No. 696,913.

Patented Apr. 1, 1902.

W. H. SULLIVAN.

CONCENTRATOR.

(Application filed Aug. 24, 1900.)

(No Model.)

2 Sheets—Sheet 1.

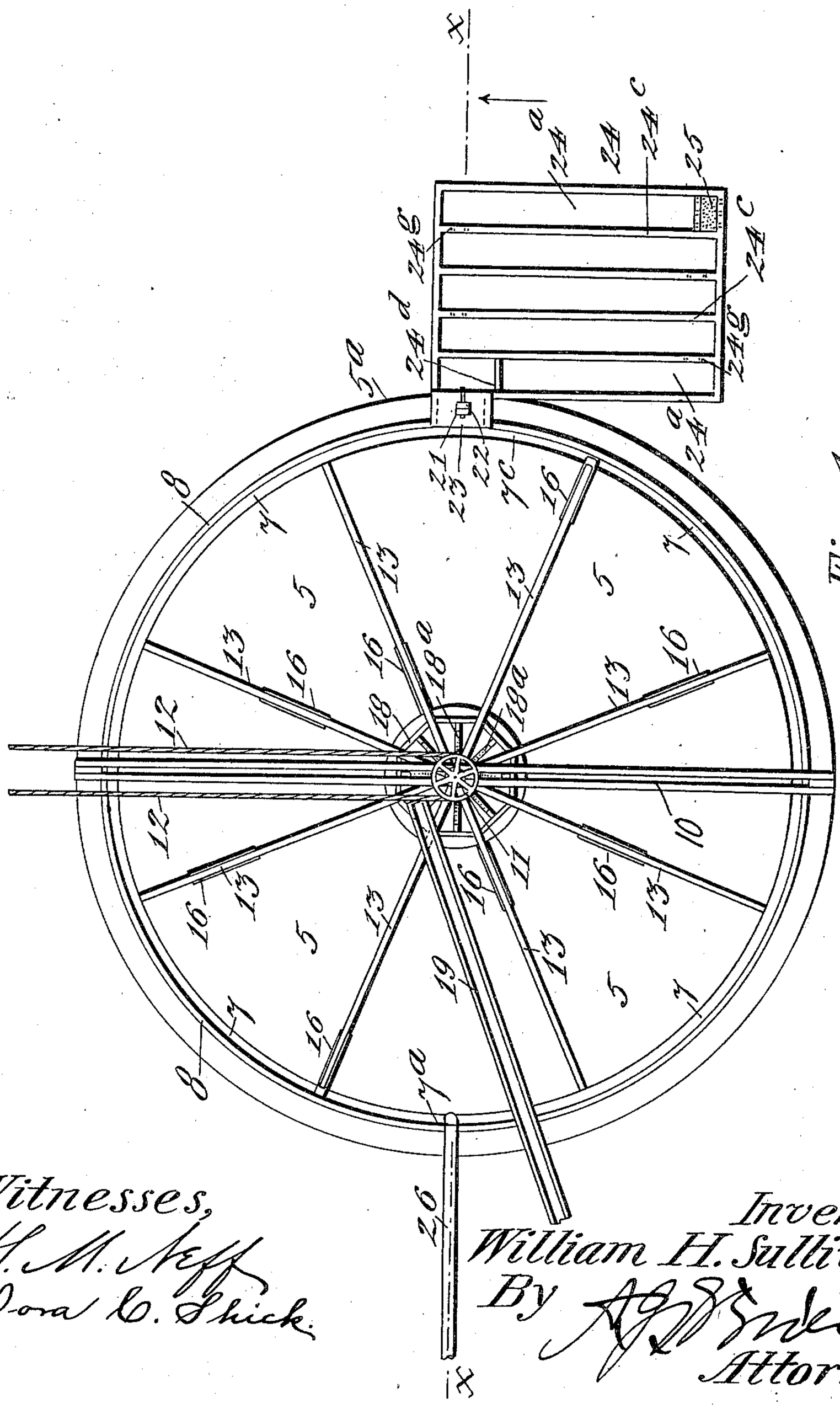

Fig. 1.

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2 Sheets—Sheet 2.

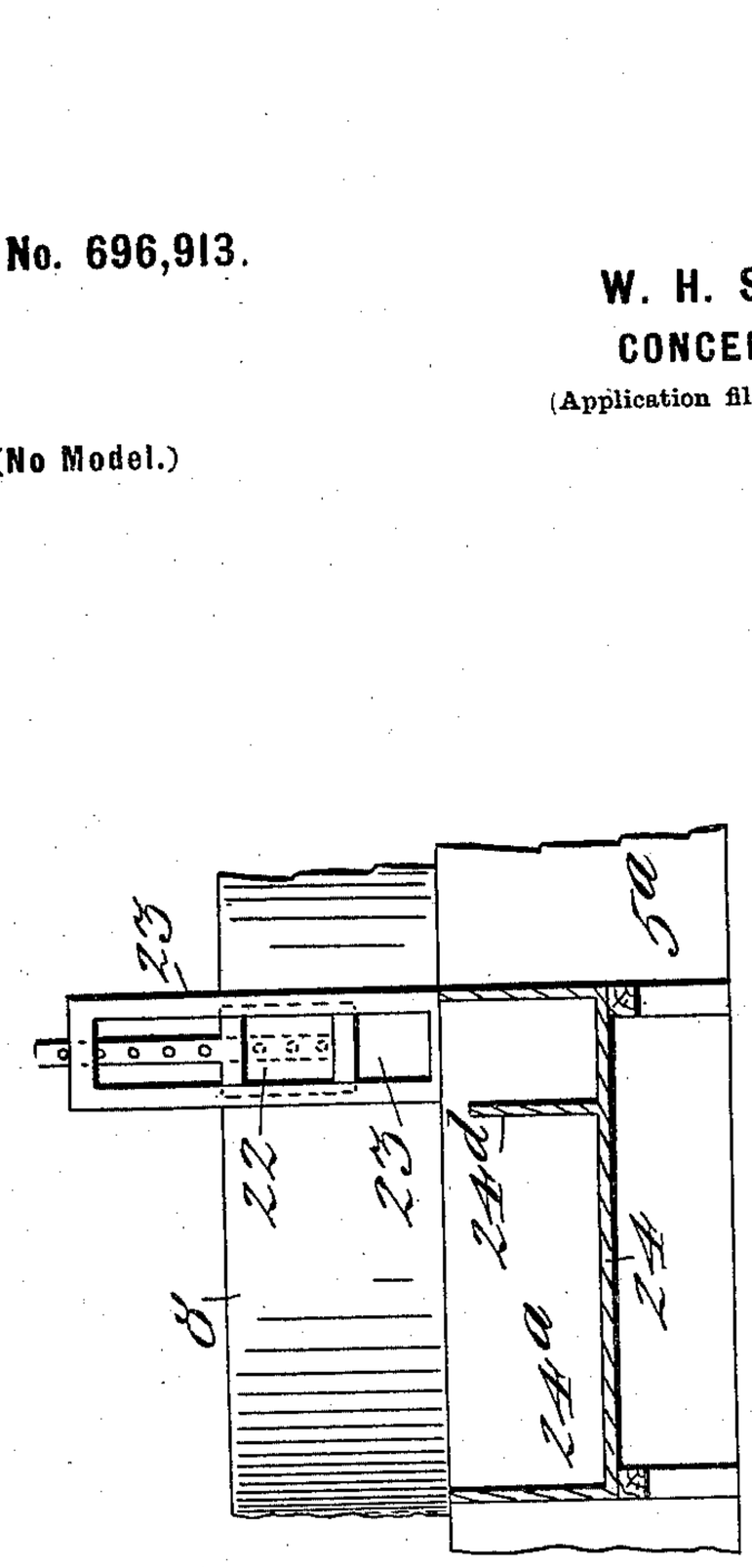

Fig. 3.

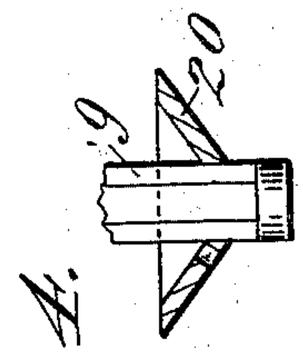

Fig. 4.

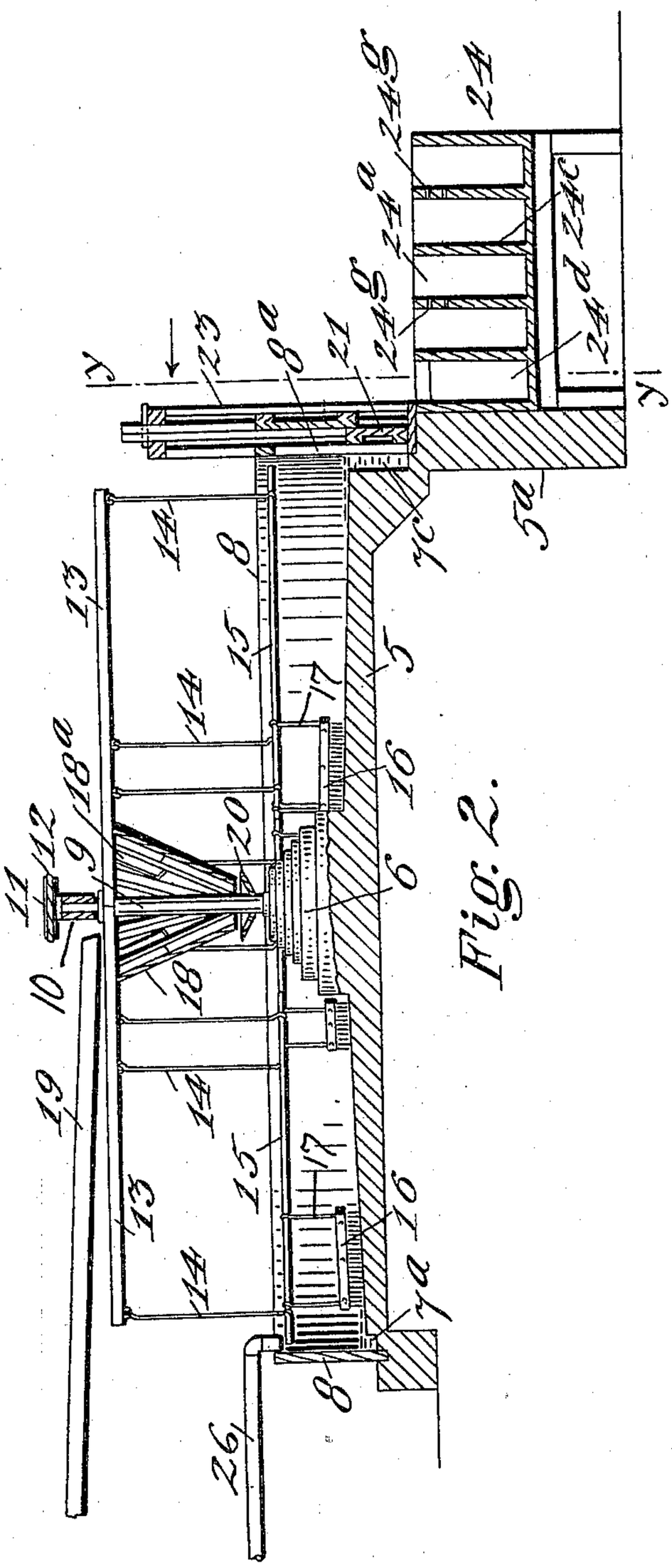

Fig. 2.

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UNITED STATES PATENT OFFICE.

WILLIAM HENRY SULLIVAN, OF DENVER, COLORADO, ASSIGNOR OF FORTY-NINE ONE-HUNDREDTHS TO OSCAR C. REITZE, GEORGE T. REITZE, AND C. B. RICHMOND, OF DENVER, COLORADO.

CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 696,913, dated April 1, 1902.

Application filed August 24, 1900. Serial No. 27,904. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM HENRY SULLIVAN, a citizen of the United States of America, residing at Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Concentrators; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in concentrators; and it consists of the features, arrangements, and combinations hereinafter described and claimed, all of which will be fully understood by reference to the accompanying drawings, in which is illustrated an embodiment thereof.

In the drawings, Figure 1 is a top or plan view of my improved concentrating apparatus. Fig. 2 is a vertical section taken through the same on the line $x\,x$, Fig. 1. Fig. 3 is a section taken on the line $y\,y$, Fig. 2, viewed in the direction of the arrow. Fig. 4 is a fragmentary view of the shaft, showing the funnel-shaped device on a larger scale.

The same reference characters indicate the same parts in all the views.

Let the numeral 5 designate a circular table having a pedestal 6 in its center and a circumferential trough at its outer edge or periphery. The bottom of this trough is downwardly inclined in both directions from its shallowest part 7^a to its deepest part 7^c. (See Fig. 2.) The pedestal 6 is provided with a series of circular steps, the lowermost being largest and the successive steps diminishing in size toward the top. The surface of the table is downwardly inclined from the base of the pedestal to the trough 7. This trough is formed by an offset at the circumference of the table at one side and the wall 8 surrounding the table on the other side and extending upward a suitable distance above the inclined surface of the table.

A vertical shaft 9 is journaled at its lower extremity in the top of the pedestal and at its upper extremity in a stationary support 10, suitably mounted above the top of the wall 8. To the upper extremity of this shaft is attached a pulley 11, which is connected with a belt 12, leading from any suitable source of power for rotating the shaft. To the shaft 9, near its top, a series of radial sweeps 13 is attached, their inner extremities being made fast to the shaft, causing them to rotate therewith. To each sweep 13 is attached a pair of depending rods 14, whose lower extremities are provided with bearings in which a horizontal bar 15 is journaled, from which bar is suspended a brush or drag 16 by means of flexible supports 17, which are attached to the bar 15. Each bar is journaled in the bearings of a pair of rods 14 and adapted to be turned therein for the purpose of raising or lowering the drag 16 by winding or unwinding the flexible support 17, whereby the height of the drags may be varied to correspond with the amount of the material on the table, since the function of the drags is to engage the top of the bed of material as it accumulates on the table, whereby the water is distributed over the entire area of the table as it passes from the center outwardly, thus preventing the water from running downward toward the trough in narrow currents or streams. By distributing this outwardly-moving water over the entire area of the table the layer of water becomes thinner as it moves outwardly, since the area of the table's surface increases, and therefore the water has not sufficient volume to carry the concentrates or mineral values far from the center of the table. The drags may be composed of any suitable material adapted to perform the function stated. As the material accumulates on the table, as hereinafter explained, the bars 15 are turned in their bearings and the cords 17 wound around them. The bars 15 are sufficiently tight in their bearings to maintain their position by friction when turned at intervals to raise the drags.

To the sweeps 13 is attached a hopper 18, which rotates with the shaft and sweeps. The interior of the hopper is preferably provided with wings 18ª, adapted to be engaged by the water and pulp as it issues from a spout or chute 19 for the purpose of rotating the hopper, the sweeps, and suspended drags. When there is plenty of water, the force of the pulp discharged into the hopper will be sufficient to operate the apparatus without the pulley and belt and in any event will aid such operation and lessen the external power necessary for operating purposes. Fast on the shaft 9 below the bottom of the hopper is a funnel-shaped device 20, adapted to break the force of the falling pulp as it leaves the hopper and cause it to fall gently to the pedestal through an opening in the funnel.

In the portion of the wall 8 corresponding with the deepest part 7ᶜ of the trough is formed an opening 8ª, which, as shown in the drawings, is controlled by two vertically-sliding gates 21 and 22, located adjacent each other and supported in a frame 23. The inner gate 21 is of sufficient height to reach from the bottom of the trough to the plane of the outer edge of the table. Hence this gate normally forms the outer wall of the trough at the opening 8ª in the wall 8. The gate 22 when in its lowermost position projects a short distance above the top of the trough and is gradually raised as the material accumulates on the table.

Outside of the base 5ª, which forms the support for the table 5 and the wall 8, is located a settling-tank 24, into which the overflow from the table at the opening 8ª is discharged for the purpose of catching the slimes or lighter mineral particles which either float upon or are held in suspension by the water. This tank is separated into compartments 24ª by partitions 24ᶜ. The compartment nearest the table is provided with a cross-partition 24ᵈ of less height than the partitions 24ᶜ. The partitions 24ᶜ are provided with openings near their upper edges to allow the tailings which enter the tank to pass from one compartment to another. At one extremity of the compartment most remote from the table is located a filter 25, adapted to strain the water as it leaves the tank, thus preventing the escape of any values which have not settled in the compartments.

In describing the operation of my improved concentrator it must be assumed that the hopper 18, together with the sweeps 13, the drags 16, and their connections, is rotating more or less slowly, as desired, the speed being dependent upon the material under treatment. This material in the form of pulp is discharged into the hopper 18 and passing thence to the funnel 20 escapes to the top of the pedestal 6 and passes thence down the steps thereof to the table. The fall of the pulp from one step to the other of the pedestal and finally to the table produces sufficient agitation to prepare the material for the separation which takes place on the table. The drags 16 are of sufficient length and so arranged as to sweep the entire surface of the table twice during each revolution. As before intimated, these drags distribute the pulp as it leaves the base of the pedestal and cause it to spread over the entire surface of the table. At the outer edge of the table the force of the pulp's movement is comparatively little. Before the pulp has reached the outer portion of the table's surface sufficient water has been discharged from the conduit 26 into the trough to fill the latter and overflow the outer edge of the table. (See Fig. 2.) The values are caught in the form of concentrates on that portion of the table immediately surrounding the pedestal, while the gangue is carried downwardly and checked by the overflow of the water at the table's outer edge adjacent the trough. As the operation continues the material accumulates in a bed upon the table, the richest concentrates being nearest the pedestal, while the material diminishes in value toward the outer edge of the table. Sufficient water is allowed to remain on the table to form a liquid wall on its outer edge between the accumulating bed of gangue and the wall 8, whereby the gangue is prevented from filling the trough. The gate 22 is kept at such a height as to allow the superfluous water to overflow to the settling-tank. As the depth of the material increases on the table the gate 22 is raised. After sufficient material has accumulated on the table and it is desired to clean up, the gate 21 is raised and a stream of water from any suitable source turned on the outer surface of the bank of material on the outer portion of the table. This material consists of the gangue and is washed away through the trough 7 and discharged at the opening 8ª into a suitable chute or trough, (not shown,) and which may be of any suitable construction to prevent the gangue from passing into the settling-tank. After the gangue has been removed the bank of material which may be termed "middlings," is next in order on the table, being located between the gangue and the concentrates. The middlings may be removed and again discharged to the table for retreatment. The concentrates may be removed in any suitable manner. During the removal of the gangue the necessary water may be introduced by way of the conduit 26.

Having thus described my invention, what I claim is—

In combination, a fixed table having an inclined surface with a fixed trough about the same deeper at one point than at another, a pair of gates at the deeper part of the trough, said gates being in different planes, a pedestal 6 provided with a series of steps, a vertical shaft extending from said pedestal and

urnaled therein, the stationary frame 10 in which the said shaft is journaled at its upper end, the sweeps connected to the shaft, the drags carried by the sweeps to move over the table, a hopper carried by the sweeps and surrounding the shaft, said hopper directing the material onto the steps of the pedestal, a trough for directing the material to the hopper and means for driving the shaft, substantially as described.

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

WILLIAM HENRY SULLIVAN.

Witnesses:

DORA C. SHICK,

MARY C. LAMB.