporting frame for securing each screen independent of the others, means including an inclined chute for conveying the screenings from the interior of said circle of screens, means including a spout for feeding material to said screens, means including a pipe for washing the interior surface of said screens, and means for conveying the oversize material from said screens.

2. In a rotary screen, the combination with the supporting disks connected by radial ribs, of a circumferential screen comprising a plurality of independent concave screens connecting end to end, means including shelves on said disks for supporting said screens between said disks and their ribs, means including an inclosed inclined chute for conveying the screenings from the interior of the circumferential screen, means including a casing for conveying the oversize from said screen, means for feeding material to said screen, means for flowing a supply of wash water onto said screen, means for flowing water through said screen from the inner side of said circumferential screen, and means for rotating said screen.

3. In a rotary screen, the combination with a supporting frame, of a circumferential screen comprising a plurality of independent concave screens connecting end to end, shelves for supporting said screens, a chute for conveying the screenings from the interior of the circumferential screen, a casing for conveying the oversize from said screen, a chute for feeding material to said screen, a pipe for flowing a supply of wash water onto said screen, means including a pipe for flowing water through said screen from the inner side of said circumferential screen, means for rotating said screen, and means including a spout attached to said circumferential screen for reserving a sample of said screen's screenings at each revolution of said screen.

4. In a rotary screen, the combination with a supporting frame, of fixed trunnion shafts mounted thereon, a circular screen frame mounted on said trunnion shafts, a plurality of independent screens mounted in the periphery of said circular frame, a suitable screenings receiving hopper inside of said circular frame, having a discharge spout, a pipe for flowing water onto said screens, a chute for feeding ore to said screen, a water receptacle within said circular frame, provided with water jet discharging apertures arranged to discharge jets of water against the inner surface of said screens at the lowest portion of said circular frame, and means for leading the oversize material from said screen.

5. In a rotary screen, the combination of a suitable supporting frame, a cylindrical screen supporting drum rotatably mounted on said frame, comprising a pair of end disks, connected by radial plates, each disk being provided with a rim flange extending toward the other, the outer ends of said radial plates being placed far enough below said rim flange to receive the ends of a concave-shaped screen between them, and a convex projecting shelf on each inner side of said disks extending from the outer edges of said plates, and sheets of concave-shaped screen cloth, arranged to be inserted between said rim flange and the outer edges of said plates, and to rest at their side edges on said shelves, and arranged and adapted to have their opposite

ends extend over and be bent down over the outer edges of said plates.

6. In a rotary screen, the combination with the opposing disk shaped screen drum heads rotatably mounted and arranged to form a screen supporting frame, of the oversize hopper within said frame, the screen drum rotatably mounted on trunnion shafts and being partially within said oversize hopper, one of said trunnion shafts being a tube or hollow shaft, a valve controlled water supply pipe connected to the outer end of said hollow shaft, a water receptacle supported by said trunnion shafts and arranged to receive a supply of water from said hollow trunnion shaft, a hopper adjacent to said water receptacle, and within said screen-drum, a plurality of independent concave screens arranged in successive circular order around the periphery of said screen-drum around said hopper and water receptacle, a water supply pipe extending over said screen-drum and arranged to discharge a supply of water on said screens, water discharge apertures in the bottom of said water receptacle arranged to discharge water on the inner side of said concave screens at the lowest portion of said screen-drum, and adapted to discharge water into said oversize hopper.

7. In a rotary screen, the combination of the frame, having oppositely arranged trunnion shafts arranged in axial alinement, one of which is hollow, the oversize hopper supported therein, the screenings discharge spout and the sampling discharge spout formed on said oversize hopper, with a circular hollow screen-drum rotatably mounted on said trunnion shafts and journaled to rotate partially in said oversize hopper, a semi-cylindrical hopper having closed ends supported on said trunnion shafts within said screen drum, and containing a screenings hopper and a water compartment, said screenings hopper having an opening in its upper side, a diaphragm extending from one upper corner of its top at one end to its bottom at the other end, a discharge aperture through said end at the lower end of said diaphragm, a discharge spout surrounding said discharge aperture and projecting a short distance from the end of said cylinder and adapted to discharge into the screenings spout, a disk secured to the side of said screen-drum that lies adjacent to the discharge spout of said cylinder, and positioned at a short distance from the side of said screen-drum and said discharge spout, and provided with a spout extending through it and projecting from it a short distance on each side of it, and provided on its inner side with a projecting lip on its lower side, said sampling spout being arranged and positioned on said disk to register opposite to and to almost touch said cylinder's discharge spout as it passes it at each revolution of said screen drum, and adapted to discharge into said sampling spout, a water receptacle in said cylinder below said screenings hopper and discharging diaphragm, a row of water discharging jets in the bottom of said cylinder, a valved water supply pipe attached to the outer end of said hollow shaft, said hollow shaft extending into said water compartment of said cylinder, a circular row of independent concave screens detachably secured to the periphery of said screen drum, means for feeding ore to each of said screens as said screen drum rotates, a water supply pipe extending over said drum and arranged to discharge jets of water on said screens.

8. In a rotary screen, the combination of the frame, the trunnion shafts and bearings secured to said frame, and the oversize and screenings and sampling hoppers and discharge chutes arranged adjacent to each other, with the circular screen-drum, the circumferential row of independent concave screens on said screen drum, the combined screenings receiving and discharging hopper, and water compartment cylinder supported on said trunnions, the water passage through one of said trunnions into said water compartment of said cylinder, and the water supply pipe for washing the outside and inside surfaces of said concave screens.

9. In a rotary screen, the combination of the rectangular frame, having a pair of boxes mounted thereon, and a hollow water conveying trunnion shaft mounted in one box and a solid trunnion shaft mounted in the other box, said shafts being in axial end to end alinement, a cylinder having closed ends and divided into a hopper chute at one end and into a water compartment at its opposite end, the said end of said cylinder adjacent to said hopper and chute portions of said cylinder being rigidly secured to said solid trunnion shaft, the opposite end of said cylinder containing an aperture through which said water conveying trunnion shaft extends into said water compartment, a circular drum, of a plurality of independent concave screens surrounding said cylinder, means for rotating said drum, means for feeding ore to the screens of said drum in successive order, a water supply pipe arranged to supply jets of water to the outside surface of said screens, a water supply pipe connected to said hollow trunnion shaft, and water jet apertures in the bottom of the water compartment of said cylinder, and adapted to supply jets of water to the inner side of said concave screens.

10. In a rotary screen, the combination with the frame, of the screen drum rotatably mounted thereon, the plurality of concave independent screens on said screen drum, the combined screenings catching and discharge hopper, and water compartment cylinder, and the screenings discharge spout, with the sampling disk secured to the side of said screen-drum adjacent to said screenings dis-

charge spout, the sampling spout on said disk arranged to register with the discharge face of said discharge spout as it passes it, and the samplings discharge chute into which the samplings spout of said disk discharges.

11. In a rotary screen, the combination of the frame, the oversize and screenings and samplings hoppers, the trunnion shafts, one of which is a water inlet tube, the water cylinder connected to said water inlet tube trunnion shaft, the screenings hopper and discharge chute in said cylinder, the rotary screen-drum revolubly mounted on said frame and surrounding said cylinder and extending partially into said oversize hopper, the circumferential row of independent concave screens removably secured to said drum, the side disks and radial plates and concave shelves of said drum arranged to support said screens, the sampling disk attached to said screen-drum, the sampling spout arranged to cut the screenings discharge from said screenings discharge spout, and discharge them into said sampling hopper, means for feeding ore pulp onto each screen in successive order, and means for supplying jets of wash water to the outer surface of said screens, as said ore pulp is fed on them, and against the inner surfaces of said screens after the ore pulp has been discharged from their outer surfaces.

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

HOWARD G. KING.

Witnesses:

G. SARGENT ELLIOTT,

KATHERINE V. BAKER.