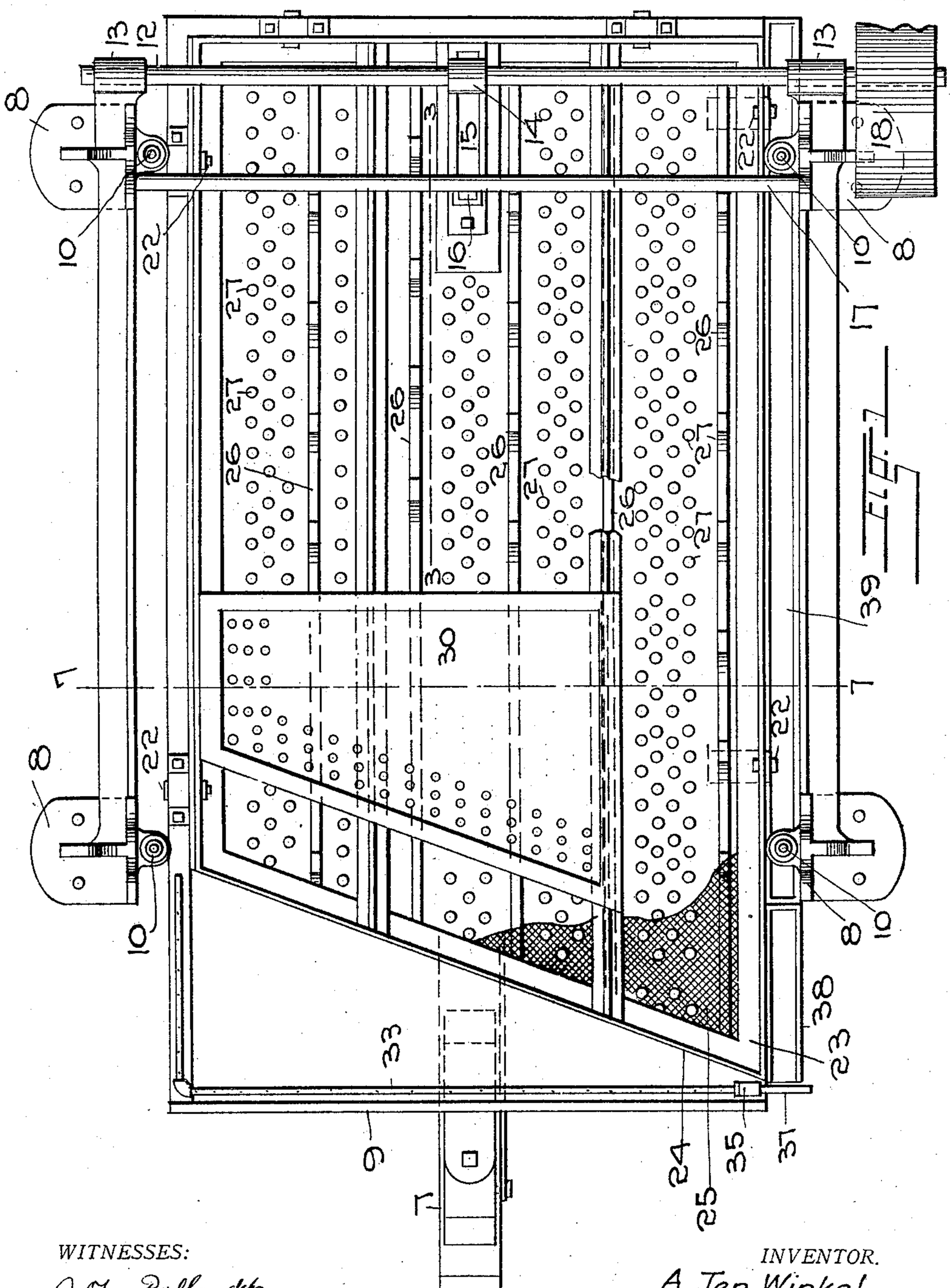
A. TEN WINKEL.

CONCENTRATING TABLE.

APPLICATION FILED AUG. 4, 1908.

967,859. Patented Aug. 16, 1910.

3 SHEETS—SHEET 1.



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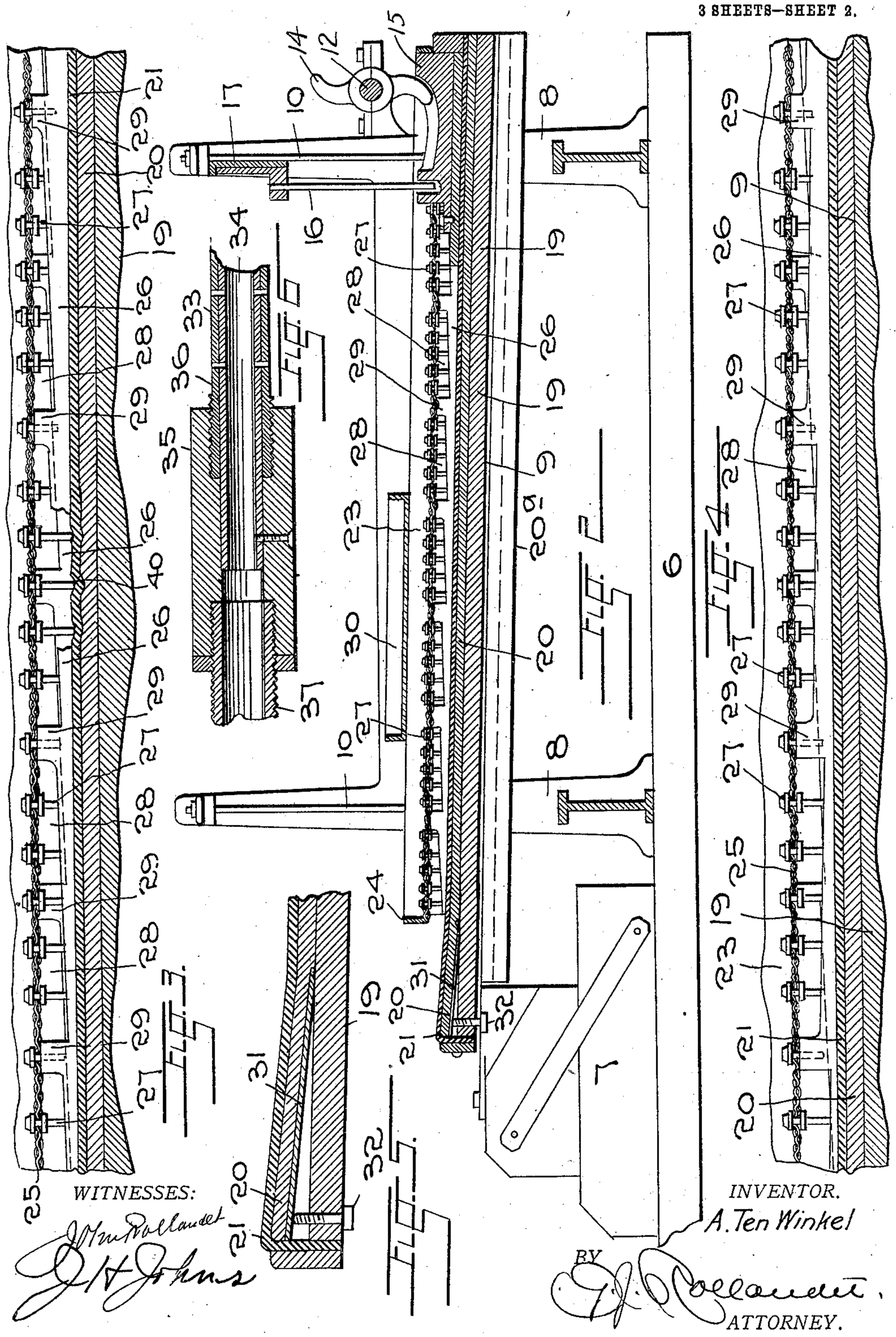

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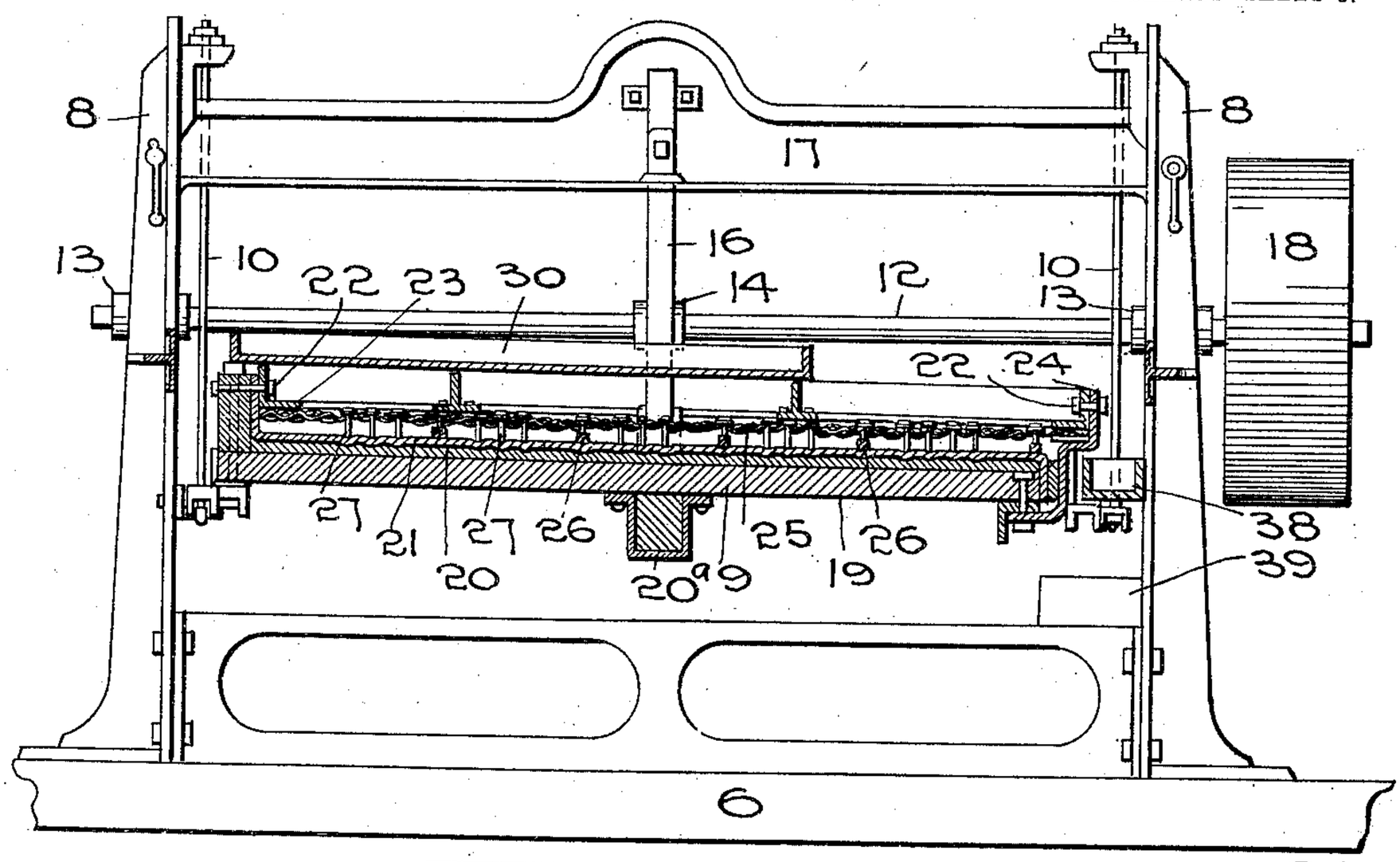

FIG. 7.

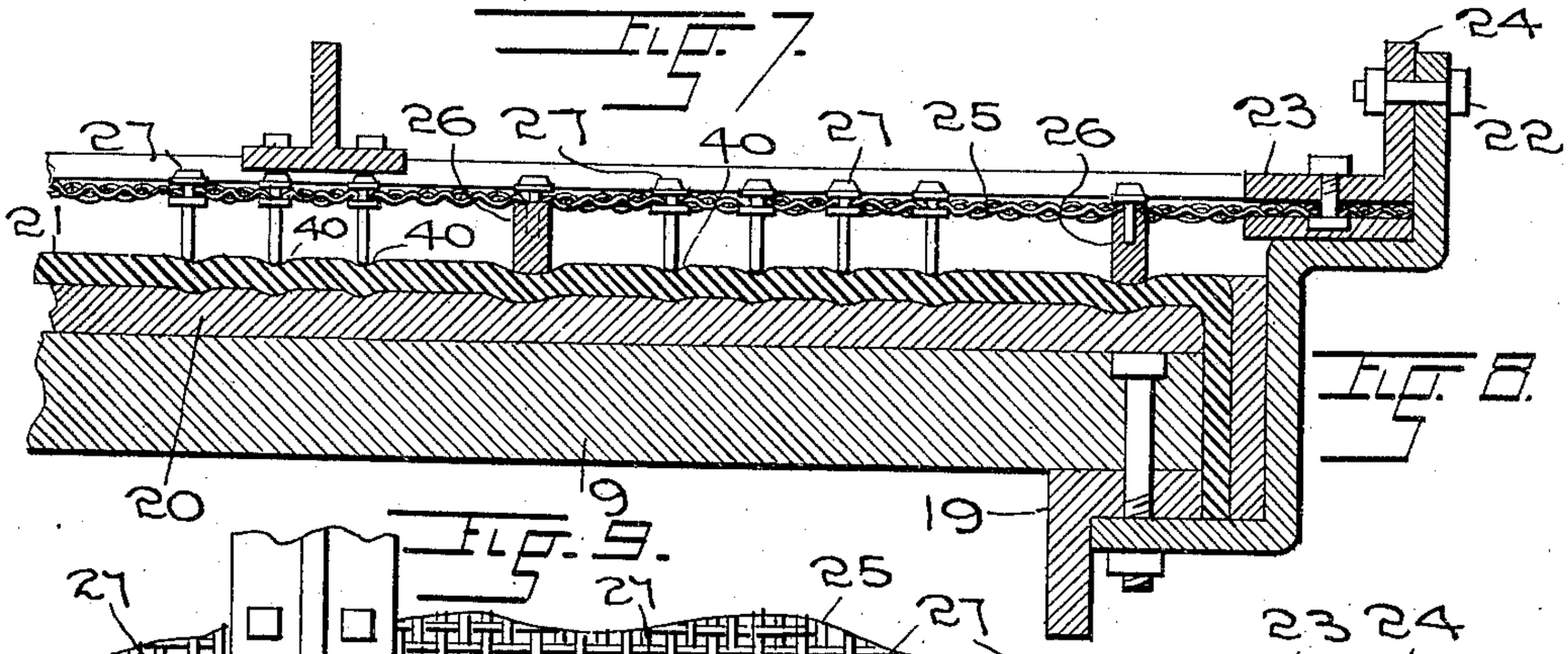

FIG. 8.

FIG. 9.

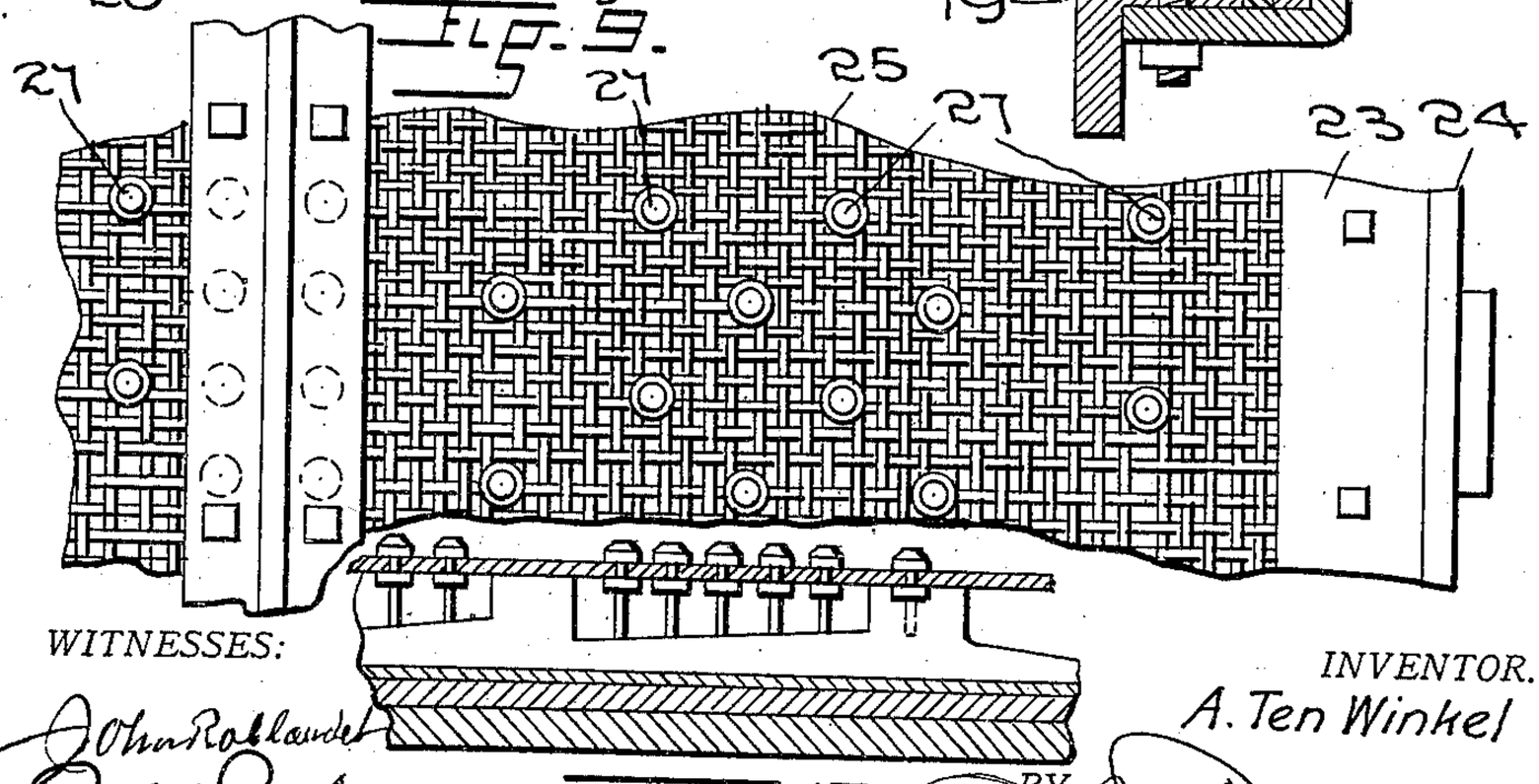

FIG 10

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CONCENTRATING-TABLE.

967,859. Specification of Letters Patent. **Patented Aug. 16, 1910.**

Application filed August 4, 1908. Serial No. 446,945.

To all whom it may concern:

Be it known that I, AUGUST TEN WINKEL, a citizen of the United States of America, residing at Denver, in the county of Denver and State of Colorado, have invented certain new and useful Improvements in Concentrating-Tables, of which the following is a specification.

My invention relates to improvements in ore concentrators and has for its object to produce an apparatus by the use of which the mineral particles contained in pulped ore may be speedily and effectively separated from the extraneous matter with which they are intermingled. I attain this object by the mechanism illustrated in the accompanying drawings in the various views of which like parts are similarly designated and in which—

Figure 1— is a plan view of the apparatus, parts of the riffle frame having been omitted to expose the subjacent mechanism, Fig. 2— a central longitudinal section through the device, Fig. 3— an enlarged, fragmentary, longitudinal section of the deck or table along a line 3—3, Fig. 1, Fig. 4— a similar section showing a modified arrangement of the riffles, Fig. 5— an enlarged, fragmentary, longitudinal section taken through the plain or unriffled portion of the table at its head-end, Fig. 6— an enlarged, fragmentary, longitudinal section through the water supply conduit included in my invention, Fig. 7— a transverse section taken along the line 7—7 Fig. 1, Fig. 8— a fragmentary, enlarged cross sectional view of the table, Fig. 9— a plan view of the portion of the table illustrated in Fig. 8, and Fig. 10, a sectional view showing a modified construction of the plate which carries the agitating pins and riffles.

My improved concentrating apparatus, as illustrated in the drawing, is of the so-called Gilpin-county or end-bump type in which a revolving cam imparts an oscillatory movement to a suspended table which during each forward motion strikes against a stationary block.

As my invention resides specifically in the deck or table over which the ore travels, it will be understood, that, if so desired, a movement different from that shown and described, may be employed to actuate the same.

Referring to the drawings by numerals, let the character 6 designate the stationary bed frame, which carries the bumping block 7 and four standards 8 from which the table 9 is movably suspended by means of rods 10.

A shaft 12 revolubly mounted in boxes 13 on the standards at the foot end of the apparatus, carries the cam 14 which works in a box 15 secured upon the deck, while a spring 16 of torsional character is suspended from a cross bar 17 on the said standards to engage the front end of the box for the purpose of accelerating the return movement of the table. A pulley 18 is mounted upon the shaft 12 to transmit power thereto from any convenient source of energy. The table 9 is composed of a flat deck 19 provided with a subjacent bumper 20^a which, in practice, engages the block 7. The deck 19 is covered with a layer 20 of heavy felt, cork or other resilient material and a superposed sheet 21 preferably composed of rubber.

Clamped upon the deck 19 and secured thereto by bolts 22 or analogous means, is a frame 23, one end of which extends at right angles to its sides and is substantially vertically alined with the foot end of the table, while its opposite end slants from a corner of the table at its head end at an acute angle toward its opposite side, at which the ore is fed upon the deck.

The frame 23 is preferably composed of angle iron, one portion of which extends upwardly to provide a surrounding flange 24. A sheet 25 of wire netting is secured within the frame and this sheet serves as a support for the riffles 26 and agitating pins 27, the construction and arrangement of which will now be described.

The riffles 26 extend equidistantly, longitudinally in parallel relation to the sides of the frame and are formed in their upper sides with a series of successive, angular depressions 28. The riffles are secured against the under surface of the sheet 25 by means of bolts which are secured into the portion 29 which separate the depressions 28 and engage the said surface and the said depressions thus form a series of ports or passages through which the ore traveling across the belt, may flow from one side of the riffle to the other.

The upper edges of the riffles which constitute the bottoms of the passages 28 slant parallelly from the foot end of the deck downwardly and the depths of the said pas-

sages decrease progressively from the head to the foot end to proportionately increase the distances between the said bottoms and the surface of the rubber sheet 21.

The depressions of the successive riffles 26 are arranged in staggered relation to each other so that the intermediate portions 29 on one, lie opposite the centers of the passages 28 in the next preceding and succeeding ones.

In the treatment of certain kinds of ores, it has been found advantageous to place the riffles so that the bottoms of the passages 28 in alternate ones slant oppositely as has been illustrated in Fig. 4 of the drawings.

Interposed between each two riffles, are a plurality of longitudinally arranged, parallel series of pins 27, the upper extremities of which are firmly secured within the meshes of the wire netting 25, while their rounded lower ends extend in a plane with the lower edges of the riffles.

The pins, comprised in each series, are disposed in staggered relation to those in the adjoining ones and the distances between the outermost rows and the adjacent riffles is made larger than that between two successive series.

I wish it understood that the wire netting is employed in the construction of the frame 23, only by reason of the facility it affords to fasten the various riffles and agitating pins and that a solid plate as shown in Fig. 10 or any other means may be used to secure the parts, without impairing the operation of the apparatus.

The feed box 30 is secured upon the frame 23 at a distance above the upper surface of the screen 25, at its head end near its obtuse corner and this box has a plurality of openings in its bottom which promote the even distribution of the pulp over the subjacent surface of the deck.

Hingedly secured upon the triangular portion of the table 19, which is not covered by the riffle frame, is a correspondingly shaped metal plate 31, whose under surface is engaged by an adjusting screw 32 and which is disposed underneath the felt covering 20.

By manipulation of the screw 32, the plate 31 and the superposed portions of the cover 20 and the rubber 21, may be inclined relative to the main portion of the deck, for the purpose of regulating the flow of water upon the table.

The water required in the process of separating the minerals from the gangue, is fed upon the table through a conduit 33 which extends along the front edge and the side of the above mentioned triangular, unriffled portion.

The conduit 33 consists of a perforated pipe 34 which is firmly secured at one of its extremities, in a head 35 and which is surrounded by another pipe 36 whose perforations are arranged to register with those of the inner one.

The outer pipe is loosely screwed into a threaded opening of the head 35 to be adjusted for the purpose of regulating the flow of water through its apertures.

A supply pipe 37 which extends into the head in communication with the inner pipe 34, may be connected with any suitable source of water.

A trough 38, placed below the table at its head end, is arranged to receive the mineral discharged from its plain unriffled portion at the side opposite to that where the feed box 30 is located and a second trough 39, disposed below the other, extends the entire length of the table to convey the gangue or worthless matter which overflows the side of the table, nearer its foot end.

The frame 23, before being secured to the table by the bolts 22, is clamped thereon by the use of suitable tools, so as to cause the free extremities of the pins 27 to indent the surface of the rubber sheet 21, and to consequently form cup shaped pockets 40 around their points, as is plainly shown in Fig. 8 of the drawings.

The depth of the indentations is regulated in accordance with the character of the material to be treated, and if so desired they may be made deeper at one end of the table than at the other.

After the depressions have been formed, the bolts 22 are applied, as shown, and the clamping instruments are removed.

The table 9 is, in practice, inclined diagonally downwardly from its feed corner and the material to be treated is distributed, in the form of pulp, over its surface at its highest portion, through the apertures in the bottom of the feed box 30.

A quantity of water is simultaneously delivered upon the unriffled portion of the deck through the conduit 33 and the aqueous mass, accelerated by the reciprocating motion of the table, will thus flow diagonally across the same.

When the pulp, in its downward travel, encounters the agitating pins 27, its progress is momentarily arrested with the result that the heavy mineral particles, which by their specific gravity are brought to the surface of the deck, fill the depressions 40, while the lighter extraneous matter flows onward. At each concussion of the table with the stationary block 7, this mineral is thrown out of the indentations around the pin extremities and, impelled by the concussive action of the table moves upwardly along the riffles 26 to the unriffled portion of the deck where it is washed by the downwardly flowing water and discharged over the lowermost side of the said portion into the trough 38. The pulp, which after the pins at the

head end of the deck have been passed, still contains a percentage of mineral, continues its course diagonally over the table and follows the nearest riffle until it has accumulated to a depth which allows it to pass through one of the ports 28, toward the next riffle.

While the rapidly accumulating mass flows along the riffles prior to its discharge through the depressions 28, the mineral particles contained therein, will sink to the surface of the table whose concussive action impels them longitudinally upwardly against the flow of the gangue to the end of the riffles from where they are discharged together with the values which were caught in the pockets 40.

As the ore travels from one riffle to the other it repeatedly encounters the intermediate pins 27 which not only break the pulpy mass, but also cause some of the mineral particles to be caught in the pockets around their lower ends, which particles are subsequently moved toward the head of the table in the manner hereinbefore described. The mass which flows along the riffles is thus gradually depleted of mineral and as the passages 28 decrease in depth toward the foot end of the table, it will be manifest that the ore, as it approaches the said end, is retained longer before it passes over the bottoms of the depressions so that the continually diminishing mineral particles have an opportunity to sink to the surface of the table.

It will thus be observed that the mineral particles contained in the ore, are gradually separated therefrom in diminishing quantities while the mass moves across the table from one riffle to the other until, after the last riffle is passed, the gangue, completely impoverished of its mineral values, is discharged over the side of the table, into the trough 39.

The plate 31 below the flexible covering at the head of the table, may be tilted for the purpose of increasing the depth of water on the table when the pulp under treatment is coarse or heavy.

When the riffles are arranged alternately reversedly, as in the form illustrated in Fig. 4 of the drawings, the aqueous mass which flows through the passages in the one will encounter the highest portions on the other and, as it tends to flow to the lowest part of the recesses in the riffles oppositely to the direction in which it flows by reason of the inclination of the table, an irregular, reciprocating movement will be imparted to the ore, to aid in the separation of the fine mineral particles from the worthless constituents.

I wish it understood that although I have shown the apparatus in the best form now known to me, variations in the form and arrangement of the various parts may be availed of within the principle of my invention.

What I claim and desire to secure by Letters Patent is:—

1. A concentrating table having its working face composed of a resilient substance, and a plurality of elongate obstructive members secured upon the table in an upright position, their lower extremities indenting the said resilient face so as to form a plurality of substantially cup-shaped depressions in which said members axially project.

2. A reciprocating, diagonally inclined concentrating table having a plurality of longitudinal riffles formed in their respective upper edges, with successive depressions of progressively decreasing depth and elongate obstructive members extending within substantially cup-shaped depressions formed in the working face of the table.

3. A reciprocating diagonally inclined concentrating table having a plain and an unriffled portion, longitudinal riffles, formed in their respective upper edges with successive depressions of progressively decreasing depth, elongate obstructive members extending within substantially cup-shaped depressions formed in the working face of the table, means arranged to feed matter upon the upper end of the riffled portion, and a conduit arranged to supply water upon the unriffled portion.

4. A reciprocating, diagonally inclined concentrating table having a plain and an unriffled portion, longitudinal riffles formed in their respective upper edges with successive depressions of progressively decreasing depth, elongate obstructive members whose lower ends extend within substantially cup-shaped depressions formed in the working face of the table, means arranged to feed matter upon the upper end of the riffled portion, a conduit arranged to supply water upon the unriffled portion along a predetermined oblique line and means to adjust the said portion to a selected angle of inclination relative to the working face.

5. A concentrating table having its working face composed of a resilient substance, and a frame having a plurality of dependent, parallel elongate members, secured upon the table, said members indenting said surface so as to form substantially cup-shaped depressions in which they axially extend.

6. The combination of a concentrating table having in its working face a plurality of substantially cup-shaped depressions and means to vary the depth thereof.

7. A concentrating table having its working face composed of a resilient substance a plurality of pins adapted to indent the said face and longitudinally secured in engagement therewith so as to be adjustable

in the direction of their axes and means for adjusting the pins.

8. A concentrating table having upon its flat upper surface, a plurality of longitudinal riffles formed in their upper edges with successive angular depressions whose respective oblique bottom edges are at progressively decreasing distances from the said surface, the depressions in each riffle being arranged out of alinement with respect to those in the next preceding and succeeding ones.

9. A concentrating table having upon its flat, upper surface, a plurality of longitudinal riffles formed in their upper edges with successive angular depressions, the depressions in each riffle being arranged out of alinement with respect to those in the next preceding and succeeding ones.

10. A concentrating table having upon its flat working surface a plurality of longitudinal riffles formed in their upper edges with successive angular depressions arranged out of alinement with those of the next preceding and succeeding riffles, the oblique bottom edges of the depressions in each riffle slanting in a direction reverse to that of the bottom edges in the next preceding and succeeding riffles.

11. A concentrating table having upon its flat working surface a plurality of longitudinal riffles formed in their upper edges with successive angular depressions, the oblique bottom edges of the depressions in each riffle slanting in a direction reverse to that of the bottom edges in the next preceding and succeeding riffles.

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

AUGUST TEN WINKEL.

Witnesses:
G. J. ROLLANDET,
E. A. TETZTAFF.