

H. L. BLACK.
CONCENTRATOR.
APPLICATION FILED NOV. 13, 1909.

956,034.

Patented Apr. 26, 1910.

2 SHEETS—SHEET 1.

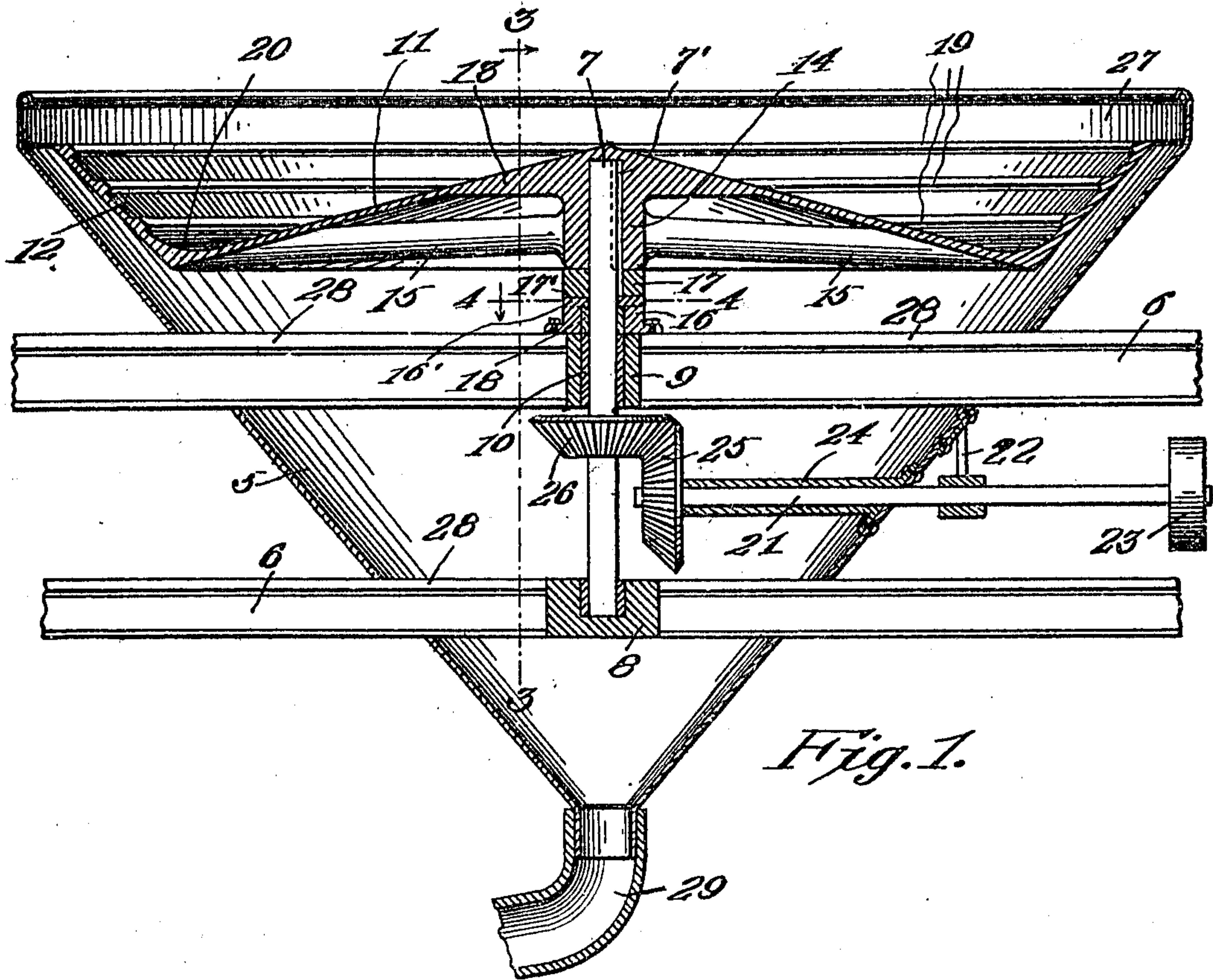


Fig. 1.

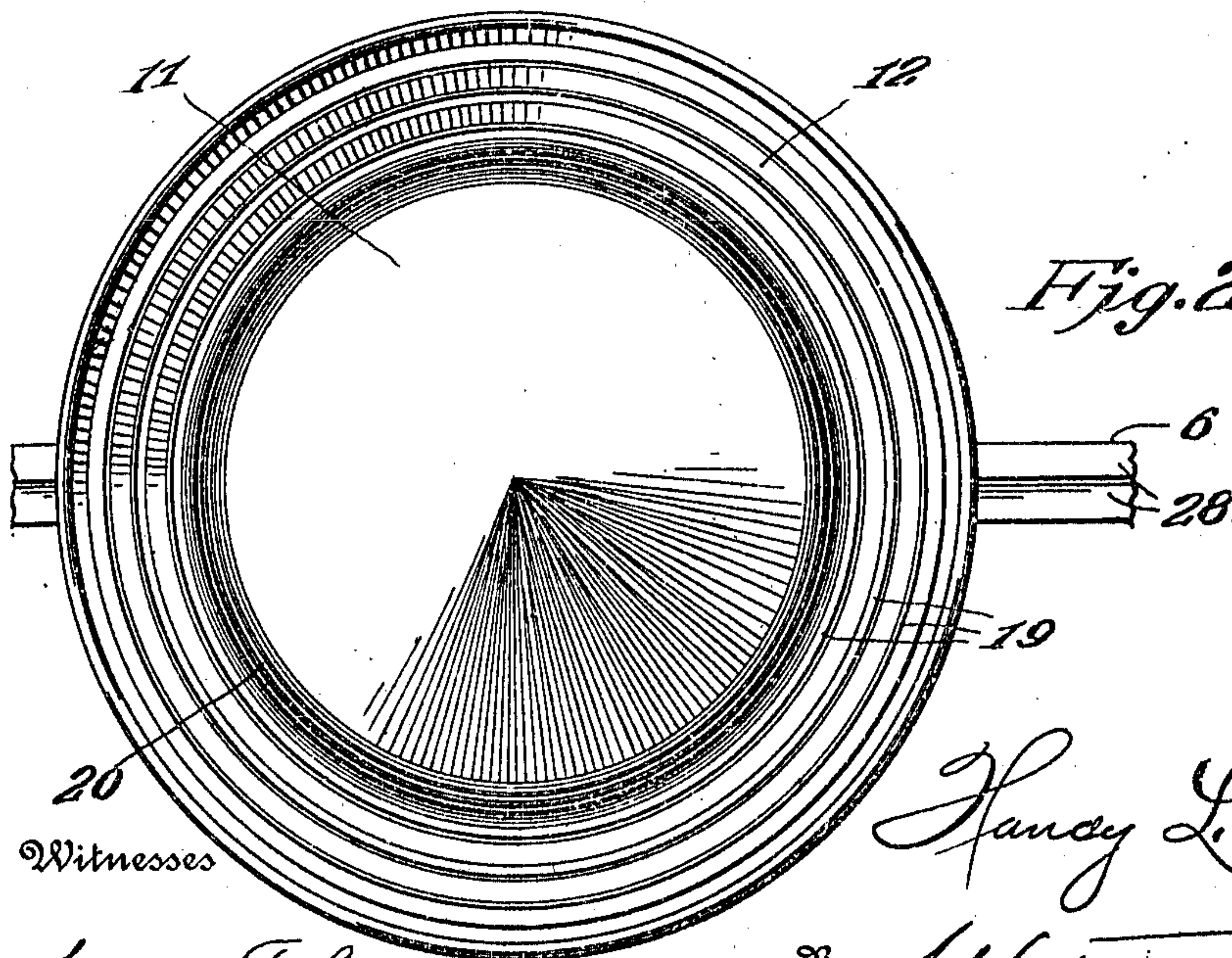


Fig. 2.

Witnesses

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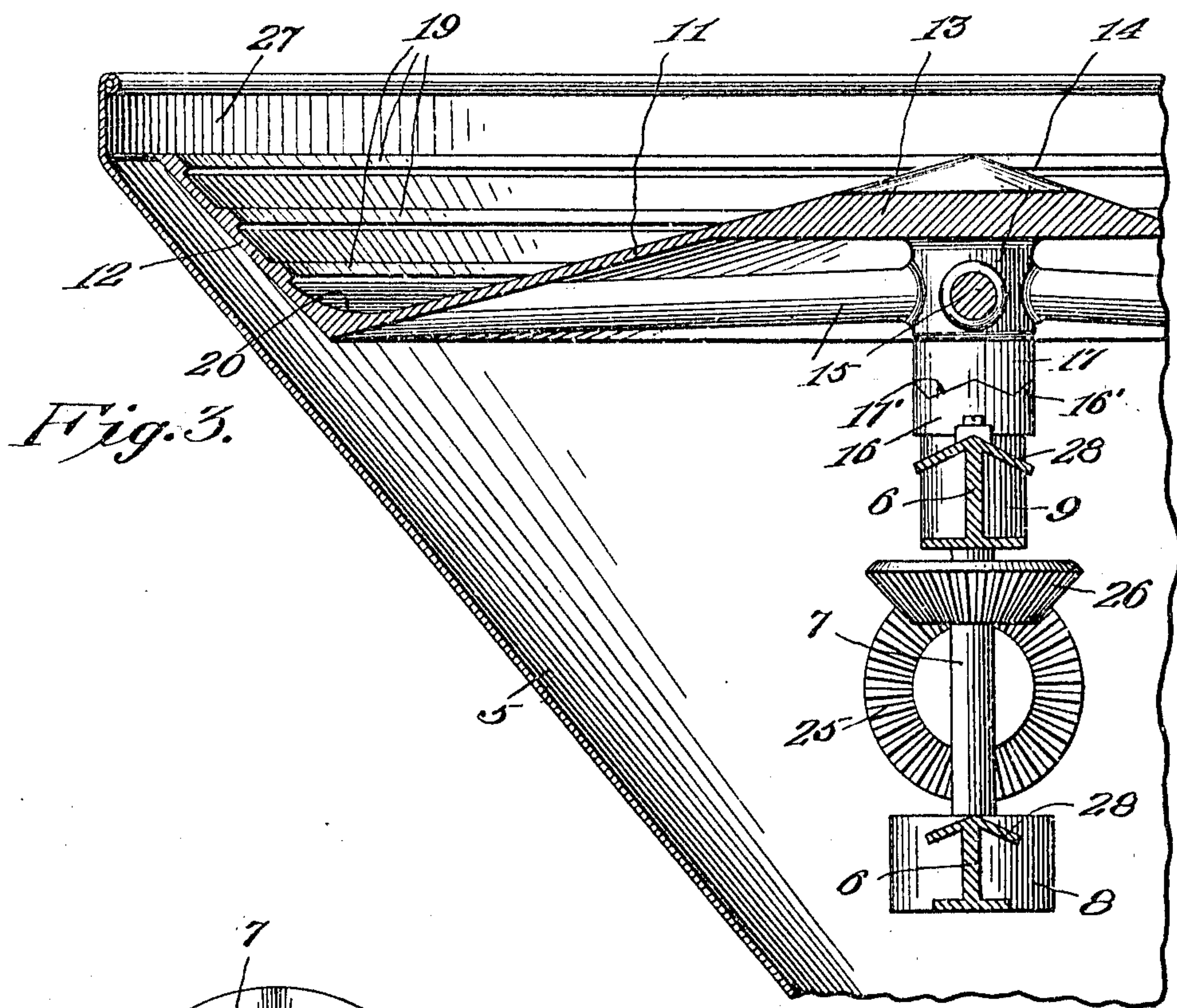


Fig. 3.

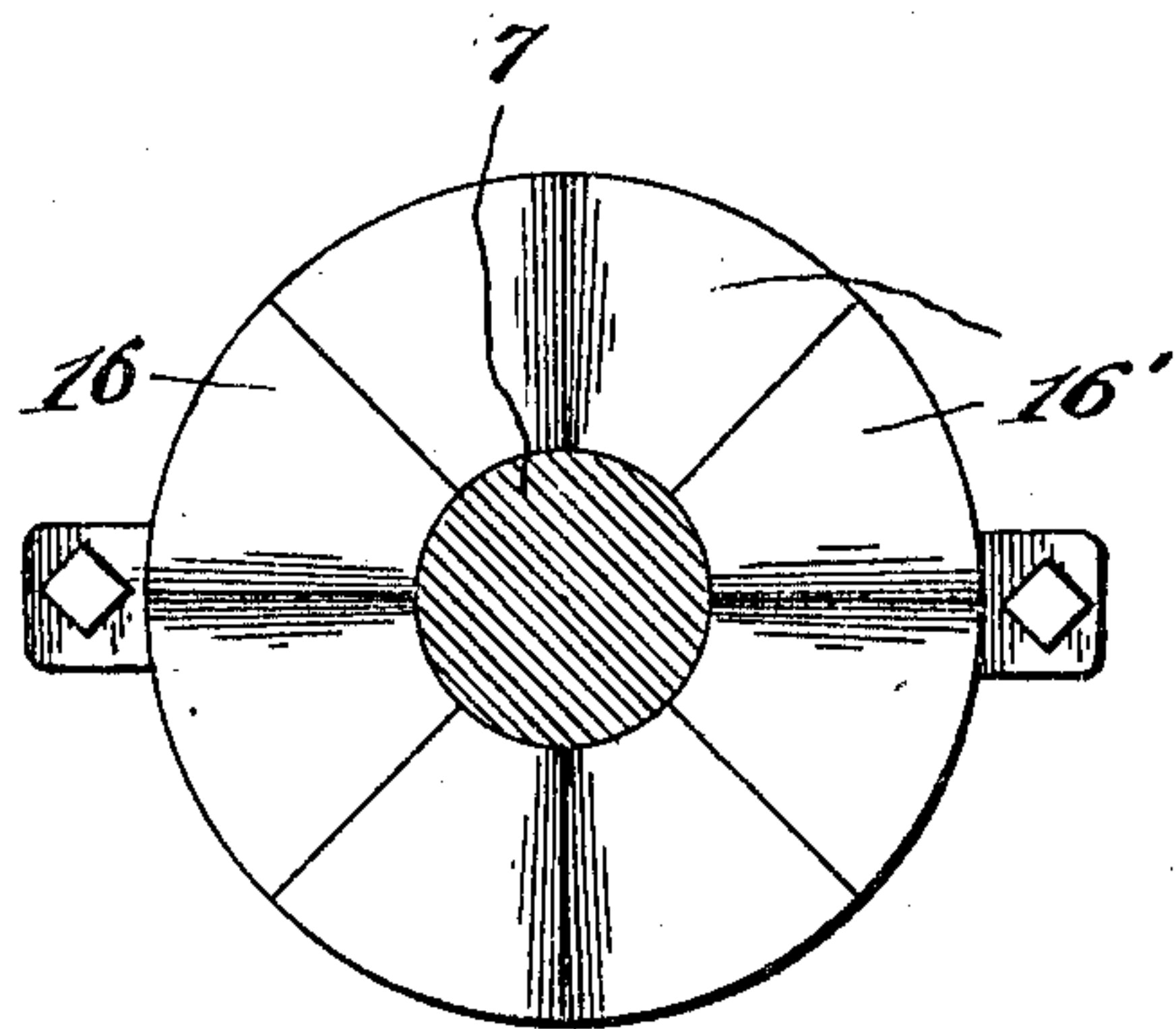


Fig. 4.

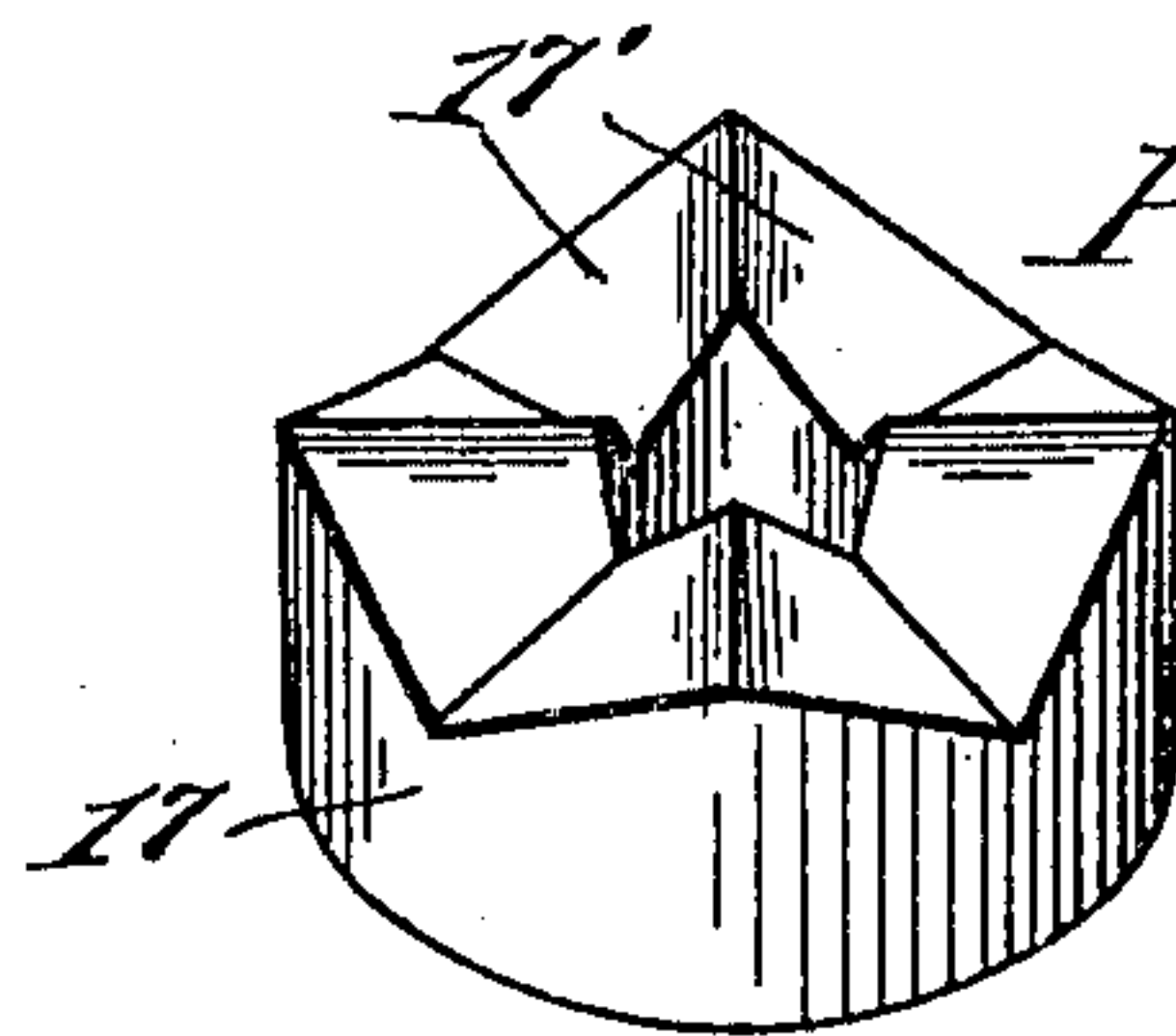


Fig. 5.

Witnesses

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UNITED STATES PATENT OFFICE.

HANCEY L. BLACK, OF CENTRAL, TERRITORY OF NEW MEXICO.

CONCENTRATOR.

956,034.

Specification of Letters Patent.

Patented Apr. 26, 1910.

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To all whom it may concern:

Be it known that I, HANCEY L. BLACK, a citizen of the United States, residing at Central, in the county of Grant and Territory of New Mexico, have invented certain new and useful Improvements in Concentrators, of which the following is a specification, reference being had to the accompanying drawings.

10 This invention relates to certain new and useful improvements in centrifugal concentrators and has for its object to provide a very simple device of this character whereby the gangue, tailings and other residual products may be separated from the ore by the centrifugal force of a revoluble disk upon which the ore is deposited.

15 Another object is to provide means whereby the body of ore may be vertically vibrated upon said disk during each revolution thereof to more thoroughly separate the precious metals from the minor earth products.

20 A further object resides in the provision of a revoluble disk mounted upon the upper end of a vertically positioned shaft, said shaft and disk being disposed within a funnel, the body of said disk having a downward slope from its center and an angularly extending circumscribing flange portion formed with a plurality of concentric ribs providing riffles thereon behind which the particles of ore are adapted to lodge and be confined, while the baser materials are thrown beyond the periphery of said disk and deposited in the funnel from which they are carried off by a suitable discharge pipe connected to the lower end thereof.

25 A still further object is to provide an ore concentrator which will be highly efficient in its operation, is durably constructed and which requires but a small amount of power.

30 With these and other objects in view, the invention consists of the novel construction, combination and arrangement of parts hereinafter fully described and claimed, and illustrated in the accompanying drawings, in which—

35 Figure 1 is a vertical section through an ore concentrator embodying my improvements; Fig. 2 is a top plan view thereof; Fig. 3 is an enlarged section taken on the line 3—3 of Fig. 1; Fig. 4 is a section taken on the line 4—4 of Fig. 1; and Fig. 5 is a detail perspective view of one of the agitating collars.

Referring to the drawing 5 indicates a conical funnel which may be supported in any desired manner or as shown in the drawings by means of the horizontal parallel 60 I-beams 6 which extend entirely through the funnel and support therein the vertical shaft 7. The lower end of the shaft 7 is rotatably disposed in a circular enlargement 8 integrally formed with the lower beam 6. The 65 upper beam is also provided with a circular sleeve portion 9 through which the shaft 7 extends. Within this sleeve portion a friction bushing 10 of Babbitt metal is secured.

A circular disk 11 is keyed upon the upper 70 end of the shaft 7 as shown at 7' and has vertical movement thereon the purpose of which will hereinafter appear, and as shown in Fig. 1 is inclined downwardly from its center at an obtuse angle to its longitudinal 75 portion of the disk, the same is extended outwardly and upwardly at an angle of substantially 45° to form a circumscribing flange 12 which terminates on approximately 80 the same plane with the center of said disk. The inclined body is thickened toward its center as shown at 13 and has integrally formed therewith a central hub portion 14 which is adapted to provide a bearing for 85 the shaft 7. This hub portion is connected to the inclined disk by means of a plurality of radial spokes 15 which are integrally formed with the disk and hub. Loosely disposed upon the shaft 7 and secured to the 90 upper I-beam 6 there is a collar 16, and keyed on the shaft above this collar there is a similar collar 17. The opposed faces of these collars are serrated to provide a plurality of V-shaped ribs 16' and 17' respectively, which radiate from the periphery of 95 the shaft. As will be seen from reference to Fig. 4 there are four of these ribs upon each of the collars which have interlocking engagement with each other. As the collar 100 16 remains stationary while the collar 17 revolves with the shaft 7 it will be obvious that as the inclined surfaces of the ribs engage and move upon each other, the collar 17 will be raised upon the shaft 7 which will 105 likewise raise and lower the disk 11. There will be four of such vertical vibrations of the disk during each and every revolution of the same, although it will of course be obvious that by providing a greater number 110 of ribs upon the collars, the vibratory movement of the disk may be increased or vice-

versa. The collar 16 is also provided with a sleeve or bushing 18 in its bore with which the shaft has frictional engagement.

To insure the separation of every particle 5 of the precious metal from the various residual deposits, I provide a plurality of concentric ribs 19 which are preferably formed integral with the disk. It will be noted that one of these ribs is disposed at the outer extremity of the flange 12, which is adapted 10 to catch and retain within the disk the very finest particles of metal which might otherwise be carried beyond the periphery of the disk by the centrifugal force thereof. The 15 inner inclined surface of the flange 12 is gradually merged into the sloped portion of the body of the disk, as shown at 20 where the thickness of the disk is increased and its upper surface gradually curved into the two 20 oppositely inclined surfaces. Any suitable driving means may be employed for operating the shaft 7 to rotate said disk. One of such means is shown in the drawing and comprises a laterally extending drive shaft 25 which is supported from the funnel 5 by means of the hanger 22. Upon this shaft a band wheel or pulley 23 is secured to which the power is applied from any suitable source of supply. The interior portion of the 30 shaft 21 is disposed within the sleeve 24 which is secured at one end to the funnel body. Upon the inner end of the shaft a bevel gear 25 is secured and meshes with a similar gear 26 carried by the shaft 7. The 35 upper circumscribing edge of the funnel 5 is vertically extended as shown at 27, such vertical portion projecting above the plane of the disk 11 and adapted to prevent the lighter materials from escaping over the sides of 40 the funnel but depositing them within the same exteriorly of the disk.

Upon reference to Fig. 3 it will be seen that each of the supporting I-beams 6 is provided with an upper flange 28 of substantially V-shaped cross sectional form, where- 45 by the gangue and tailings which have been separated from the ore during the concentrating process is prevented from lodging upon the I-beams. These base materials gravitate 50 downwardly within the funnel and are carried off by a discharge pipe 29 suitably secured to the lower end thereof.

In the operation of the device, the mined ore is deposited upon the center of the disk 55 in large quantities, and gravitates downwardly and outwardly toward the flange 12. As the disk is revolved, it will be moved vertically up and down upon the shaft 7 by the engagement of the serrated faces of the 60 collars 16 and 17 as previously described. This movement of the disk will vibrate the ore and tend to settle the heavier metals which it is desired to separate from the various baser products usually found in the 65 crude material. Owing to the centrifugal

force of the disk, these heavy particles of metal will be caught behind the riffles 19 and prevented from flying beyond the periphery of the disk. The lighter particles or 70 tailings will, however, be thrown from the disk and subsequently discharged from the funnel by this centrifugal force. It will be obvious that as the flange 12 is inclined with relation to the body of the disk, that the outward flow of the material over the riffles 75 19 would be retarded by said riffles were it not for the provision of the conically formed central body portion of the disk. It is by this peculiar construction that the proper operation of the machine is attained. When 80 the ore is deposited upon the center of the revolving disk, it will quickly gravitate downwardly and outwardly therefrom onto the upwardly inclined circumscribing riffled flange, and as the point of juncture of 85 the conical body portion and the flange is concaved, as at 20, and forms a perfectly smooth unbroken surface between the two portions of the revolving disk, the movement of the material onto the flange will 90 not be intercepted or retarded to any appreciable extent, and it will strike the first of the concentric riffles with the accumulated momentum imparted thereto by the centrifugal force due to the rotation of said disk. 95 Thus the outward movement of the material upon the inclined flange is assured so that the successive riffles will catch and retain the precious metal and the baser products will be finally discharged over the upper edge 100 of the disk. If the body of the disk were flat, the centrifugal force would not be sufficient to separate the ore, and by forming said disk with the comparatively steep inclined body, the angular circumscribing 105 flange may be increased in width so as to permit of the provision of a number of the riffles thereon without impairing the efficiency of the separator or overcoming the desired result of the centrifugal action. In this 110 manner every particle of the precious metal may be saved while the baser minerals are completely separated therefrom and carried out. The outer circular riffle 19 on the disk flange 12 will catch and retain the most 115 minute particles of metal which are often lost and carried off with what is known as mineral black sand in the ordinary process of washing the ore. Thus a considerable saving is attained while the desired result is 120 very speedily accomplished.

From the foregoing it will be seen that I have provided a centrifugal ore concentrator which while of comparatively simple construction is admirably designed for the 125 purpose in view, requiring a minimum amount of power for its operation. The various parts are easily manufactured and the whole device may be assembled and produced at a very moderate expenditure. The 130

capacity of the disk would preferably be about two tons although it is to be understood that this capacity may be greatly increased with a proportional increase in the proportions of the respective operative elements.

Numerous other minor modifications may be resorted to within the scope of the claims without departing from the spirit or sacrificing any of the advantages of the invention.

Having thus described the invention, what is claimed is:

1. In an ore concentrator, the combination of a revoluble disk, said disk having a shallow conical body portion, and an upwardly and outwardly extending angular circumscribing flange terminating on a plane in horizontal alinement with the center of the disk, a plurality of concentric
ruffles carried by the disk flange, means for vertically vibrating the disk, and means for revolving said disk.

2. In an ore concentrator, the combination of a vertically positioned shaft, a disk keyed upon the upper end of said shaft and vertically movable thereon, said disk having a body portion downwardly inclined from its center, and outwardly and upwardly inclined at an obtuse angle to the body portion to provide a circumscribing flange having its upper edge disposed in a plane in alinement with the center of said disk, a plurality of concentric ribs formed on the inner surface of said flange, means for imparting a series of vertical vibrations to the disk during each revolution thereof, and a power shaft geared to said vertical shaft to revolve the same.

3. In an ore concentrator, the combination of a conical funnel having a vertical circumscribing flange at its upper end, parallel I-beams extending through said funnel, a vertical shaft centrally positioned within the funnel revolubly mounted in said beams, a disk keyed to the upper end of said shaft,

the body portion of said disk being inclined downwardly from its center and having a circumscribing flange extending outwardly and upwardly therefrom at an angle of approximately 45° , the upper edge of said flange being disposed in the same plane as the center of the disk, the upper surface of said body portion and the inner surface of said flange being connected by a concave portion, a plurality of concentric ribs integrally formed upon the interior of said flange, means for imparting a series of vertical vibrations to said disk during each revolution thereof, and a drive shaft disposed through the funnel geared to said vertical shaft to operate the same.

4. In an ore concentrator, the combination of a funnel having a vertical circumscribing flange at its upper edge, parallel horizontal I-beams disposed through said funnel, a vertical shaft centrally positioned in the funnel and revolubly mounted in said beams, a disk keyed upon the upper end of said shaft and vertically movable thereon, said disk being disposed below the vertical flange of the funnel and having a shallow conical body portion and an angularly extending circumscribing flange spaced upon the sides of said funnel, a plurality of concentric ribs extending inwardly from the flange, the upper surface of the body portion and the inner surface of said flange being connected and merged together by a curved surface provided at the point of junction of said flange and body portion, means for vertically vibrating said disk on the shaft, and a drive shaft disposed through said funnel and geared to said vertical shaft to operate the same.

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

HANCEY L. BLACK.

Witnesses:

R. A. NYE,

M. M. SUNDT.