No. 882,070. PATENTED MAR. 17, 1908.

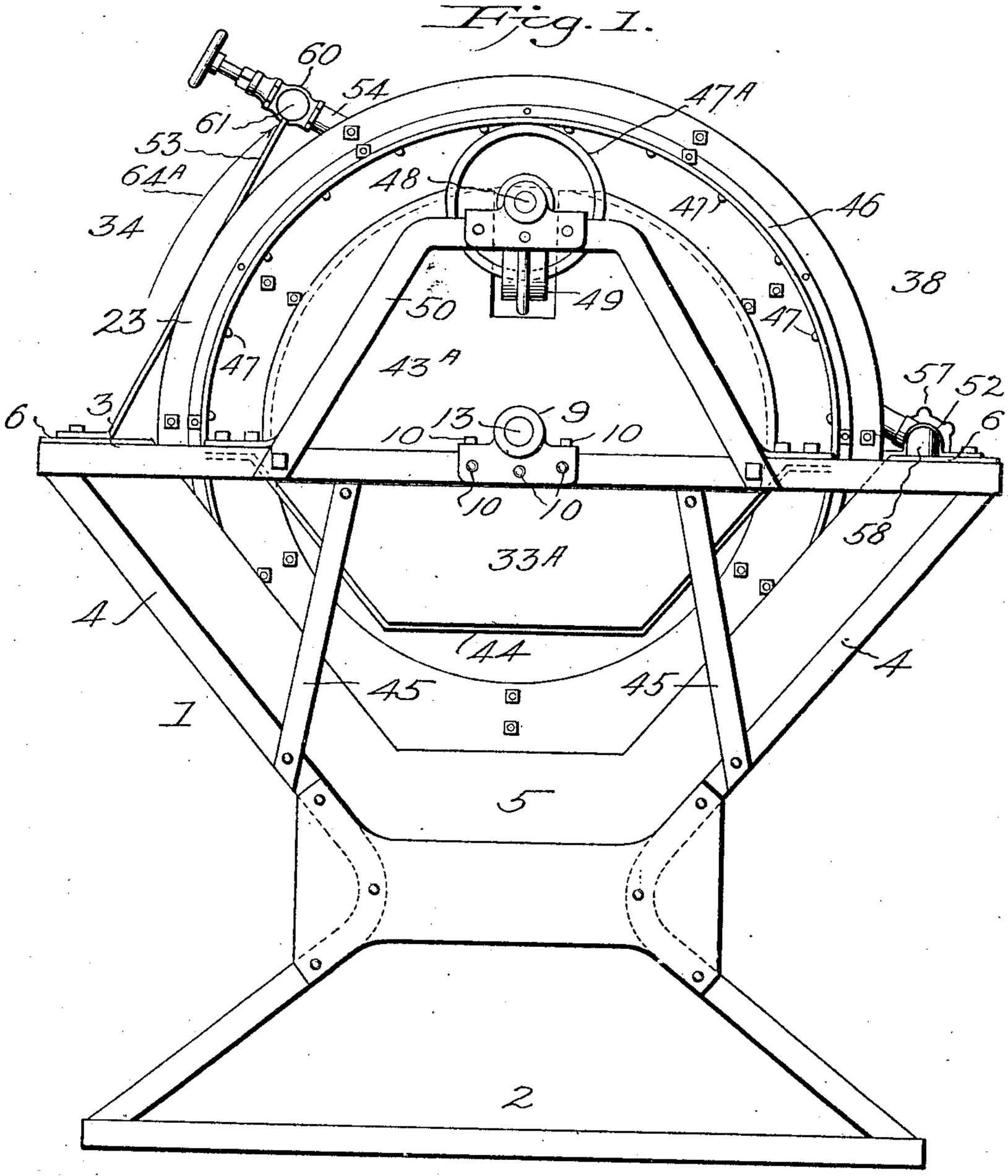
H. G. KING.

ROTARY SCREEN FOR ORE AND MATERIALS.

APPLICATION FILED JULY 17, 1907.

4 SHEETS—SHEET 1.

Fig. 1.



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4 SHEETS—SHEET 2.

Fig. 2.

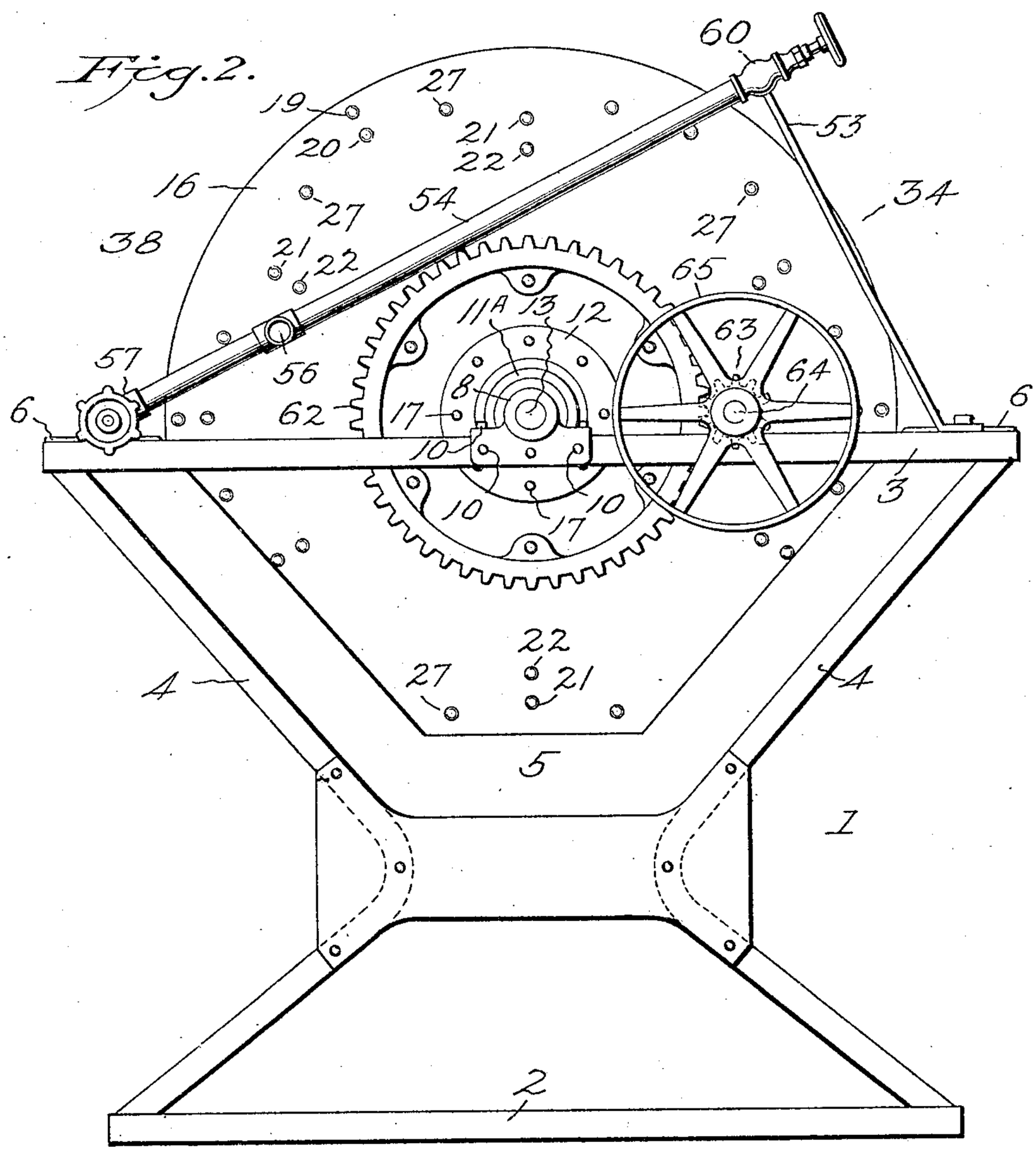
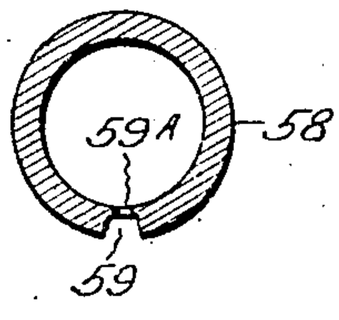


Fig. 8.



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4 SHEETS—SHEET 3.

Fig. 3.

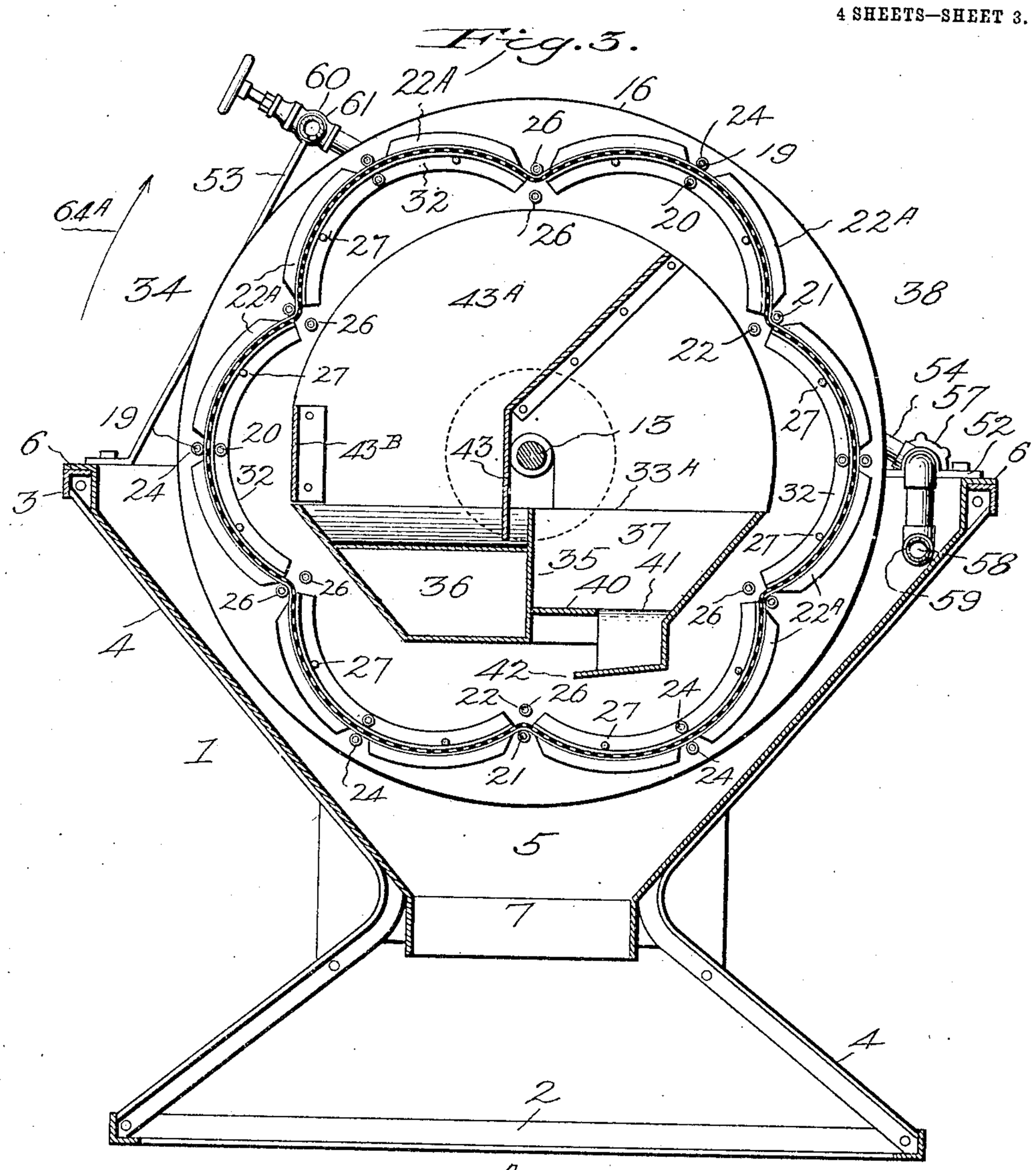
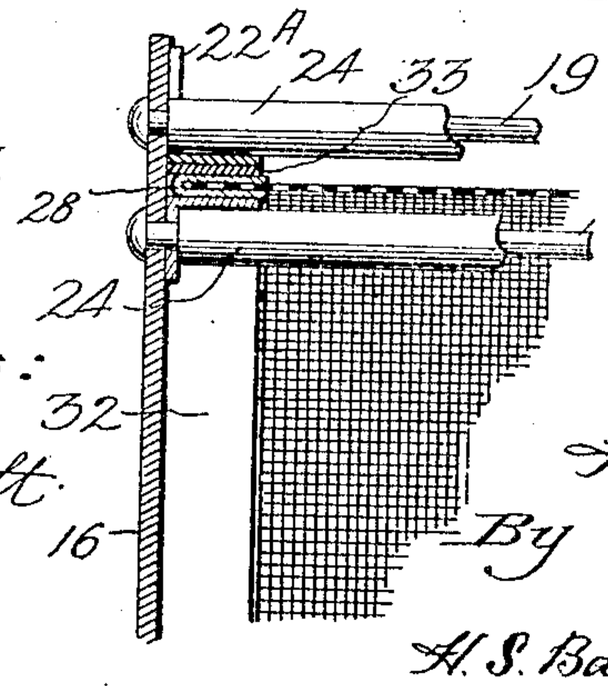


Fig. 7.



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4 SHEETS—SHEET 4.

Fig. 5.

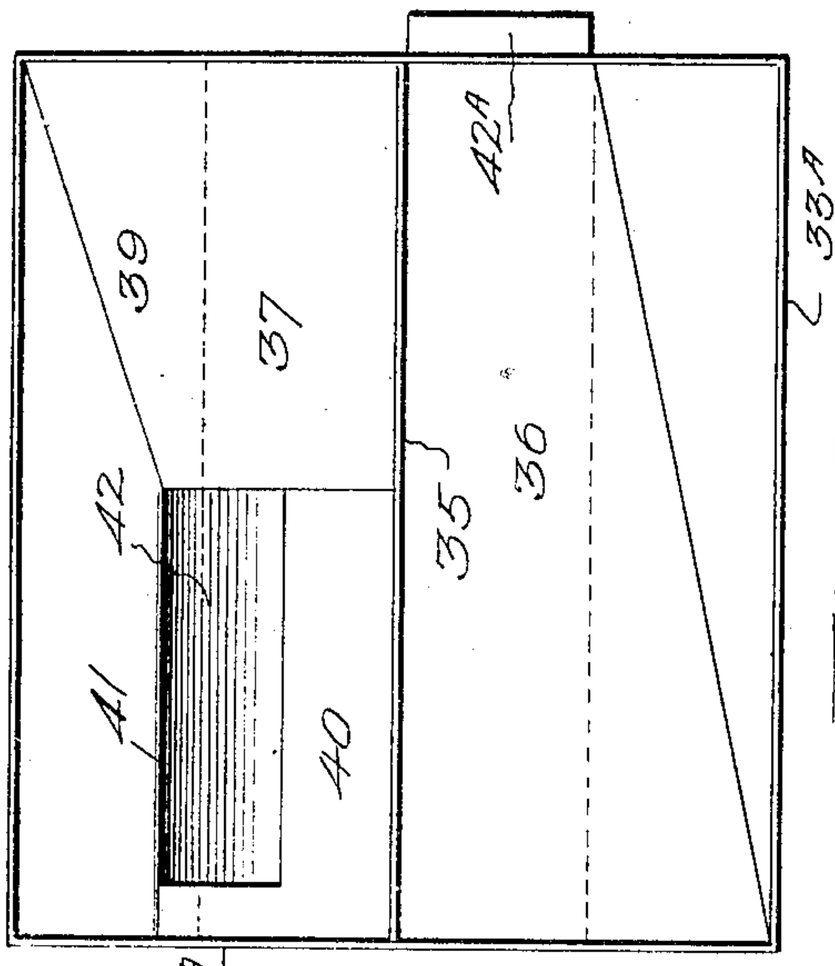
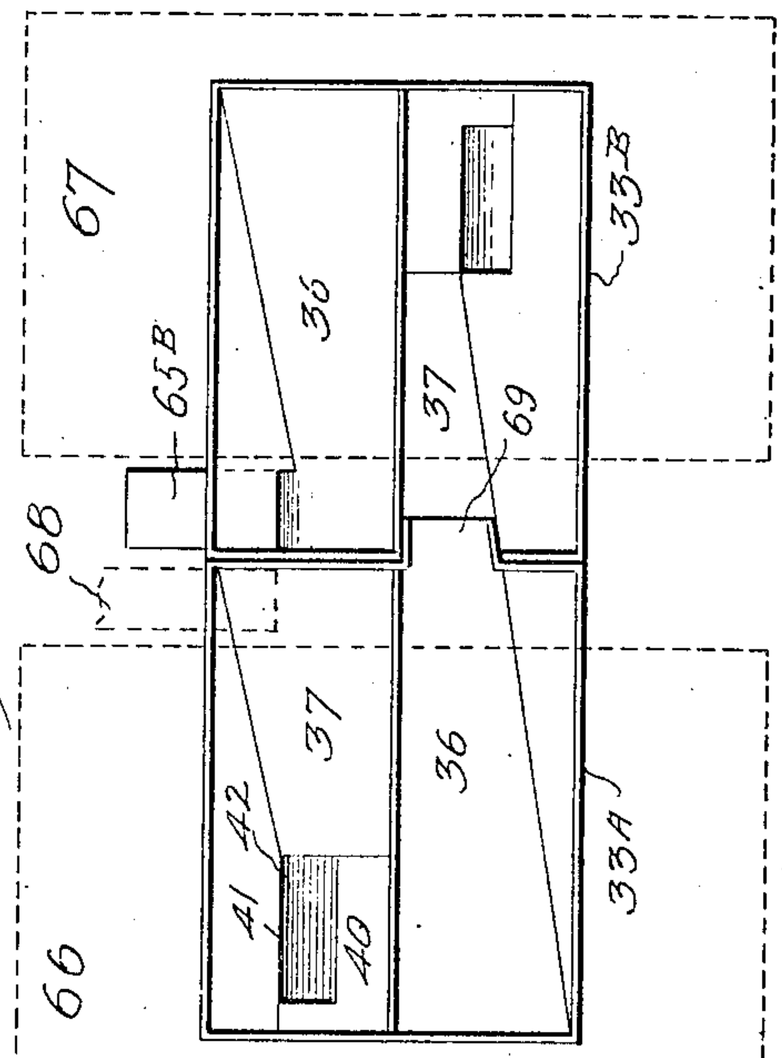


Fig. 6.



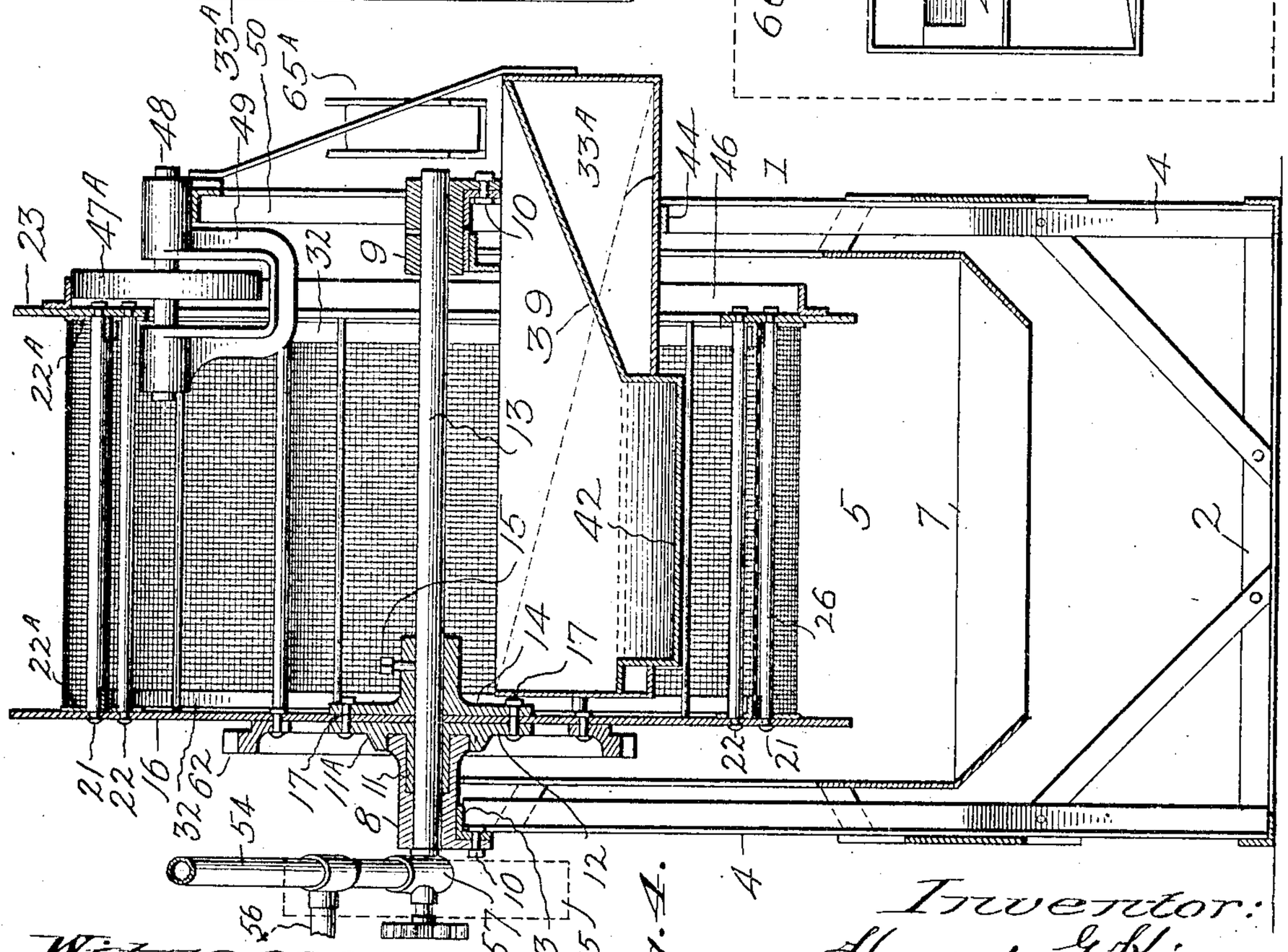


Fig. 4.

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UNITED STATES PATENT OFFICE.

HOWARD G. KING, OF DENVER, COLORADO.

ROTARY SCREEN FOR ORE AND MATERIALS.

No. 882,070. Specification of Letters Patent. Patented March 17, 1908.

Application filed July 17, 1907. Serial No. 384,192.

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 for Ore and Materials, of which the following is a specification.

My invention relates to a new and improved rotary screen for ore and materials, and the objects of my invention are: first, to provide a simple, continuously rotating screen, that is arranged into a plurality of semi-circular segment-shaped concave screen surfaces. Second, to provide a rotating ore screening machine provided with a reciprocatory vibrating, shaking and bumping movement. Third, to provide a rotary screen in which the over-size and the screenings are discharged from different spouts. Fourth, to provide a rotating drum-shaped screen, provided with a plurality of internally arranged concave screen surfaces that are adapted to receive ore upon their internal concave surfaces and discharge the screened product from their external surfaces, and that are arranged to carry the over-size upward and over as they move rotatably upward and over far enough to fall from the inner surface of the upper portion of the screen into a hopper arranged with the drum which is adapted to lead this oversize product to another machine of coarser mesh of screen, or to wash, as desired. Fifth, to provide a revolving drum-shaped screen, having a rapid intermittent short vibratory reciprocal movement of its screen surfaces, and that is adapted to be used singly or in tandem side by side, to screen ore and other materials, and to rescreen the tailings or over-size of ore or other materials. Sixth, to provide a revolving screening machine for ore or other material, provided with a combined feeding in and over-size hopper, and that is adapted to use a continuous circumferential band of screen cloth, and to divide said screen cloth into a series of independent concave surfaces arranged to receive and screen ore on their internal surfaces. And seventh, to provide a simple, durable revolving screen drum type of screening machine, that does not require much floor space, is of very large capacity, and that is adapted to screen wet or dry ores or other material, and that when wet ores are screened is arranged to clean its inner screening surface and its outer discharging surface automatically. I attain these objects by the mechanism illustrated in the accompanying drawings, in which:

Figure 1, is a front elevation of my improved rotary screen. Fig. 2, is a rear elevation of the same. Fig. 3, is a transverse vertical section taken centrally through the machine. Fig. 4, is a vertical section taken at right angles to the section shown in Fig. 3. Fig. 5, is a plan view of the feed hopper shown in Fig. 4. Fig. 6, is a plan view showing the manner of arranging a pair of hoppers where two machines are used in tandem order, the machines being shown in dotted lines. Fig. 7, is an enlarged fragmentary sectional view through the head plate of the screen, showing the manner in which the screen is clamped. And Fig. 8, is a transverse sectional view through one of the water distributing pipes.

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

The numeral 1, designates the supporting frame of my revoluble ore screen. This frame is preferably constructed of angle and bar iron or steel, although any other suitable material may be used, if desired. This supporting frame comprises a rectangular base or foundation frame portion 2, and a top bearing frame portion 3, which is supported above the base portion by bracing rods 4. The several pieces of angle and bar iron are securely riveted or otherwise secured together to form an open lattice work form of frame. The two opposite ends of this frame are inclined convergingly inward to near the bottom of the frame, and are then curved divergingly outward to the outer corners of the base frame, and a screenings hopper 5, is supported within the frame by bearing against these end portions, the upper end of the hopper being provided with extending portions 6 at its ends, which extend over and rest on the end pieces of the top portion 11 of the frame. This hopper converges on both sides from the top of the frame to a small discharging open end 7, which terminates at the narrowest portion of the frame, and thus allows room enough between it and the bottom of the frame for a spout to be placed to convey the screenings away from the screen.

Upon the central portion of each of the longest sides of the frame, I secure journal boxes 8 and 9, by bolts 10. The journal box

8 is adapted to receive the hub portion 11, of a flange 12, and the flange is provided with an axial bore which is revolubly mounted on a shaft 13, which extends through the flange and journal box, and across the frame into and through the journal box 6. A circular projecting lip or hub 11^A, on the flange 12, projects over and surrounds the adjacent end of the journal box 8, and acts as a dirt and dust guard for the bearing between the inside surface of the hub of the flange and the outside surface of the journal box. Upon the shaft 13, a flange 14 is mounted at the side of the flange 12, and this flange is secured to the shaft 13, by set screws 15. These two flanges are adapted to support between them a thin sheet iron imperforate disk-shaped circular head 16, which is rigidly clamped between the flanges by rivets or bolts 17, which extend through both flanges and head and rigidly clamp the flanges to the disk. This thin disk-shaped head forms one side of the screen supporting drum of the machine, and this head varies in diameter in screening machines of different capacities, being made about three feet in diameter for a machine of a capacity of about twenty tons per day. This head forms what I term the screen drum's supporting head, and it forms the rear side of the screen drum, and through it adjacent to its peripheral edge four circumferential rows of bolts 19, 20, 21 and 22 extend. The circumferential row of bolts 19, preferably comprises six bolts, which are spaced at equal distances apart in a circle concentric with the axis of the head, and at a few inches from its peripheral edge. These circular rows of bolts are adapted to support on their opposite ends a thin disk-shaped ring 23, which is provided with holes through which the ends of the bolts extend. A piece of pipe or tubing 24 is placed on each bolt between the two disk heads, and the lengths of these pieces of pipe represent the width of the space between the heads of the drum and the width of the screen of the drum.

I find in practice that a screen eighteen inches in width gives better practical results of equal and even feed throughout its width, and the best results as to screening area and to wear, than wider screens, and I preferably make the screen drums of a width to mount on them screen cloth eighteen inches in width, but of course wider screen cloths may be used if desired.

The ring head 23, is mounted on the ends of these bolts and is clamped against them by nuts, which thus rigidly clamp the ring head to the disk head. The ring head is thus supported entirely by the supporting head through the medium of the bolts 19—22. This ring head is provided with a central aperture of large enough diameter to permit an ore feeding and an ore oversize hopper to be inserted and positioned within the screen drum, as will be presently described.

The circumferential row of bolts 20, is positioned in radial alinement with the bolts 19, and at a short distance from them, and are adapted to form the inner supports for the central portions of a series of concave sections of screen cloth. These bolts are also preferably covered by a piece of pipe that extends over them between the heads of the drum.

The two circumferential rows of bolts 21 and 22, are positioned in alinement with each other, and at a short distance apart sufficient to pass the screen cloth and its binding and supporting members between them; and are positioned in alternate order centrally between the bolts 19 and 20, and they are positioned farther from the peripheral edge of the disk and form the supports for the terminal portion of each concave section of the screen. I preferably use six concave sections of screening surface in the drum, although more or less may be used if desired; consequently, I use six bolts in each of the circular rows of bolts 21 and 22, and both of these rows of bolts are preferably covered by pipes 26. In addition to the bolts 20 and 21 and 22, each concave section of screen surface is supported in its concave position by two bolts 27, which are positioned inside of the screen cloth centrally between the bolts 20 and 21 on the edge of the true curve the concave sections are adapted to form. These bolts 27 in addition to supporting the screen sections in their true form, prevent them from sagging inward.

Each concave section of screen surface may be covered by a separate and independent piece of screen cloth of any desired mesh, if desired, and be independently keyed or otherwise secured between the bolts 21 and 22 and 19 and 20. I preferably however, use a piece of screen cloth long enough to extend entirely around the drum, threading it between and around and over the bolts, and their pipe coverings, to form the concave sections, and thus forming a continuous circular screen composed of a plurality of independent concave screening sections, and key or otherwise secure in any suitable manner the ends of the screen between one of the pair of bolts 19 and 20.

I preferably reinforce and strengthen the edge of the screen by means of a strip of tin or other suitable metal or material 28, which I fold over the opposite side edges throughout the length of the screen, and secure there by any suitable means, preferably by punching in the tin pointed indentations with a pointed punch. In order to support the screen at its edges in the true curvature of the concave segments of circles

I desire to have them stand in, I secure to the inside of both of the heads, between the bolts 21 and 22, concaved semi-circular projecting shelves 32, which are preferably formed of right angled strips of thin galvanized iron, one angle of which is riveted or otherwise secured to the sides of the heads. These concave shelves are true circular curvature and project from the heads only far enough to form a firm support for the opposite edges of the screen cloth. In order to bind the edges of the screen cloth against the concaved shelves, especially for the finer mesh of screens, I provide a narrow flexible band of canvas or belting or other suitable material 33, which is of about the width of the screen supporting shelves, and wrap it around the outside edges of the screen close up against the heads and under the bolts 19 and 21, and wedge or otherwise lock its ends under one of the blots. For coarse mesh screens, I preferably use a concave shelf 22^A, which is positioned parallel with the shelves 32, between the bolts around the drum heads. This shelf 22^A comprises a right angled strip, one side of which is riveted to the sides of the heads and the other side projects from the heads a short distance. In some cases however, both the shelf 22^A and the fabric 33 may be used to bind the screen in place. The screen cloth, which may be of any desired mesh, from about a half inch to about one hundred, is very firmly mounted on the drum, and is very tightly and safely secured thereto in a manner that enables it to be very easily and quickly removed whenever it becomes necessary to change the screens.

As my revolving screen receives the ore or other material and screens it on and from the inside of its internal surface through to the outside, it is necessary to provide an ore feeding and distributing hopper 33^A, that will feed the ore into and distribute it over the width of the screen, and also an oversize or tailings receiving and discharging hopper that will convey the oversize. Separate feeding in and discharging hoppers can be employed for this purpose, but I preferably employ a combined feeding in and discharging hopper so arranged that the ore is fed into the interior of the screen drum on one side of the hopper, and the oversize is fed out of the screen drum on the opposite side. These ore feeding in and oversize feeding out hoppers comprise a rectangular shaped box made preferably of galvanized iron, which is made of a size in width and depth to fit loosely through the ring head at and to one side of the center towards the oversize discharging side 34, of the screen, and of a length to extend through the ring head across to close to the supporting disk head of the screen drum; and it is divided centrally of its length by a partition 35, into two compartments 36 and 37. On the feeding side 38 of the interior of the screen drum, a downwardly inclined chute portion 39, is formed, which forms the bottom of the hopper at its outer end, and that extends from the outer edge of the feed hopper to about the central portion of the length of the hopper, at which points it intersects with a portion of its width a straight ore distributing shelf portion 40, and a discharge aperture 41. The ore distributing shelf portion projects from the partition 35, a short distance, and extends along the bottom of the spout a distance nearly equal to the width of the screen, and below it a discharge shelf 42 is formed, and upon the shelf the ore from the aperture 41 falls, and is fed across the width of the screen. This discharge aperture is preferably positioned at about the center of the width of this feed hopper, and the side of the hopper opposite to the shelf inclines upward to the side edge of the hopper, and where it intersects the chute portion 39, it forms with it a chute valley from the top edge of the hopper to the adjacent end of the discharge aperture. The oversize discharge hopper as to its chute portion, is identical in construction to the feed hopper, except that the distributing shelf is dispensed with, and the oversize discharging aperture is in the forward end, 42^A, as shown in Fig. 5. In cases where a pair of these screening machines are set side by side, two communicating hoppers 33^A and 33^B are used, as shown in Fig. 6, and the oversize from the first machine runs into the compartment 37 of the second hopper, and thence into the second machine, and undergoes the same action as in the first machine, and discharges through a chute 65^B.

A partition 43, as shown in Fig. 3, is placed between the two compartments of the hopper, and is extended upward and towards the feed side of the screen drum close to the lower portions of the concave portions of the screen, and at about an angle of forty-five degrees. This partition extends across the whole width of the screen and acts as a fender and guide board to catch the oversize material that is carried up over to the top portion of the interior of the screen, and which, when it drops therefrom, strikes this partition guide board, and is guided into the oversize hopper. This partition is supported upon disks 43^A at each end of the drum, and these disks are connected, on the discharge side of the hopper, by a plate 43^B, which forms a vertical extension of the adjacent side of the hopper. The hopper is supported by a strap iron 44, which surrounds its under side at its front end, the ends of which are removably secured to the under side of the top side rails 3 of the screen drum's supporting frame; and also by the depending rods 45, the upper ends of which are se-

cured to the front of this double hopper, while their lower ends are bolted to the members 4 of the frame.

The disk 43[A] and partition are omitted in Fig. 4 to afford an unobstructed view of the interior of the screen drum.

In order to facilitate the screening of such ores as have a tendency to clog in the meshes of the screen, I provide the screen with a slight vibratory movement at right angles to the axial center of its shaft, and as one end of the screen drum is mounted on the driving shaft, this vibratory movement is necessarily imparted to the free end of the drum. There are many ways in which a vibratory movement can be imparted to the screen drum, and my invention contemplates any means by which this may be accomplished. I preferably carry out this feature of my invention in the following manner: To the outside of the ring-shaped head of the drum, I secure a circular band 46, which comprises a right-angled bar of iron, the free side of which projects at right angles from the outside of the head, as a narrow flat band, and I provide the inside surface of this band 46, with a circumferential row of small convex projections 47, which preferably consist of round rivet heads, the bodies of which are extended through and secured to the band. These projections or rivet heads are spaced at equal distances apart around the band at preferably a few inches apart, and a tread wheel 47[A] is supported on a shaft 48, in the plane of this band in a yoke-shaped double journal box bearing 49, to bear up against the top portion of the inside of this band in the path of these small depending lugs. The journal box bracket 49, is detachably secured at one end to a bracket 50, which is secured to the adjacent top side rail 3. This tread wheel is adjusted to bear up against the inner face of the band to support and carry a portion of the weight of the free end of the drum; consequently, the band always rests upon and runs on this supporting wheel, and as the drum is rotated, the projecting lugs engage its tread, and as they pass over it the free end of the drum is thereby raised, while the smooth portion of the band falls back against the tread as the lug passes over the wheel, and as the drum rotates continuously, a succession of rapid vertical vibrations are imparted to the free end of the drum, and as the opposite end of the drum is secured to the shaft, these short vertical reciprocal movements practically oscillate the drum on its axle bearing on the shaft, which operates to impart a continuous series of short longitudinal vibratory shakes or bumping movements to the drum, as well as the vertical shake and bump imparted by each depending lug, as it passes over the wheel.

In the treatment of wet ores or other material, it is necessary to apply water to the outside of the surface of the screen to wash away the screened ore or material that adheres to it. To this end, I secure to the supporting frame 1, by means of a clip 52, which is secured to one end of the top rail 3 of the frame, and a bracket 53, which is secured to the opposite end of the top rail 3 of the frame, a water supply pipe 54, which extends across the rear end portion of the disk drum at an upward angle from the feed side 38, of the frame. This water supply pipe is provided with a water inlet pipe 56, which leads to a supply of water under pressure. To the lower end of the supply pipe 54, I connect a valve 57, and to the valve by proper pipe fitting I connect a water distributing pipe 58, which extends across the screen just below the top rail 3 of the frame. This distributing pipe on its outer surface is provided with a longitudinal groove 59, which extends partially through the pipe, and from which a plurality of perforations 59[A] extend into the pipe in position to discharge jets of water against the outer surface of the screen as it rotates toward it, and this water washes the screenings adhering to the outer surface of the screen off from it and they fall into the screenings hopper in the frame. The groove 59 reduces the thickness of the metal through which the perforations 59[A] are formed, and thereby lessens the liability of their becoming clogged, as will be understood by reference to Fig. 8.

To the opposite and upper end of the water supply pipe, I also connect a valve 60, to which is connected by suitable pipe fittings a water distributing pipe 61, which I extend across the screen. This pipe 61 is formed with a groove and water distributing perforations similar to the pipe 58, and is adapted to wash any particles of ore or other material lodged in the meshes of the screen back into the interior of the screen, and thus clean out the meshes of the screen, as the screen drum revolves above that part of the screen where the ore or other material is feeding continuously into it, and onto its surface.

The opposite ends of the water distributing pipes 58 and 61 are closed by plugs. The large opening in the front end portion of the ring head of the screen drum, is preferably closed by one of the shields or disks 43[A], which is supported in position by being secured to the top rail of the frame. The screen drum may be rotated by any suitable means by which rotative movement may be imparted to it. I preferably secure a spur gear 62, to its rear end, concentric to its shaft, which meshes with a pinion 63, which is mounted on a shaft 64, that is journaled in a suitable box, which is secured to the frame 3, and upon the shaft 64, I place a driving

pulley 65, which may be connected by a belt to a source of rotative power.

The operation of my rotating screen is as follows: The screen is rotated in the direction of the arrow 64^A at a moderate speed, and the ore or other material is fed into the feed hopper from a launder 65^A, and runs down the chute portion onto the shelf, along which it works, and it feeds off of the entire length of the edge of the shelf into the discharge aperture and drops through the aperture onto the screen at its bottom portion, and as the several concave screen sections travel upward the ore or other material rolls and falls over and over itself on the concave surfaces of these screen sections, and is tossed about by the vertical reciprocal vibratory shaking and bumping movement of the drum as it runs over the drum's free end supporting wheel, and the finer particles of the ore or other material which will pass through the meshes of the screen in use will pass through the screen and fall into the screenings hopper in the frame, and will flow out of the discharge aperture in the bottom of this hopper into a launder which is arranged to allow it to flow away from the machine; while the ore or material that is fed into the screen drum that is too coarse to pass through the screen and which is called the oversize or tailings, is carried up close to the top of the drum by the concave sections, and drops from them either directly into the oversize hopper or against its guide board, and is guided by it into the oversize hopper, from which it flows either into a duplicate screening machine that is provided with a coarser mesh screen and is rescreened, or it flows into a launder placed under the discharge aperture of this oversize hopper, and flows to waste.

In Fig. 6 I illustrate a plan view of a pair of feed and oversize hoppers 33^A and 33^B, arranged to feed the oversize of one screening machine into a duplicate screening machine. The dotted squares 66 and 67 denote the positions occupied by the two machines, and 68 represents a launder that feeds the ore or other material into the feed hopper 33^A of this double hopper. The oversize of the second machine feeds out of the hopper through the spout 65^B.

The oversize hopper of the first machine communicates with the hopper of the second machine by means of a spout or trough 69, which extends from the end of the first hopper, through the adjacent end of the duplicate hopper, and during the treatment of wet ores, streams of water are flowing against the outside surface of the screens from the water supply and distributing pipes, and keep the outside surface as well as the meshes of the screen clean.

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

1. In a rotary screen, the combination with a supporting frame, of a disk drum head revolubly mounted on said frame, a plurality of bolts extending from said disk head, pipes on said bolts, a ring-shaped disk drum head secured on said bolts against said pipes, a plurality of outwardly radiating concaved and semi-circular-shaped sections of screen arranged between said drum heads on said bolts, and extending around said drum in a circular row of successive concave sections, means including concaved shelves secured to said disk heads for supporting said outwardly radiating concaved screens in semi-circular shaped forms on said drum, a roller-way on the free end of said drum, and a roller supported on said frame and arranged to support the free end of said screen supporting drum.

2. In a rotating screen, the combination with a supporting lattice-work box-shaped frame, having a screenings receiving hopper secured within it, said hopper being provided with an open top and with converging sides terminating at a short distance from the bottom of said frame, the said bottom portion of said hopper being provided with a discharge aperture, a circular screen supporting drum revolubly mounted on said frame, with its lower half portion projecting into said hopper, a cylindrical screen mounted on said drum, comprising a circumferential row of concaved semi-circular-shaped segments arranged with their curved interior surfaces radiating from the axial center of said drum, means for feeding ore into and for discharging the oversize ore from the interior of said cylindrical screen and drum, means for rotating said drum and screen, and means including a roller tread-way on said drum for imparting a reciprocating oscillating vibrating shaking and bumping movement to said screen.

3. In a rotary screen, the combination with the supporting frame, having a shaft rotatably supported and journaled thereon, of a flange detachably secured to said shaft, a disk-shaped drum head secured to said flange, a plurality of bolts extending through said disk drum head, a tubular covering over each bolt, a ring-shaped disk drum head secured on the ends of said bolts against said pipes, a double cylindrical circular ring of concaved semi-circular segmental shaped shelf portions projecting a short distance from the inside faces of said drum heads, said concaved segment shelves being arranged to radiate with their curved inner faces from the axial center of said drum disks, and said projecting shelves being spaced far enough apart in parallel alinement throughout their circular form to receive the opposite side edges of

screening material, said shelves being arranged between said pipe covered bolts, a screen extending around said drum between the bolts of said drum heads and extending into the space between said shelves, and adapted to be supported by said shelves, means for securing a screening material to said shelves, and bolts of said drum, and means for feeding material into and for discharging the oversize out of the interior of said screen and drum.

4. In a rotary screen, the combination with a suitable supporting frame, provided with a screenings hopper, of a cylindrical screen drum, having an axial support at one end and an open ring-shaped end at its opposite end, a revoluble shaft secured to the axial supporting end of said drum and revolubly journaled in said supporting frame, a roller tread-way on the free end of said drum, a supporting roller on said frame arranged in bearing contact with said drum's tread-way and adapted to support the free end of said drum, a circular row of projections on said tread-way arranged to engage said roller as said drum rotates, means for rotating said shaft and drum, a cylindrical shaped screen mounted on said drum, said screen being arranged in a continuous series of concave semi-circular segments, the inner surfaces of which radiate outward from the axial center of said drum, means including concave projecting shelves on said drums for supporting said concave sections of said cylindrical screen in their true outwardly radiating semi-circular shaped form on said drum, means for operatively feeding ore or other material to the interior of said cylindrical screen, and means for flowing water onto said screen.

5. In a rotary screen, the combination with the frame and the cylindrical screen drum, said screen drum being provided with an open end, of a hopper adapted to be inserted into the interior of said screen drum through said open end, comprising a box-shaped hopper divided longitudinally and centrally by a partition; a feeding hopper compartment on one side of said partition, a feeding in chute in the feed side of said hopper, a material distributing shelf at the end of said feed chute, a discharge aperture in the bottom of said hopper at the side of said distributing shelf, and a material catching and distributing shelf on said feed compartment of said hopper at the bottom of said discharge aperture, an oversize feeding out chute in the compartment of said hopper on the opposite side of said partition, provided with a discharge outlet at its lowest end, and a guide board partition within the interior of said cylindrical drum and screen extending from the oversize compartment of said hopper to the top portion of the interior of said screen, and adapted to guide the oversize material into the oversize discharging chute of said hopper, and means for supporting said hopper and guide board in operative positions within said screen drum.

6. In a rotary screen, the combination of the screen supporting drum, comprising the disk-shaped heads, provided with the projecting shelf portions and the connecting screen supporting bolts and pipes, with a screen adapted to extend across said drum and to be supported by said bolts, said screen being provided with a narrow metal strip folded over and secured to the opposite side edges of said screen, and adapted to fit between said drum head's screen supporting shelves, and means for securing said folded strips and screen to the supporting shelves and bolts of said drum heads.

7. In a rotary screen, the combination of the screen supporting drum, comprising the disk-shaped heads, provided with the parallelly-arranged projecting shelf portions and the connecting screen supporting bolts and pipes, with a screen adapted to extend across said drum and to be supported by said bolts, said screen being provided with a narrow metal strip folded over and secured to the opposite side edges of said screen, and adapted to fit between said drum head's screen supporting shelves, and means including a flexible ribbon adapted to be inserted between said shelves over said folded edge strips of said screen, and arranged and adapted to secure said screen to said shelves and bolts of said screen drum.

8. In a rotary screen, the combination of the supporting frame, the screenings hopper in said frame, the water supply pipes mounted on said frame, and the combined ore feeding in and oversize discharging hopper and guide board supported by said frame, with a cylindrical screen drum revolubly supported and mounted at one end in said frame in said screenings hopper, and having its opposite end open and fitting revolubly over said hopper and guide board, and arranged in water receiving relation to said water supply pipes, a roller tread-way on said drum, a roller supported by said frame to roll in bearing contact with said drum's tread-way, projections on said drum's tread-way in the path of said roller adapted to impart a shaking and bumping movement to the free end of said drum, and means for rotating said drum.

9. In a rotary screen, the combination with a supporting frame, of bearings on opposite sides thereof, one of which has a bore of two diameters; a shaft mounted in said bearings; a circular plate on said shaft and disks on said shaft between which said plate is clamped, one of which has a hub portion which projects into the larger bore of the adjacent bearing, and an annular lip which ex-

tends over and around the end of said bearing, while the other disk has a hub which is secured to the shaft; a ring in axial line with said circular plate and secured thereto at a suitable distance to form a drum, a screen cloth on said drum arranged to form a plurality of independent concavo-convex screen surfaces; a feeding and discharge hopper in said drum; means for rotating said drum, and means for imparting a vibrating motion to the free end of the drum during its rotation.

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

HOWARD G. KING.

Witnesses:

G. SARGENT ELLIOTT,

ADELLA M. FOWLE.