(No Model.) 2 Sheets—Sheet 1.

A. R. WILFLEY.

ORE CONCENTRATOR.

No. 590,675. Patented Sept. 28, 1897.

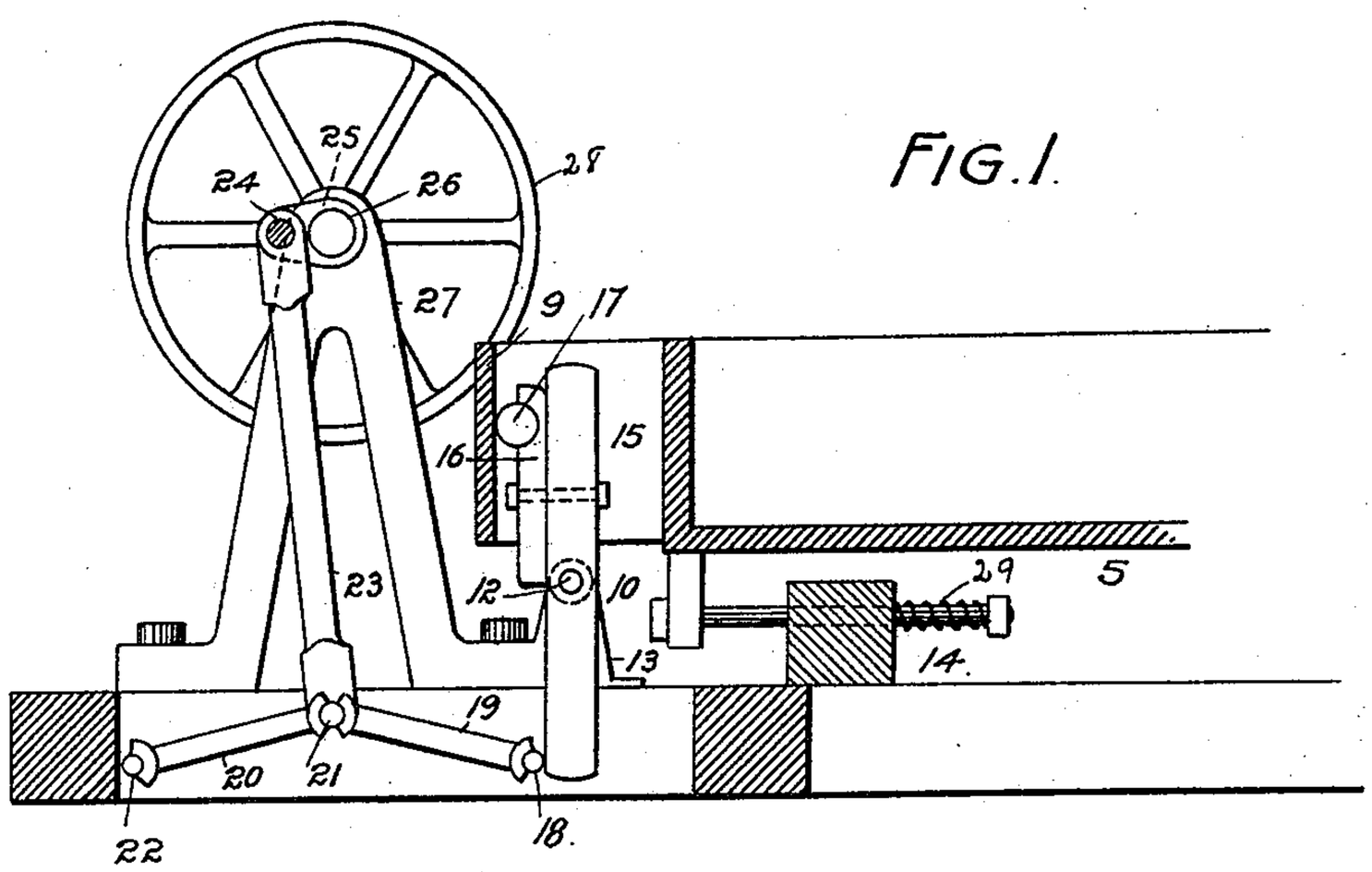

FIG. 1.

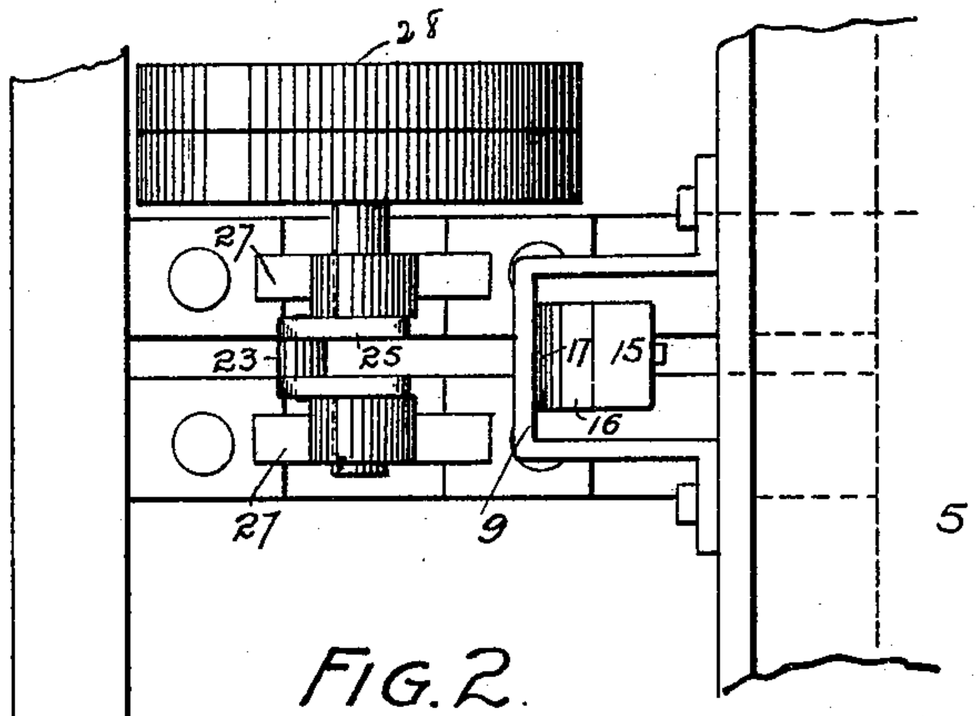

FIG. 2.

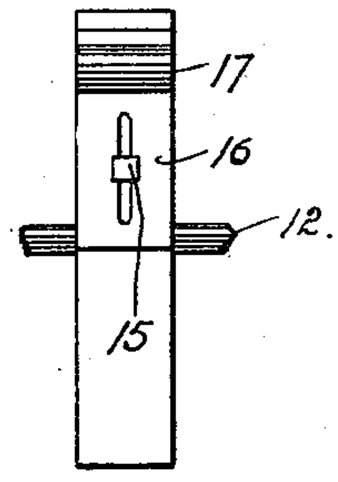

FIG. 6.

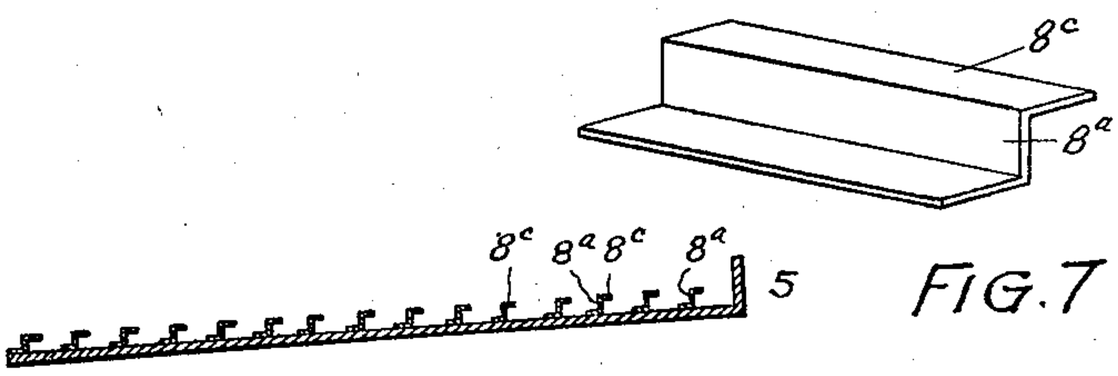

FIG. 5.

FIG. 7

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(No Model.) 2 Sheets—Sheet 2.

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ORE CONCENTRATOR.

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FIG. 3.

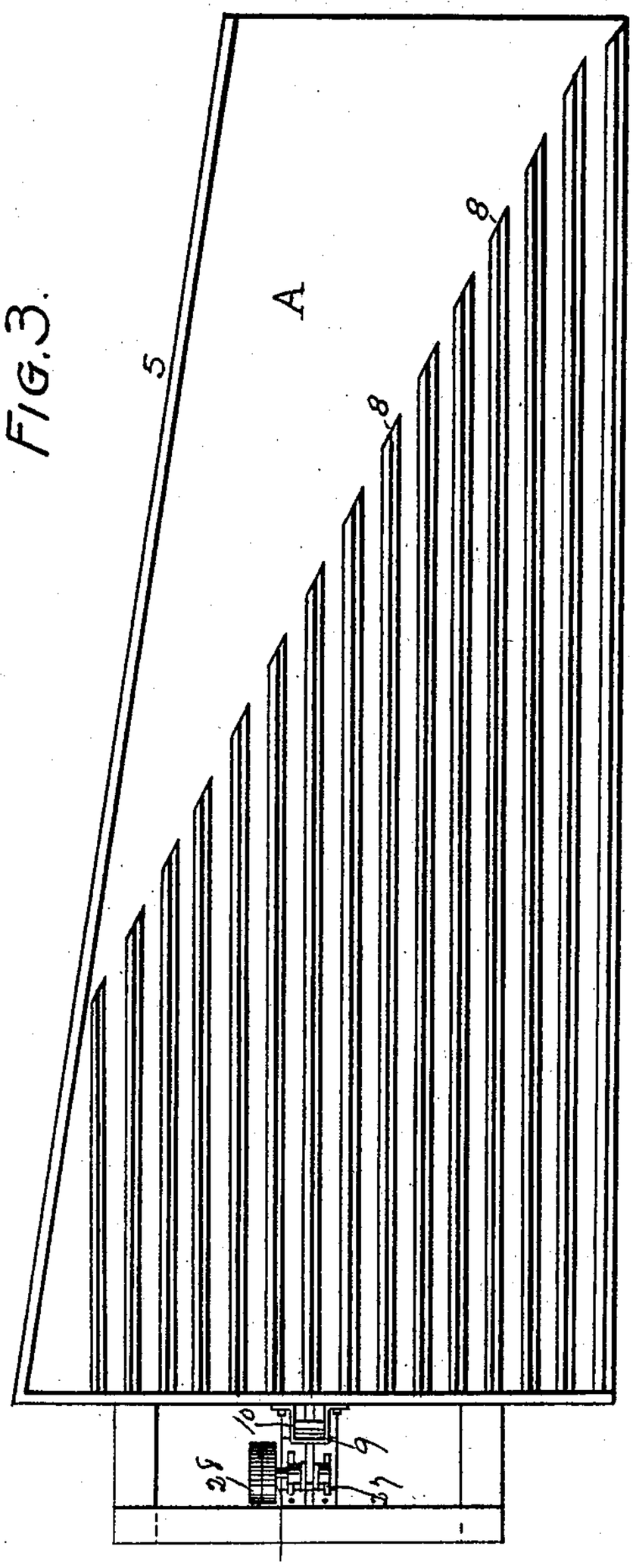
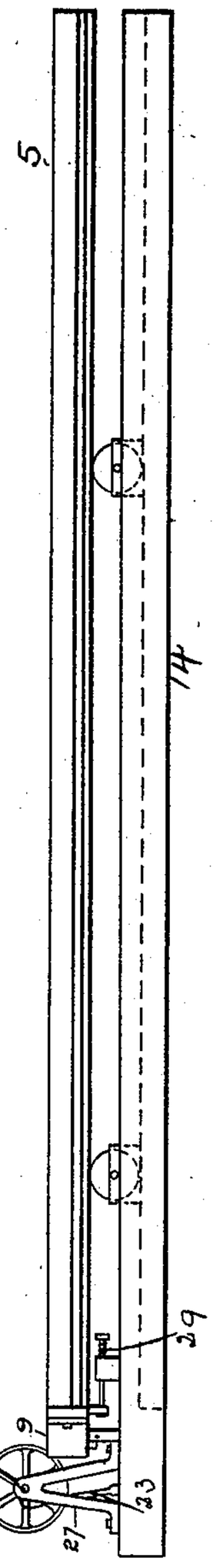


FIG. 4.



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UNITED STATES PATENT OFFICE.

ARTHUR R. WILFLEY, OF DENVER, COLORADO.

ORE-CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 590,675, dated September 28, 1897.

Application filed March 16, 1897. Serial No. 627,798. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR R. WILFLEY, 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 Ore-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 letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in ore-concentrators; and it consists of the features 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 side elevation of the apparatus, partly in section. Fig. 2 is a top or plan view of the same. Fig. 3 is a plan view of the table. Fig. 4 is a side elevation of the same. Fig. 5 is a cross-section of the table. Fig. 6 is a detail view of a lever forming a part of the operating mechanism. Fig. 7 is a perspective view of one of the riffles detached.

Similar reference-characters indicate corresponding parts in the views.

Let the numeral 5 designate the table, provided with longitudinal riffles 8, attached to its upper surface. These riffles are of unequal length and angular in cross-section. The vertical or upwardly-projecting part of the riffle is designated by the reference-character 8^a, and the upper part, which lies parallel with the bed of the table, is designated by the reference-character 8^c. The table tapers from the head toward the foot, where it is narrowest. It is transversely inclined, (see Fig. 5,) the gangue being discharged at its lower edge and the mineral at the tail thereof. The riffles increase in length from the upper edge of the table downward, where they are longest. The lowermost riffle extends nearly the full length of the table.

To the left of the riffle extremities (see Fig. 3) there is a triangular portion A of the table, which is smooth or free from riffles. The function of this smooth or unriffled portion of the table will be hereinafter described.

The table has a longitudinal reciprocating movement and is supported on rollers 7, mounted on a suitable stationary support.

The mechanism for actuating the table will now be described.

The extremity of the table farthest to the left (see Figs. 1 to 4 of the drawings) will for convenience of description in this specification be termed the "head," while the opposite extremity is termed the "tail" of the table.

To the head end of the table is attached a keeper 9, which is engaged by one extremity of a vertical lever 10, fulcrumed at 12 on a support 13, mounted on the stationary frame 14. The upper arm of the lever 10 is slotted (see Fig. 6) to receive a bolt 15, which holds a block 16 in place on the lever. This block carries an antifrictional roller 17, which engages the outer wall of the keeper 9. The block 16 is adjustable for the purpose of changing the bearing-point on the keeper and thereby regulating the length of the table's stroke.

The lower arm of the lever 10 is provided with a bearing 18, which is engaged by one extremity of a link 19. This link is connected at 21 with a link 20, forming a toggle-joint. One extremity of the link 20 engages a bar 22, attached to the stationary frame. The pin 21 connecting the two toggle parts also passes through one extremity of a pitman 23, whose opposite extremity is connected with a wrist 24 on a crank 25, carried by a shaft 26, journaled in an upright support 27, mounted on the stationary frame 14. The shaft 26 is provided with a pulley 28, which may be connected with any suitable motor for operating the mechanism. The outer extremities of the toggle are open, being simply recessed or forked to engage the bearings 18 and 22, respectively. Hence as the shaft 26 is rotated the toggles only impart the backward movement to the table or move it toward the left. (See Fig. 3.) The forward or reverse movement is effected or imparted by the recoil of a spring 29, which is compressed or placed under tension by the table during its backward movement.

In the operation of the machine the material to be treated is discharged in the form of

pulp upon the upper left-hand corner of the table. (See Fig. 3.) The gangue passes transversely downwardly over the angular longitudinal riffles and is discharged over the lower edge of the table, which, as before stated, is transversely inclined.

All the mineral, together with a portion of the gangue, is first caught by the riffles, and under the influence of the table's motion is carried longitudinally toward the foot of the table until it reaches the smoother unriffled portion A of the table, where it is acted on by the water, which effects a perfect or approximately perfect separation of the gangue from the mineral. As the material caught by the uppermost and shortest riffle passes to the portion A of the table the action of the water, which is fed to the upper edge of the tables, carries the gangue downward to the next riffle, while the mineral remains on the smooth portion A and is carried toward the tail of the table, where it is finally discharged. It is expected that some of the mineral caught by the uppermost and shortest riffle will be carried downward with the gangue to the next riffle, which is longer. After leaving this last-named riffle and passing to the smooth or unriffled portion of the table the water again acts on the material and carries the gangue downward to the next riffle, leaving the clean mineral on the smooth portion A of the table. If any mineral escapes with the gangue the second time, it will be caught by the riffle next below and again subjected to the separating action of the water as soon as it reaches the smooth portion A of the table. In this manner the material is carried transversely downward and longitudinally forward, the gangue being discharged at the lower edge of the table completely impoverished of its mineral values, while the latter are discharged at the foot or tail of the table. A portion of the gangue—that is to say, the lighter part thereof—passes over each riffle in succession from the shortest or uppermost to the longest or lowermost riffle. The mineral and the heavier gangue are caught by the riffles and finally separated on the smooth portion A of the table. This combination, in a concentrating-table, of riffles of varying length for catching the mineral and a smooth, plain, or unriffled portion at the extremities of the riffles, where the final separation is effected through the action of the water, is believed to be entirely new in an apparatus of this class.

A riffle is the best means of catching mineral, while a smooth, plain, or unriffled surface is the best for effecting the separation of the mineral from the gangue caught with the mineral by the riffles, the separation being effected by the action of water.

While I prefer to employ the angular riffle shown and described in this application, I do not limit the invention to any special construction of riffle.

The function of the angular riffles will now be described in detail.

The part 8^a of the riffles would be sufficient alone to catch the larger and heavier particles of mineral, but some of the more minute particles would be forced over the riffles and carried downward with the gangue and perhaps finally lost were it not for the part 8^c of the riffles, which checks this tendency and allows specific gravity to prevail, the same as in hand-panning. It is well known that the finest particles of mineral can be saved by hand-panning. The specific gravity of the finest particle of gold is, of course, the same as the largest nugget, and if the proper conditions exist the minute particle can be saved as well as the nugget. The object of my angular riffles is to produce the conditions necessary to save not only the largest but also the finest mineral particles. Under ordinary conditions these fine particles when acted on by a current of water are carried along with the water, and consequently lost with the gangue. The upper part 8^c of my riffle checks the tendency of these light particles to pass over the riffles with the water. Hence they are confined by the bed of the table below the part 8^c of the riffles above, while the part 8^a of the riffles checks their downward movement. Hence under the influence of the table's movement or vibration the mineral particles, both fine and coarse, are caught by the riffles.

It will be observed by an inspection of my operating mechanism that the length of the table's stroke may be regulated without changing, altering, or interfering with the quality of the movement imparted by the toggle.

With other toggle movements as applied to this class of machines the length of stroke is regulated by changing the point where the lower extremity of the connecting-rod or pitman is attached to the toggle. This is equivalent to changing the length of the pitman and of course not only changes the length of the table's stroke, but also the quality of the movement. For instance, if the pitman be made shorter the point where the toggle-links are connected must move farther upward, but not so far downward, and vice versa. In other words, by changing the length of the pitman (or changing the point where it is attached to the toggle, which is the same thing) the angle of the links becomes greater when the table has reached its limit of movement in one direction and less when the table has reached its limit of movement in the opposite direction. Hence in such constructions the speed of the table at a given point in its stroke varies as the length of the stroke is changed.

Having thus described my invention, what I claim is—

1. A transversely-inclined concentrating-table having a movement whose tendency is to carry the material longitudinally forward

toward the tail or foot of the table, said table being provided with a number of riffles extending longitudinally a portion of the distance from its head toward its foot, said riffles varying in length for the purpose specified, the table having a smooth, plain, or unriffled portion extending from the extremities of the riffles toward the tail of the table, whereby the material as it leaves the riffles is subjected to the action of the water on the smooth portion of the table and the final separation of the mineral from the gangue effected.

2. A transversely-inclined concentrating-table having a number of longitudinal riffles extending a portion of the table's length from the head toward the foot, said riffles being of unequal length, the uppermost being the shortest while the other riffles increase in length from the upper edge to the lower edge of the table, the table having a plain or unriffled portion lying at the extremities of the riffles and adapted to receive the material caught by the riffles.

3. The combination of a transversely-inclined concentrating-table having a number of longitudinal riffles of unequal length extending from the head toward the tail of the table, said riffles increasing in length from the upper toward the lower edge of the table, said table being provided with a plain or unriffled portion at the extremities of the riffles, and means for imparting to the table a longitudinally-reciprocating movement comprising a toggle, an operating-pitman, and a lever, one link of the toggle engaging one arm of the lever, while the other arm of the lever is connected with the head of the table.

4. The combination of a transversely-inclined concentrating-table having a number of longitudinal riffles extending from the head toward the foot of the table, the table being provided with a plain or unriffled portion located at the extremities of the riffles, and means for imparting to the table a longitudinal reciprocating movement comprising a toggle-joint, an operating-pitman and a lever, one link of the toggle engaging one arm of the lever, while the other arm of the lever is connected with the table and provided with an adjustable roller adapted to engage a keeper carried by the table.

5. The combination of a transversely-inclined concentrating-table having a series of longitudinal riffles extending from the head toward the foot of the table, the table being provided with a plain or unriffled portion extending from the riffle extremities to the foot of the table, and means for imparting to the table a longitudinally-reciprocating movement, said means comprising a toggle-joint, an operating-pitman, and a lever, one link of the toggle engaging one arm of the lever, while the other arm of the lever is connected with the table and provided with an adjustable roller, said roller being mounted on a block adjustably attached to the lever.

6. The combination of a transversely-inclined concentrating-table having a number of longitudinal riffles extending from the head toward the tail of the table, the table being provided with a plain or unriffled portion located at the extremities of the riffles, and means for imparting to the table a longitudinally-reciprocating movement comprising a toggle-joint, an operating-pitman, and a lever, one link of the toggle engaging one arm of the lever, while the other arm of the lever is connected with the table and provided with a vertical slot, and a block held in place by a bolt passing through the slot and carrying an antifrictional roller engaging a keeper on the table.

7. The combination of a transversely-inclined concentrating-table having a series of riffles extending longitudinally from the head toward the tail of the table, said riffles being of unequal length, the uppermost being the shortest and the riffles increasing in length from the upper to the lower edge of the table, the table being provided with a plain or unriffled portion of suitable area located at the extremities of the riffles, means for feeding the material to the upper portion of the table's head, means for discharging water on the upper edge of the table, and suitable means for imparting to the table a longitudinally-reciprocating movement of a character adapted to move the material from the head toward the tail of the table.

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

ARTHUR R. WILFLEY.

Witnesses:

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G. J. ROLLANDET.