Jan. 5, 1926. 1,568,572

D. J. SHAW

APPARATUS FOR SCREENING SEWAGE AND OTHER MIXTURES OF LIQUIDS AND SOLIDS

Filed June 13, 1923 3 Sheets-Sheet 1

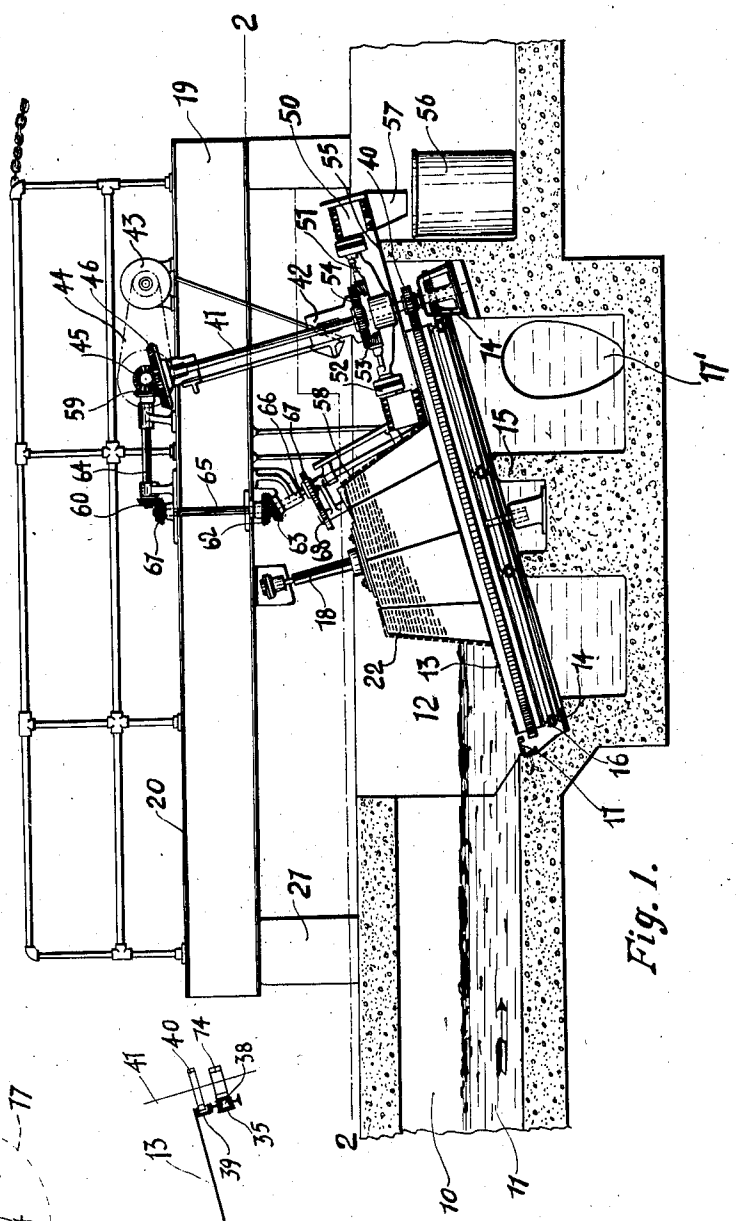

Fig. 1.

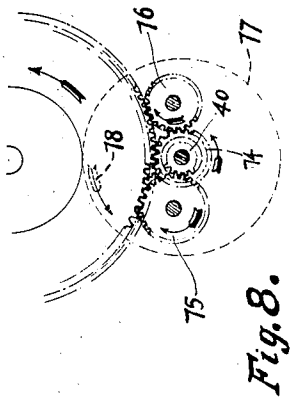

Fig. 8.

Fig. 9.

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Filed June 13, 1923 3 Sheets-Sheet 2

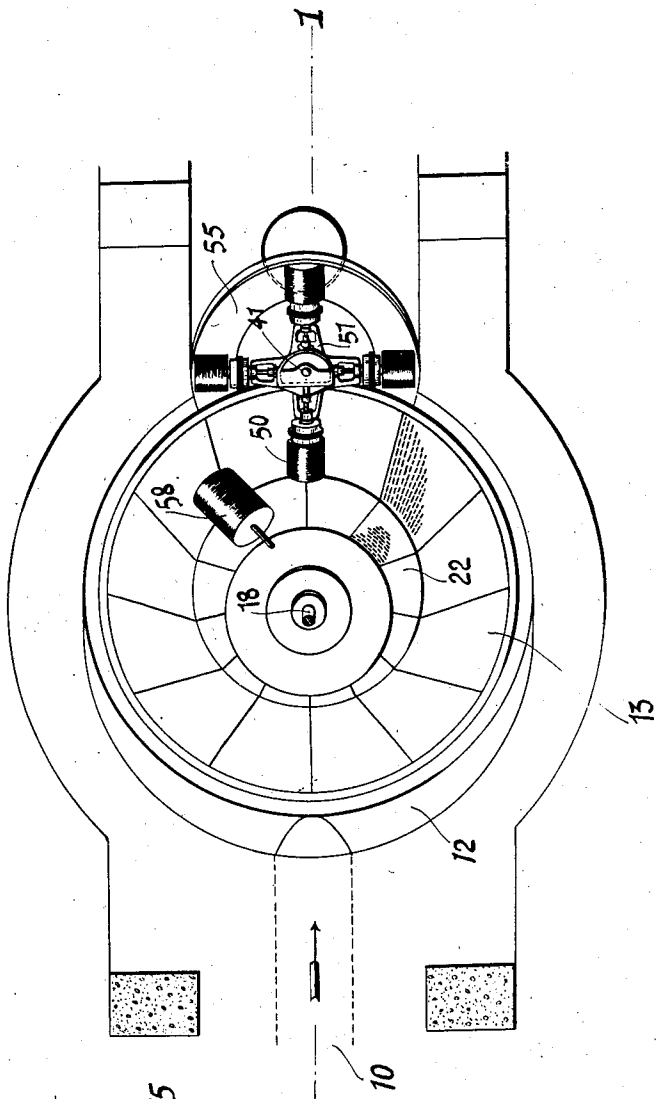

Fig. 2.

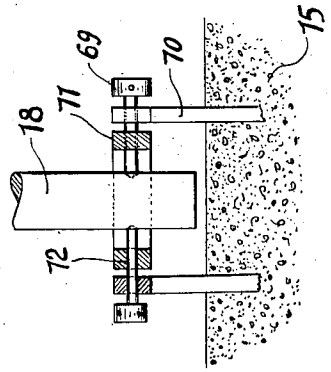

Fig. 6.

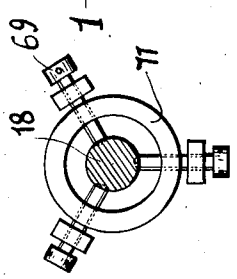

Fig. 7.

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APPARATUS FOR SCREENING SEWAGE AND OTHER MIXTURES OF LIQUIDS AND SOLIDS

Filed June 13, 1923 3 Sheets-Sheet 3

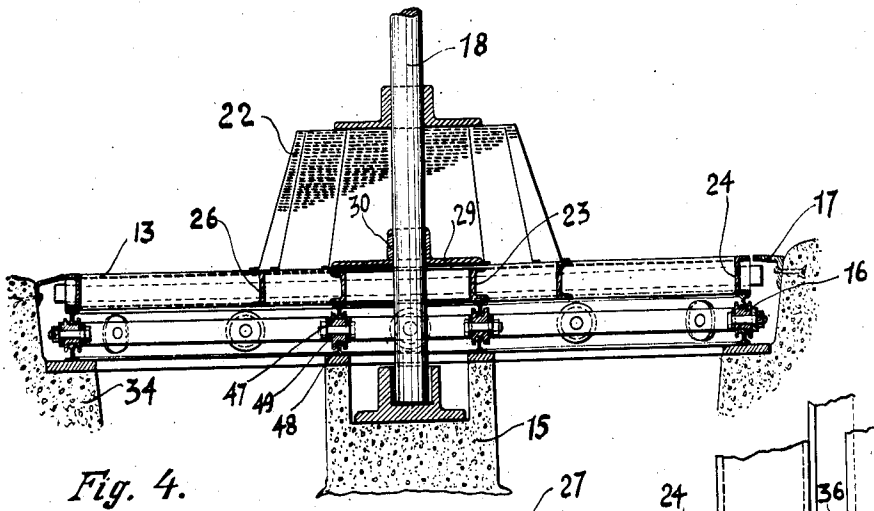

Fig. 4.

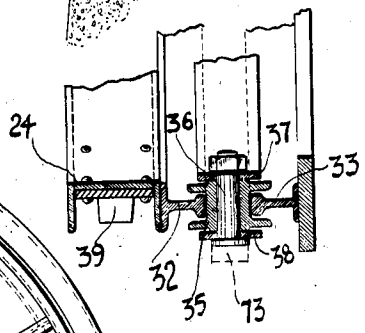

Fig. 5.

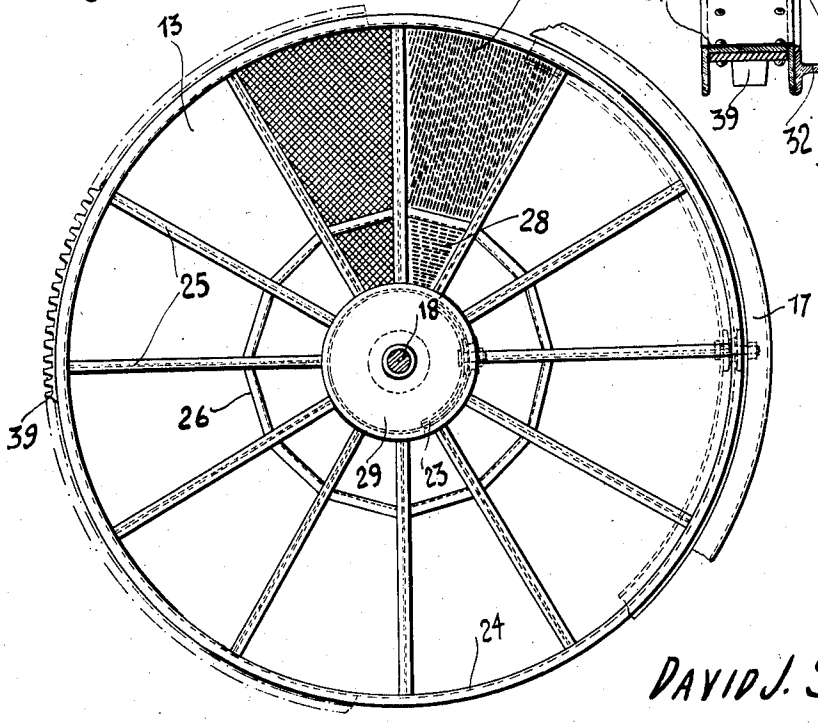

Fig. 3.

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Patented Jan. 5, 1926. 1,568,572

UNITED STATES PATENT OFFICE.

DAVID J. SHAW, OF NEW YORK, N. Y.

APPARATUS FOR SCREENING SEWAGE AND OTHER MIXTURES OF LIQUIDS AND SOLIDS.

Application filed June 13, 1923. Serial No. 645,095.

To all whom it may concern:

Be it known that I, DAVID J. SHAW, a citizen of the United States, and resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Apparatus for Screening Sewage and Other Mixtures of Liquids and Solids, of which the following is a specification.

This invention relates to screens of the inclined disk type such as are used in screening sewage and other liquids.

In the treatment of such liquids I have found that a rotating inclined disk screen with or without a surmounted conical element, and automatically and continuously cleaned by travelling brushes, can be used very effectively for the separation of solids from the liquid.

I discovered however that existing forms of such screens possess certain defects which interfere with their satisfactory use in such service and result in undue wear and depreciation of the screening machinery.

Heretofore in such screens the elements have generally been carried on frames cantilevered from a central shaft and supported only or chiefly by such shaft.

The disadvantage of such support has been that since this type of screen is designed for, and must necessarily work under, an eccentric loading, the frame is sprung downward under its working load so that the opening at the periphery is spread to more than its designed width, and thus defeats the object of the screen, by permitting relatively large objects to pass through the widened openings.

A further disadvantage has been that hard objects, such as rags, sticks and the like, have entered the widened opening and, by friction, have worn the edge of the screen so that the peripheral opening has been permanently widened.

A still further disadvantage has been that the eccentric loading, combined with the distortion caused by the springing downward of the frame, have resulted in undue wear on the bearings of the screen and the consequent serious shortening of the useful life of the apparatus.

One of the chief obstacles in eliminating the principle of the cantilever screen, and the substition of a peripherally supported frame has been the difficulty of devising a frame having peripheral and central supports and which would afford sufficient workable space for the attachment of radial members heavy enough to carry the necessary loads without using an undue weight of metal and incurring excessive cost.

It is an object of my invention to overcome these disadvantages by providing a strong and rigid support which will prevent the springing downward of the frame and consequent widening of the peripheral opening and which will also avoid the eccentric strain and undue wear under the conditions which this type of screen is normally used.

It is a further object of my invention to provide a supporting frame of such construction as to be readily adaptable by men of ordinary skill in the art to screens of any desired diameter and for any desired loading.

Another object of my invention is to provide a support which will be simple, rugged, durable and fool-proof, and which cannot get out of order either by ordinary wear or neglect.

Still a further object of this invention is to provide an apparatus of the mentioned character which will be easily and securely rotated, efficiently and constantly cleaned and conveniently adjusted to its best working position, by simple and effective means.

With these and other objects in view, my invention consists in the arrangements and combinations of parts hereinafter more fully described and specifically pointed out in the appended claims.

While I have perfected my invention for use in the treatment of sewage, I am aware that it is useful in screening other liquids containing solids and hence I do not limit myself to processes involving the treatment of sewage alone.

In the accompanying drawings:

Fig. 1 is a longitudinal sectional view of my improved rotary sewage screen, assembled, the section being taken substantially on the line 1—1 of Fig. 2.

Fig. 2 is a horizontal sectional view of

my apparatus, the section being taken on the line 2—2 of Fig. 1.

Fig. 3 is a plan view of the screen proper, showing portions of the closing ring applied therearound.

Fig. 4 is a cross sectional view of the assembled screen,

Fig. 5 is a sectional view of the running mechanism employed at the periphery of the screen,

Figs. 6 and 7 are sectional elevation and plan view, respectively, of the adjusting mechanism employed in connection with the shaft of my screen, while

Figs. 8 and 9 are diagrammatic plan and sectional views, respectively, of an improved drive for my rotary screen.

Referring now more closely to the drawings, the numeral 10 indicates the inflow of the raw sewage 11 which will be screened and the solid contents removed in the preferably circular basin 12. The screen 13 is applied in said basin 12 in an inclined position, resting partly on the ledge 14 at the periphery of it and partly on column 15, at the center of the same. Rolling means 16 are interposed between the screen 13 and the ledge 14 and pillar 15, respectively, while the periphery of the basin 12 carries the closing ring or bridge member 17, cooperating with the screen 13 and insuring that no liquid may pass from the inflow channel 10 to the outflow channel 17' at the opposite end of the basin, except through the screen. A shaft 18 is applied to the center of my screen, being fastened at the lower end to the pillar 15 and at its upper end to the superstructure of my device, consisting of girders 19 and bridge 20, resting on the concrete pillars 21.

My screen proper is preferably of a circular flat construction and may have a central truncated cone screening element 22, superimposed thereon. The frame work of my rotatable and peripherally supported screen comprises a central hub structure 23 (Figs. 3 and 4) made of heavy channel iron, an outer ring 24, also made of channel iron, and equi-spaced radial I-beams 25, connecting said hub and the outer ring. Spacedly from the hub structure 23, the I beams 25 are rigidly held in their equi-spaced positions by reinforcing members 26 arranged in substantially circular order as shown. Screen elements proper 27 and 28 are secured to the I-beams 25, reinforcing members 26 and to the inner and outer rings 23 and 24, respectively, and they may have further supporting members placed underneath them and secured into said structural elements. A circular plate 29 may cover the central portion of my screen structure and may be made with a central hub or bearing 30 for the reception therethrough of a shaft, non-rotatable, whose upper and lower ends are secured in any suitable manner in the bridge structure and the central concrete pillar 15, respectively, as referred to hereinbefore, and whose sole purpose is to keep my rotatable screen structure in the desired inclined and central position for purposes hereinafter to appear.

The outer ring 24 is secured upon a ring 32 comprising an inverted rail. Below the rail shaped ring 32 is a similarly shaped ring 33 of the same size, arranged with its base mounted upon a ledge 34 (Fig. 4), said ledge being preferably formed integral with the concrete wall of the basin 12. This ledge, it will be noted, is inclined towards the inlet channel 10, the degree of inclination being such as to incline the entire screen structure in the manner necessary to receive the incoming raw sewage 11 to the best advantage. Rollers 35 are placed between the confronting heads of the rail rings 32 and 33, said rollers being equi-spaced and each rotatably mounted on a pin 36, secured into and carried by two concentric rings 37 and 38.

My screen structure 13 may easily rotate on rollers 35 and a toothed ring 39 is secured to the periphery of the channel ring 24 in order to provide means for rotating the screen structure. As best shown in Fig. 1, the toothed ring 39 is in mesh with the gear 40 fast on shaft 41, operatively secured in casting 42 made fast in bridge 20. The shaft 41 is driven from an electric motor 43 through the instrumentalities of a belt 44 and beveled gears 45 and 46.

As best shown in Fig. 4, I also may employ a central supporting roller structure similar to the one hereinbefore described and comprising the rail shaped rings 47 and 48 between which are interposed the equi-spaced rollers 49, mounted on pins secured in two concentric rings as in the previous instance. This central supporting structure is located, it will be noted, directly below the hub ring 23 and on top of a central concrete pillar 15, built up in the center of the basin 12.

Thus mounted on outer and inner roller structures and inclined towards the incoming raw sewage, my screen structure receives and carries the solid matter to its highest point where I locate a set of rotary brushes 50, adapted to scrub my screen clean and to remove the solid matter therefrom. Said rotary brushes 50 are arranged on the arms of a spider 51, fast on shaft 41 and rotating therewith. The shafts of said brushes 50 are further driven by gears in gear boxes 52, said gears receiving motion through bevel gears 53, in mesh with stationary bevel gear 54, secured to the supporting casting 42, thus insuring a double rotation to the brushes 50, first around the axis of shaft 41 and secondly, around their

own shafts. The screened solids are removed by the rotating brushes 50 from my screen structure 13 to a stationary platform 55 (Fig. 2) whence they will be dropped into the container 56, through the opening 57.

In case I employ the superimposed central truncated cone screen 22 in connection with my rotary screen, a further rotary brush 58 may be employed for scrubbing and cleaning the same and for removing the solid matter deposited thereon. The scrubbing brush 58 may be driven from the same electric motor 43 by the use of additional bevel gears 59, 60, 61, 62, 63 on shafts 64 and 65, and counter shaft 66, from which motion is transmitted to brush 58 through the gears 67 and 68.

In Figs. 6 and 7 I illustrate means whereby adjustably to center my screen structure on its supporting tracks in relation to the circular ring bridge member 17. Here the lower end of shaft 18, instead of being held in a bearing as in Fig. 4, is held by three heavy set-screws 69, arranged at right angles thereto and threaded through the eyes of bolts 70, set in the concrete pillar 15. In order to keep the set screws 69 and the eye bolts 70 in an exact position while the concrete is fresh or not set, I employ the heavy cast iron ring 71, placed concentrically with the shaft and receiving the set screws 69 through tapped holes 72.

In Figs. 8 and 9, I illustrate diagrammatically an improved method for driving my rotary screen. Screen 13 carries toothed ring 39 while the outer ring 38 carrying the rollers 35 (Figs. 5 and 9) may have a similar toothed ring 73 on its outer circumference. Both toothed rings are driven by the shaft 41 through the gears 40 and 74, respectively. The ring carrying the rollers being thus rotated simultaneously with the screen structure 13 in the same direction and in any desired speed relation thereto. To secure the desired speed relation between the screen proper and the rings carrying the rollers and also to arrive at the necessary reduction of speed from shaft 41, I preferably employ the intermediate gears 75 and 76 to transmit motion to the screen 13 and the roller ring 38, respectively. (Fig. 8.) The dotted circle 77 and the arrow 78 represent the path and direction of rotation of brushes 50.

Having thus described my invention, what I claim as new and want to protect by Letters Patent of the United States, is:—

1. In sewage treatment apparatus, the combination with a basin, formed with an inclined interior support, of a pair of circular track rails having antifriction rollers therebetween, the lower one of said rails being arranged upon said support, a screen structure supported upon the top track rail to turn therewith as a unitary structure, and means for imparting rotary movement to said screen structure.

2. In sewage treatment apparatus, the combination with a basin formed with an inclined interior support, of a pair of circular track rails having antifriction rollers therebetween, the lower one of said rails being arranged upon said support, a screen structure supported upon the top track rail to turn therewith as a unitary structure, a central pillar in said basin having an inclined top, a second pair of circular track rails having antifriction rollers therebetween, said screen structure being further supported by the top rail of said second pair of rails, and means for imparting rotary movement to said screen structure.

3. In sewage treatment apparatus, the combination with a basin formed with an inclined internal support, of a pair of circular track rails having antifriction rollers disposed therebetween the lower one of said rails being arranged upon said support inclined therewith, a toothed ring mounted upon the top track rail, a screen structure supported at its rim upon said toothed ring, said top rail, toothed ring and screen structure being rotatable as a single structure upon the antifriction rollers, and means engaging said toothed ring for imparting rotary movement thereto.

4. In sewage treatment apparatus, the combination with a basin formed with an inclined interior support, and a central pillar, of a pair of track rails having antifriction rollers therebetween the lower one of said rails being arranged upon said support inclinedly therewith, a toothed ring mounted upon the top track rail, a wheel-shaped framework supported at its rim upon said toothed ring and provided with a central hub, comprising a bearing screen element arranged between the spoke elements of said framework, an overhead beam, and a shaft extending through said bearing and having its top and bottom ends fitted in said beam and said central pillar, respectively.

5. In sewage treatment apparatus, the combination with a basin formed with an inclined internal ledge, of a pair of circular track rails the lower one of said rails being mounted on said ledge inclinedly therewith and said rails being arranged one over the other with antifriction rollers therebetween, a ring connected with and holding said antifriction rollers in equispaced relation, a screen structure supported upon said top rail to turn therewith as a unitary structure, and means for driving said screen structure and said roller connected structure independently of each other.

6. In sewage treatment apparatus, the

combination with a basin formed with an inclined interior ledge, of a pair of circular track rails the lower one of said rails being mounted on said ledge inclinedly therewith and said rail being arranged over one another with antifriction rollers engaged therebetween, concentric ring plates connecting and holding said anti-friction rollers in spaced relation, the outer ring plate being toothed, a toothed ring mounted upon the top track rail, a screen structure supported at its rim upon said toothed ring, means in connection with said outer ring plate for driving the connected rollers as a unitary structure, and means connected with the toothed ring for driving the same in conjunction with the top track rail and the screen structure as a unitary construction.

7. In a sewage treatment apparatus, the combination with a basin formed with an inclined interior ledge and an inflow opening through the wall of said basin above said ledge, of a pair of circular track rails the lower one of said rails being mounted on said ledge inclinedly therewith and said rails being arranged one over the other with antifriction rollers therebetween, a ring connected with and holding said antifriction rollers in spaced relation, a screen structure supported upon said top rail to turn therewith and provided with a central hub constituting a bearing, a pillar rising centrally from said basin, an overhead beam, a shaft extending through said bearing and having its top end engaged in said beam and its bottom end adjustably connected with said pillar whereby to adjust said ring connected rollers and supported structure relatively to the substantially circular opening formed by said ledge.

8. In sewage treatment apparatus, the combination with a basin formed with an inclined interior support and an inflow opening through the wall of said basin above said support, of a pair of circular track rails the lower one of said rails being mounted on said support inclinedly therewith and said rails being arranged one over the other with antifriction rollers therebetween, a ring connected with and holding said antifriction rollers in spaced relation, a screen structure supported upon said top rail to turn therewith and provided with a central hub constituting a bearing, a pillar rising centrally from said basin, an overhead beam, a shaft extending through said bearing and having its top end engaged in said beam and its bottom end adjustably connected with said pillar whereby to adjust said ring connected rollers and supported structure relatively to a substantially circular opening formed by a closing ring member on the wall of said basin bridging the opening between said wall and the rotating structures.

9. In sewage treatment apparatus, the combination with a basin formed with an inclined interior support, of a circular track rail mounted on said support, anti-friction rollers supported by and travelling on said circular track, a second circular track rail supported by and travelling on said anti-friction rollers, a screen structure supported on the top track rail so as to turn therewith as a unitary structure, and means for imparting rotary movement to said screen structure.

Signed at New York, in the county of New York and State of New York, this 11th day of June A. D. 1923.

DAVID J. SHAW.