No. 723,865. PATENTED MAR. 31, 1903.

F. W. HARLOW.

ORE CONCENTRATOR.

APPLICATION FILED DEC. 23, 1901.

NO MODEL. 3 SHEETS—SHEET 1.

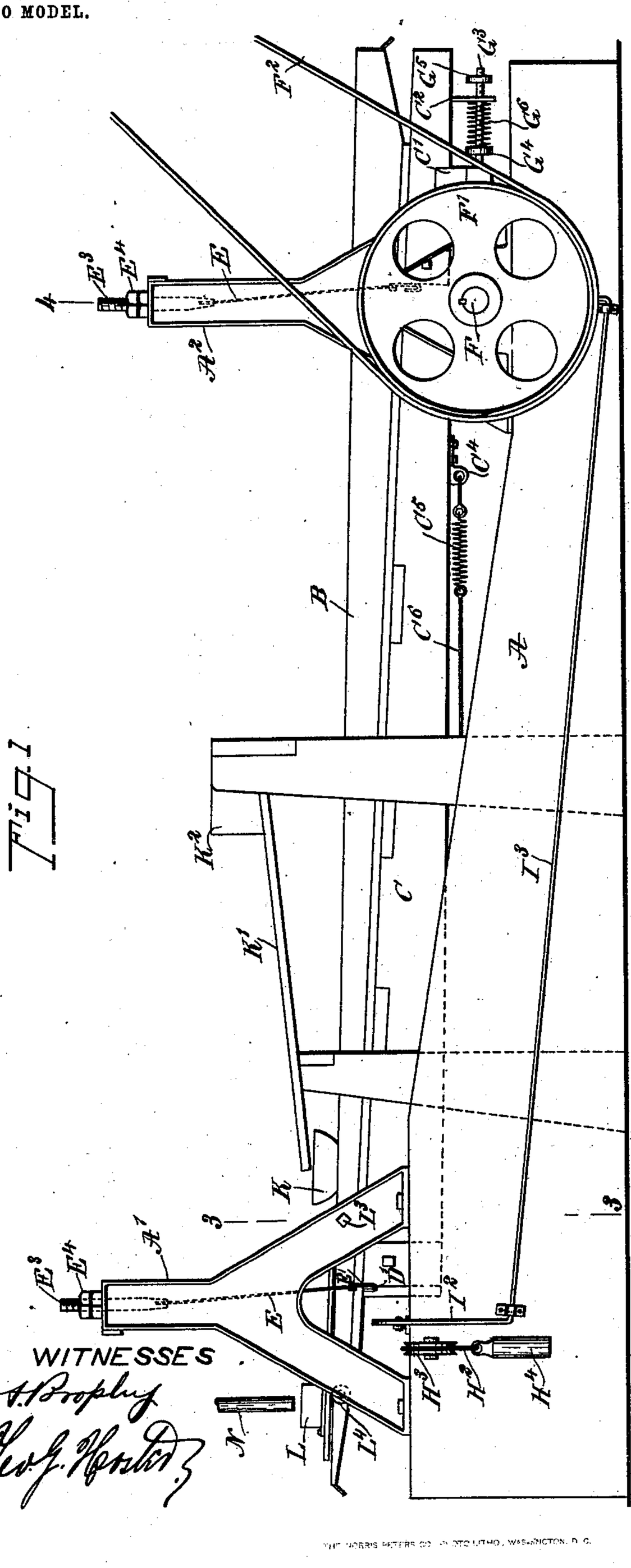

FIG. 1.

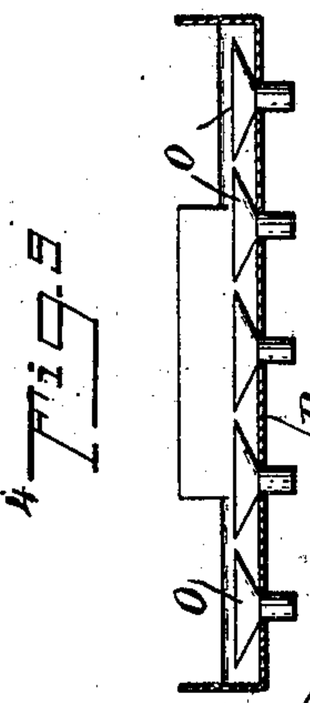

FIG. 5.

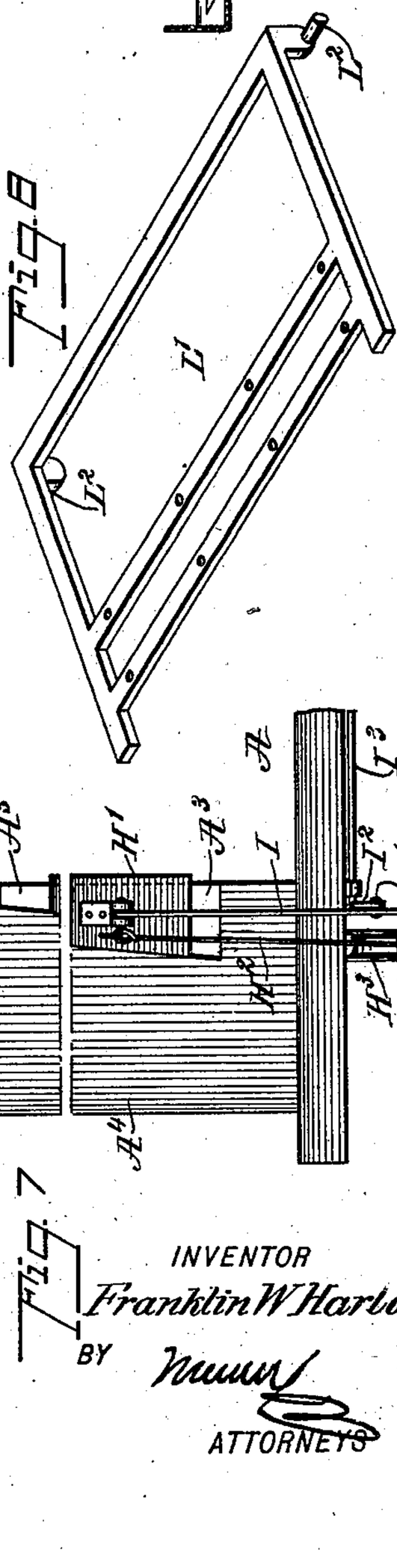

FIG. 8.

FIG. 7.

WITNESSES.

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NO MODEL. 3 SHEETS—SHEET 2.

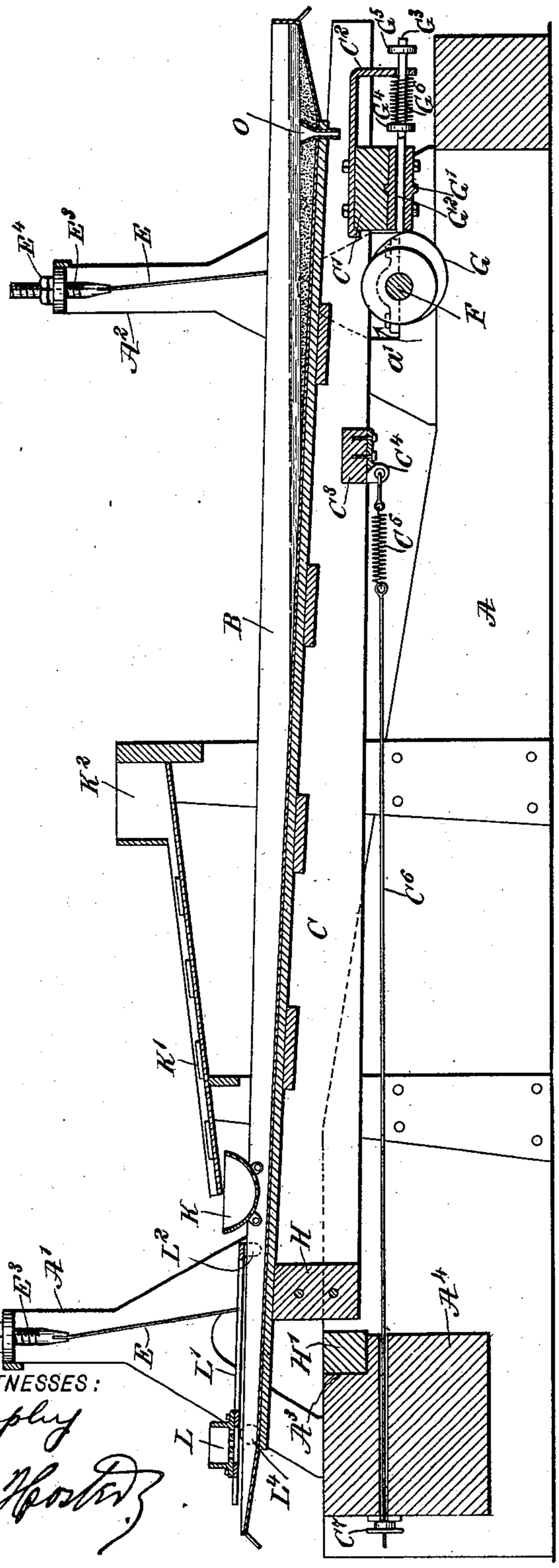

FIG. 2.

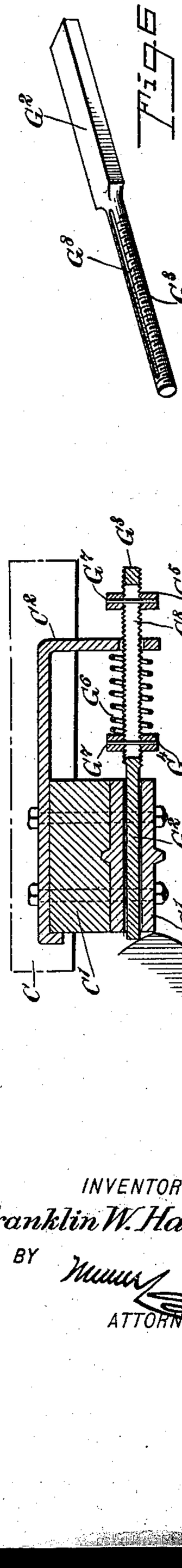

FIG. 1.

FIG. 3.

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NO MODEL. 3 SHEETS—SHEET 3.

Fig. 4

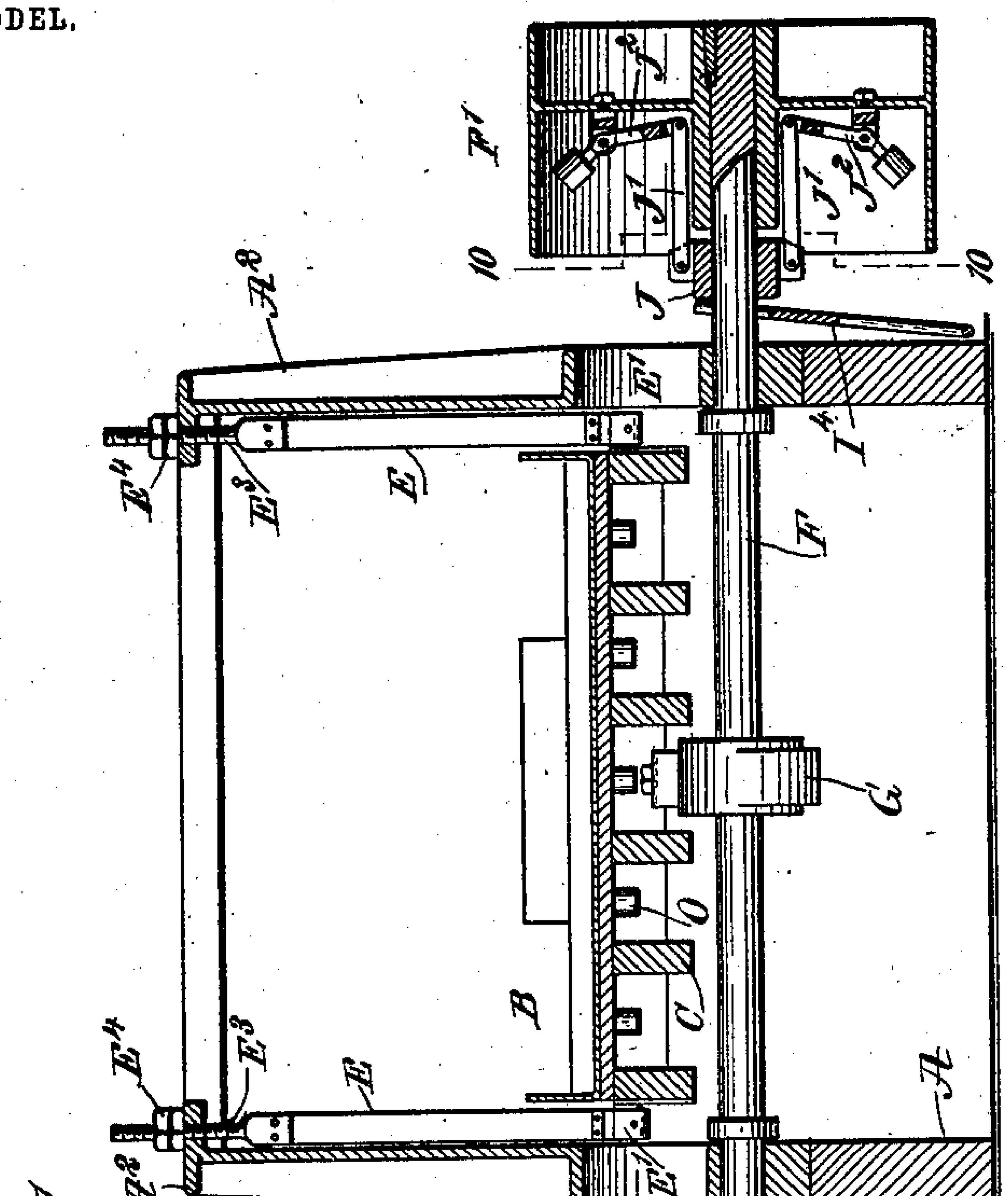


Fig. 3

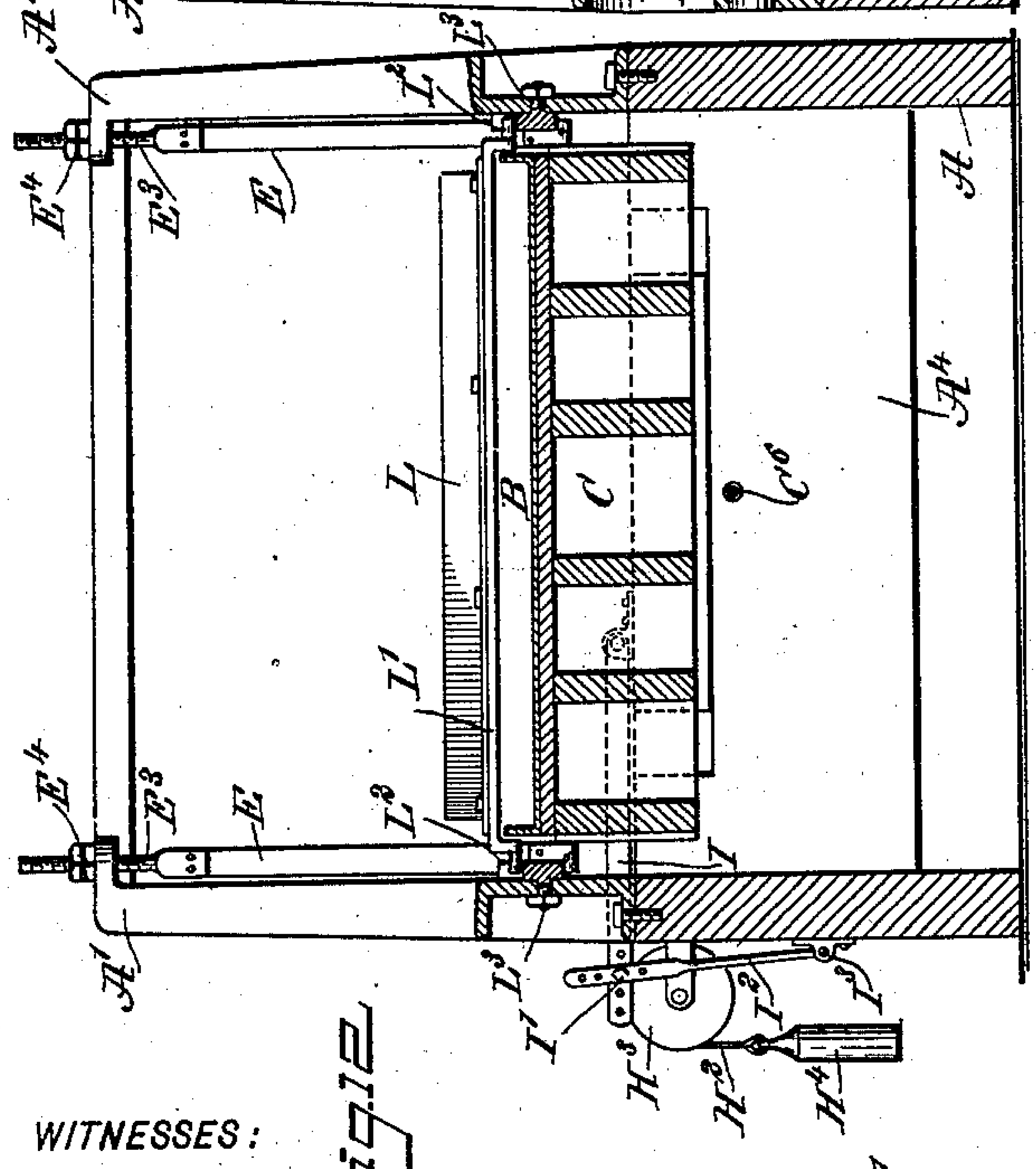


Fig. 11

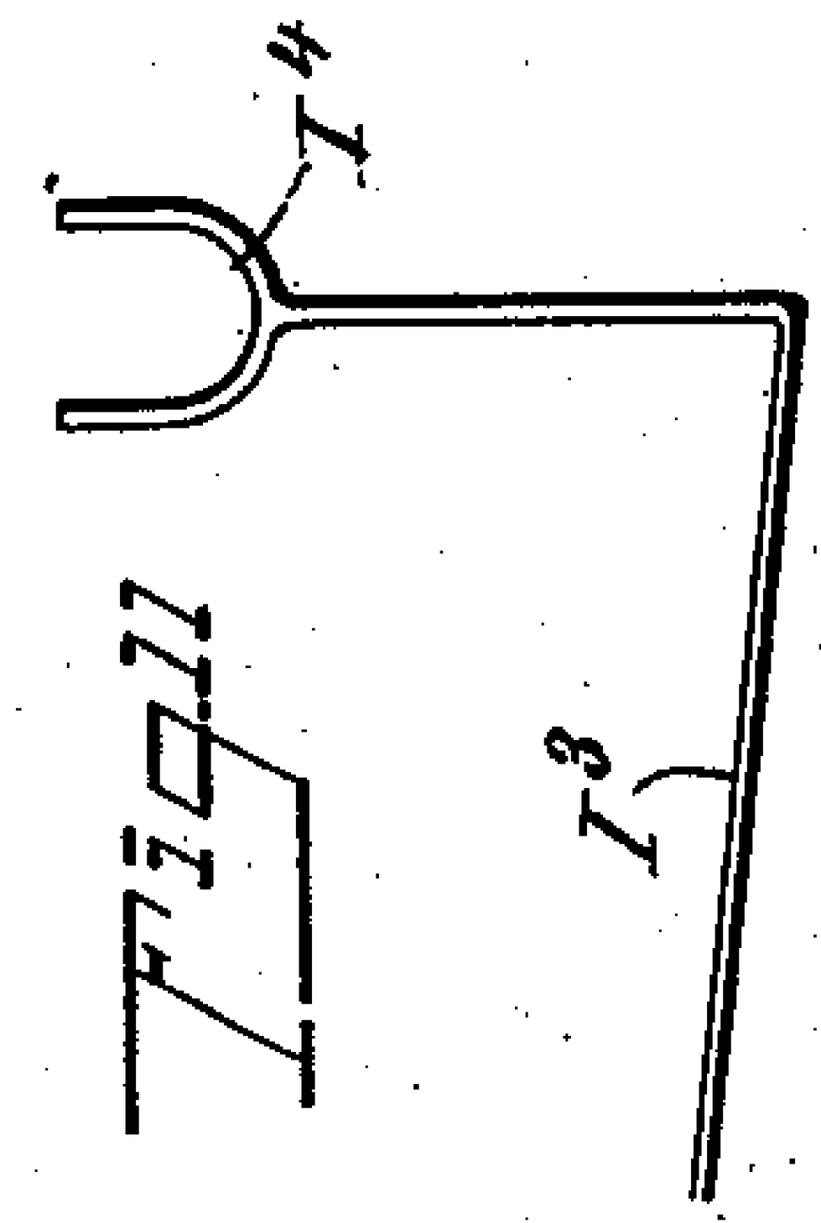


Fig. 10

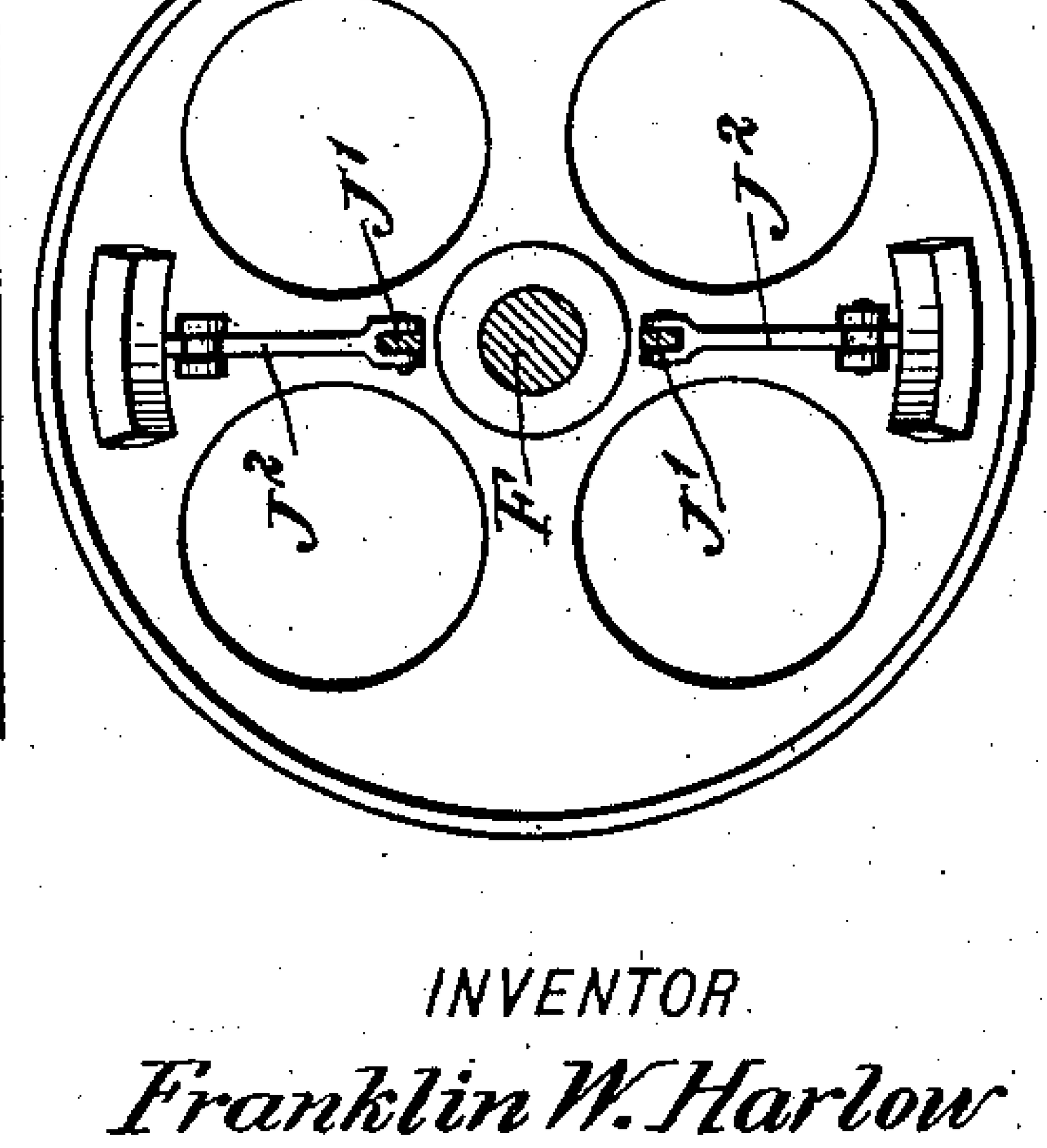
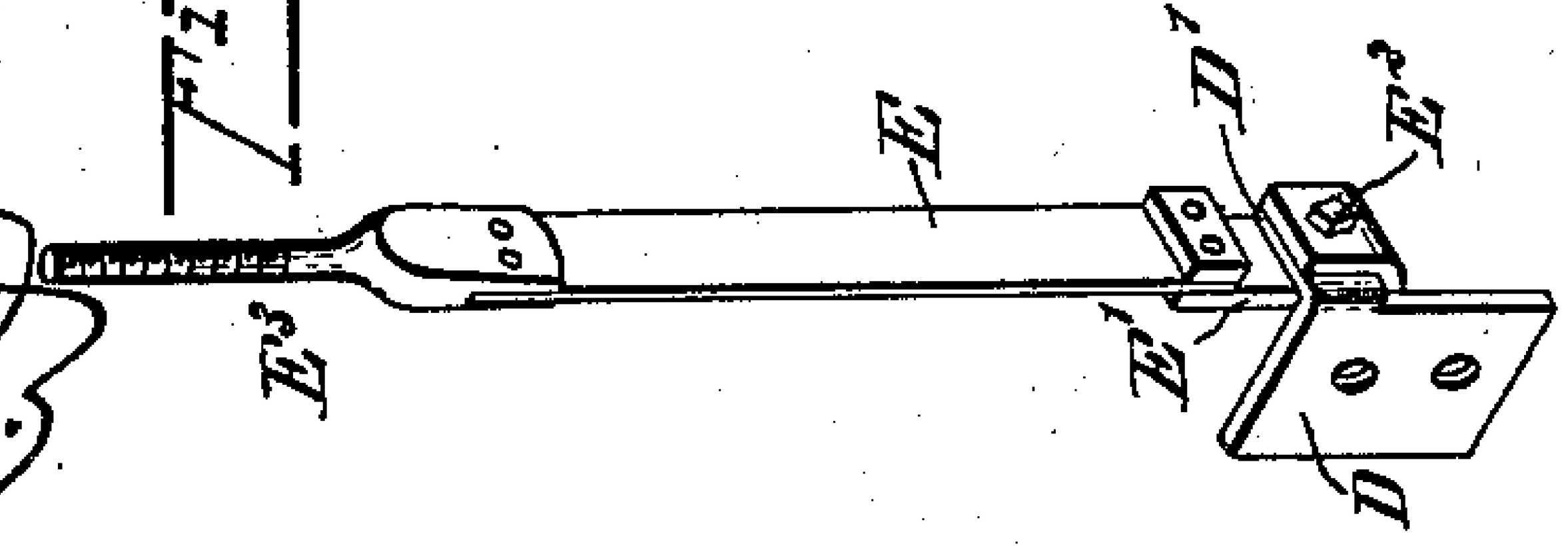


Fig. 12



WITNESSES:

INVENTOR

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UNITED STATES PATENT OFFICE.

FRANKLIN WINFIELD HARLOW, OF EUREKA, COLORADO.

ORE-CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 723,865, dated March 31, 1903.

Application filed December 23, 1901. Serial No. 86,935. (No model.)

To all whom it may concern:

Be it known that I, FRANKLIN WINFIELD HARLOW, a citizen of the United States, and a resident of Eureka, in the county of San Juan and State of Colorado, have invented a new and Improved Ore-Concentrator, of which the following is a full, clear, and exact description.

The invention relates to ore-concentrators and slimers such as shown and described in the Letters Patent of the United States, numbered 606,138, granted to me on June 21, 1898.

The object of the invention is to produce a new and improved ore-concentrator which is simple and durable in construction, very effective and comparatively noiseless in operation, and automatically governed as to the length of the stroke of the bed or pan to insure a thorough separation of the tailings from the ore and without undue jarring of the machine.

The invention consists of novel features and parts and combinations of the same, as will be fully described hereinafter and then pointed out in the claims.

A practical embodiment of the invention is represented in the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a side elevation of the improvement. Fig. 2 is a longitudinal sectional elevation of the same. Fig. 3 is a transverse section of the same on the line 3 3 of Fig. 1. Fig. 4 is a similar view of the same on the line 4 4 of Fig. 1. Fig. 5 is an enlarged sectional side elevation of the actuating device for the bed or pan. Fig. 6 is a perspective view of the slide thereof. Fig. 7 is a plan view of the governor-controlled bumper. Fig. 8 is a perspective view of the water-box frame. Fig. 9 is a transverse section of the pan and tailings discharge funnels. Fig. 10 is an enlarged sectional rear elevation of the centrifugal governor for regulating the length of the stroke of the pan, the section being on the line 10 10 of Fig. 4. Fig. 11 is a perspective view of one end of the lever connection between the governor and the bumper, and Fig. 12 is an enlarged perspective view of one of the hangers or suspension-arms for the pan.

The improved machine is mounted on a suitably-constructed frame A, provided with standards A' and A^2, between which is mounted to swing longitudinally a scoop-shaped bed or pan B, preferably made of sheet metal, with its bottom formed of two inclined parts and the sides and ends sufficiently high to retain a large quantity of concentrates, water, and tailings, as indicated in the drawings. The bed or pan B is secured in a suitably-constructed bed-frame C, provided on its forward and rearward sides with brackets D, each of which is formed with a transversely-extending arm D' (see Fig. 12) for engagement by a hook E', secured on the lower end of a hanger or suspension-arm E, formed of a flat thin piece of spring-steel, to which the hook E' is riveted or bolted, the said hook E' and arm E being fastened together by a suitable bolt E^2. On the upper end of each arm E is riveted or otherwise fastened a bolt E^3, engaging the corresponding standards A' and A^2, the nuts E^4 of the said bolts resting on top of the standards to allow of adjusting the bolts, and consequently the supporting-arms E, to bring the bed-frame C and the bed or pan B into a proper position—that is, to give the desired inclination to the bed or pan, according to the grade of material under treatment.

In order to impart a rearward swinging motion to the bed B and its frame C, I provide the following device: A shaft F extends transversely and is journaled in suitable bearings attached to the main frame A, and on one outer end of this shaft is secured a pulley F', connected by a belt F^2 with other machinery for imparting a continuous rotary motion to the said shaft F. On the latter and between the sides of the main frame A is secured a cam G, adapted to engage with its peripheral surface the forward end of a block G', bolted or otherwise fastened to a cross-beam C' of the bed-frame C, and in the said block G' is mounted to slide longitudinally a slide G^2, likewise adapted to abut at its forward end against the peripheral surface of the cam G. The slide G^2 is formed on its rear end with a threaded rod or bolt G^3,

on which screw the nuts G^4 and G^5, of which the nut G^4 is pressed on by one end of a spring G^6, coiled on the rod G^3, and resting at its other end in a bracket C^2, attached to the cross-beam C'. The nuts G^4 and G^5 after they are adjusted are locked against movement on the rod G^3 by pins G^7, extending through the nuts and through a longitudinal slot G^8, formed in the rod G^3. The nut G^5 is adapted to limit the forward sliding movement of the slide G^2 by resting against the outer face of the bracket C^2 at the time the cam G is in a corresponding position. When the shaft F is rotated in the direction of the arrow a', the cam G by engaging the slide G^2 forces the same rearwardly against the tension of the spring G^6, at the same time moving the nut G^5 away from the bracket C^2, and when the forward end of the slide G^2 is flush with the forward end of the block G' the latter is engaged by the cam G to move the block into the rearmost position, and with it the frame C and bed B. The slide G^2, on account of being yieldingly mounted and engaged by the cam G previous to the latter engaging the block G', forms a cushion for receiving the cam-blow when starting the pan on the back swing. A forcible forward swinging movement is given to the bed-frame C by a spring device connected with a cross-beam C^3 and the bed-frame C, (see Fig. 2,) and on this cross-beam is attached a bracket C^4, engaged by one end of a spring C^5, connected at its other end with a rod C^6, extending forwardly through a cross-beam A^4 of the main frame A. A nut C^7 screws on this rod C^6 and abuts against the beam A^4 to regulate the tension of the spring C^5. It will be seen that when the machine is in operation and the cam G has imparted a rearward swinging motion to the bed-frame C and bed B the spring C^5 causes a return movement of the frame C as soon as the cam frees the block, and the spring C^5 overcomes the tension of the spring G^6 on further rotation of the cam G.

Near the forward end of the frame C is secured a bumper-block H, adapted to abut against a bumper H', made in the shape of a wedge, mounted to slide transversely in a guideway A^3, formed on the cross-beam A^4, previously mentioned. The bumper H' is counterbalanced, and for this purpose a cord H^2 is connected with the bumper and extends transversely to pass over a pulley H^3, journaled on one side of the main frame A. (See Figs. 1, 3, and 7.) A weight H^4 hangs on the depending end of the cord H^2, so as to draw the bumper H' to one side of the frame, the bumper being moved in an opposite direction by the action of a centrifugal governor actuated from the main shaft F. For this purpose the bumper H' is pivotally connected by a link I and pivot-pin I' with an arm I^2, secured on a shaft I^3, extending longitudinally and journaled in suitable bearings held on one side of the main frame A. On the rear end of this shaft I^3 is secured a forked arm I^4, (see Figs. 4 and 11,) resting against the inner end of a collar J, mounted to slide loosely on the shaft F adjacent to the pulley F'. The collar J is pivotally connected by links J' with weighted levers J^2, fulcrumed on the web of the pulley F', so that when the latter is rotated at a higher rate of speed than that normally given to the shaft F the weighted levers swing correspondingly owing to the centrifugal force, so that the links J' impart a transverse sliding movement to the collar J, which in turn imparts a swinging motion to the forked arm I^4 to rock the shaft I^3 and to cause the arm I^2 to swing inwardly to move the links J' and the bumper H' in a like direction, so that the concussion between the bumper-block H and the bumper H' takes place sooner, thus decreasing the length of the stroke of the frame C and pan B. When the speed decreases, the weighted levers J^2 swing back to their former position, thus drawing the collar J outward, and thereby allowing the bumper H' to resume its forward position by the action of the weighted cord H^2.

In order to allow the operator to adjust the position of the bumper H' in its guideway A^3 and relatively to the bumper-block H, I provide the link I with apertures for engagement by the pivot-pin I', and in order to allow more or less variation in the throw by the action of the governor I provide the arm I^2 with apertures for adjusting the link I vertically on the said arm to give more or less throw to the bumper H' when rocking the shaft I^3 upon the centrifugal governor. Near the front end of the bed or pan B is secured a feed-hopper K, which receives the material over the feed-board K', connected at the upper end with the usual pulp-receiving hopper K^2, receiving the pulp from a stamp-mill or other machine. In the front of the hopper K is arranged a transversely-extending water-supply L in the form of a box having a perforated bottom, the said box being connected by a pipe N with a suitable water-supply. The box L is bolted or otherwise secured to a frame L', provided at its rear end with transversely-extending trunnions or pivots L^2, (see Fig. 8,) engaging suitable bearings L^3, bolted or otherwise fastened to the sides of the standard A'. (See Fig. 3.) The forward end of the frame L' rests on rollers L^4, journaled on the pan B, so that when a swinging motion is given to the bed B by the mechanism above described the feed-hopper K moves with the bed, and consequently the material is discharged into the bed at the same place, while the water-supply box L remains stationary during the swinging motion of the bed, so as to deliver water at different points thereon, but the same distance from the pan-floor, whether the pan is raised or lowered. In the lower portion of the bed B are arranged tailings-discharge funnels O,

having their funnel-bodies preferably of oval shape, the long axes of the funnels extending transversely, as plainly indicated in Fig. 9, so that a large amount of tailings can readily pass through the funnels to be discharged from the bed.

The operation of the machine is about the same as the one described in the patent above referred to, with the exception that the cam action takes place without jarring the machine and without creating undue noise, and at the same time the length of the stroke of the bed or pan B is increased or diminished, according to the speed at which the shaft F is driven.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. An ore-concentrator having a pan mounted to swing, an actuating device for the pan, an adjustable controlling device for controlling the stroke of the pan, and a governor driven in unison with the actuating device and automatically adjusting said controlling device, as set forth.

2. An ore-concentrator, having a pan mounted to swing, an actuating device for the said pan, and a controlling device driven in unison with the said actuating device and automatically controlling the stroke of the pan, the said controlling device comprising a governor, and a wedge-shaped bumper mounted to slide and adapted to be engaged by the bumper-block of the said pan, the movement of the said bumper being controlled by the governor, as set forth.

3. An ore-concentrator, having a pan mounted to swing, an actuating device for the said pan, and a controlling device driven in unison with the said actuating device and automatically controlling the stroke of the pan, the said controlling device comprising a centrifugal governor, a wedge-shaped bumper mounted to slide and carrying a counterweight, and a connection between the said governor and the said bumper, as set forth.

4. An ore-concentrator, having a pan mounted to swing, an actuating device for the said pan, and a controlling device driven in unison with the said actuating device and automatically controlling the stroke of the pan, the said controlling device comprising a centrifugal governor, a wedge-shaped bumper mounted to slide and carrying a counterweight, and a connection between the said governor and the said bumper, the said connection being adjustable to regulate the position of the bumper relatively to the bumper-block and to give more or less throw to the bumper, as set forth.

5. An ore-concentrator, provided with a pan mounted to swing, and a bumping device for the said pan comprising a revoluble member, a cam-block on the pan and adapted to engage the peripheral face of the said cam, a spring-pressed slide in the said cam-block for engagement by the cam, and a bumping spring device pressing said pan, as set forth.

6. An ore-concentrator, provided with a pan mounted to swing, a bumping device for the said pan comprising a revoluble member, a cam-block on the pan and adapted to engage the peripheral face of the said cam, a spring-pressed slide in the said cam-block for engagement by the cam, a bumping spring device pressing said pan, and means for adjusting the tension of the springs on the said slide and the said bumping spring device, as set forth.

7. An ore-concentrator, having a pan mounted to swing, means for imparting a swinging motion to the pan in one direction, a bumper-block on the pan, a wedge-shaped bumper for the said block to bump against, and a governor actuated by the said means and automatically controlling the position of the wedge-shaped bumper relatively to the bumper-block, to regulate the length of the stroke of the pan, as set forth.

8. An ore-concentrator having a pan mounted to swing, an actuating device for the said pan, a movable bumper for regulating the stroke of the pan, and means for controlling the movement of the bumper and driven in unison with the said actuating device, as set forth.

9. An ore-concentrator, comprising a frame mounted to swing, a pan carried by said frame, a shaft mounted to turn and provided with a cam, a block carried by the frame and adapted to be engaged by the said cam to swing the frame in one direction, a spring-pressed slide in the said block and engaged by the cam, a spring device for swinging the frame in the opposite direction, and means for controlling the stroke of the frame and pan carried thereby, as set forth.

10. An ore-concentrator, comprising a pan mounted to swing, an actuating device for swinging the pan in one direction, a spring device for swinging the pan in the opposite direction, an adjustable bumper for controlling the stroke of the pan, and a governor driven in unison with the actuating device and automatically adjusting said bumper, as set forth.

11. An ore-concentrator, comprising a pan mounted to swing, a shaft provided with means for swinging the pan, an adjustable device for regulating the stroke of the pan, and mechanism actuated by the said shaft and connected with said adjustable device for automatically controlling the position of said device, as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

FRANKLIN WINFIELD HARLOW.

Witnesses:
GEO. H. BARNES,
FRANK C. KENDRICK.