(No Model.)

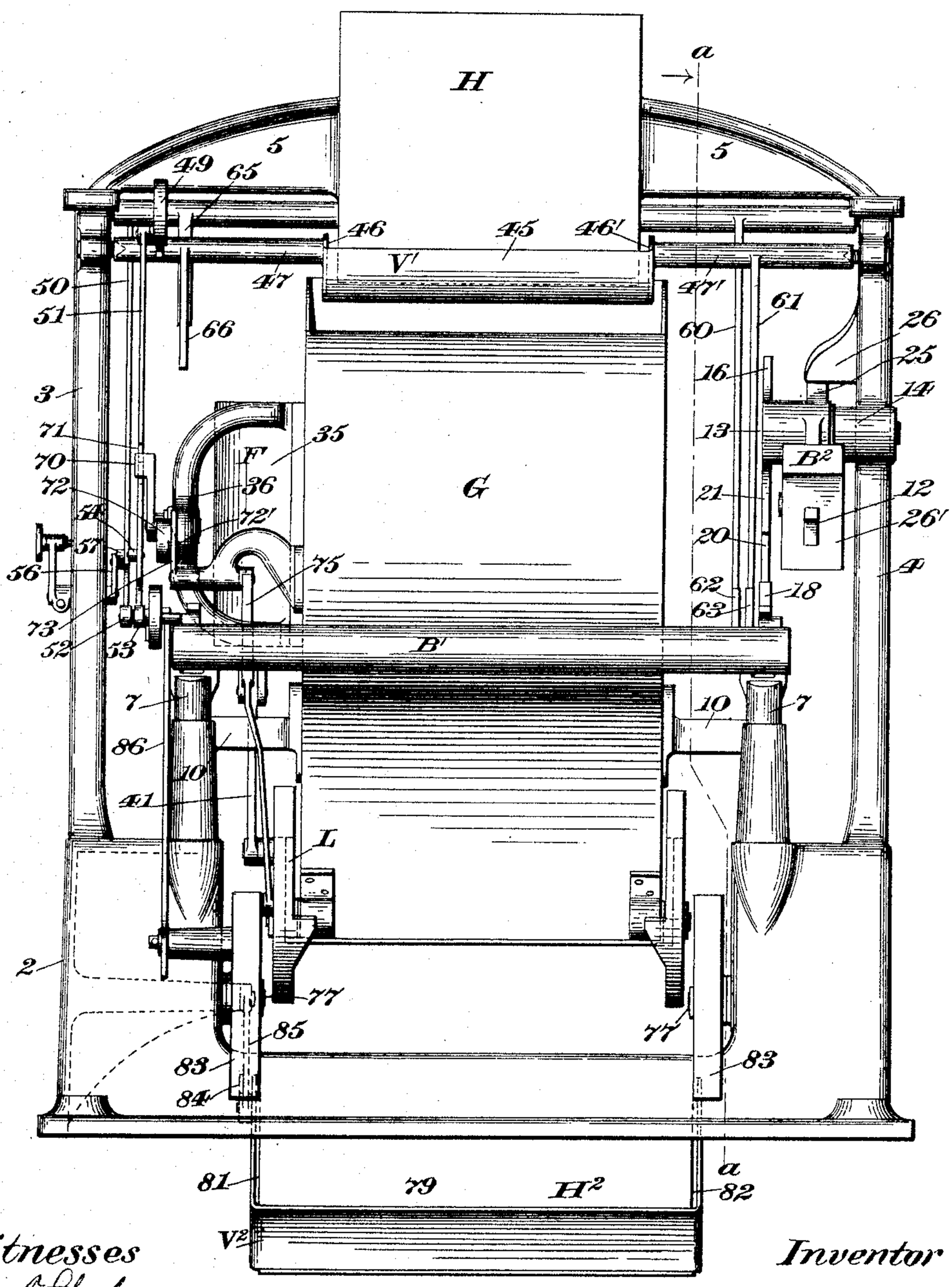
6 Sheets—Sheet 1.

F. H. RICHARDS.

WEIGHING MACHINE.

No. 585,973. Patented July 6, 1897.

Fig. 1.



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(No Model.) 6 Sheets—Sheet 2.

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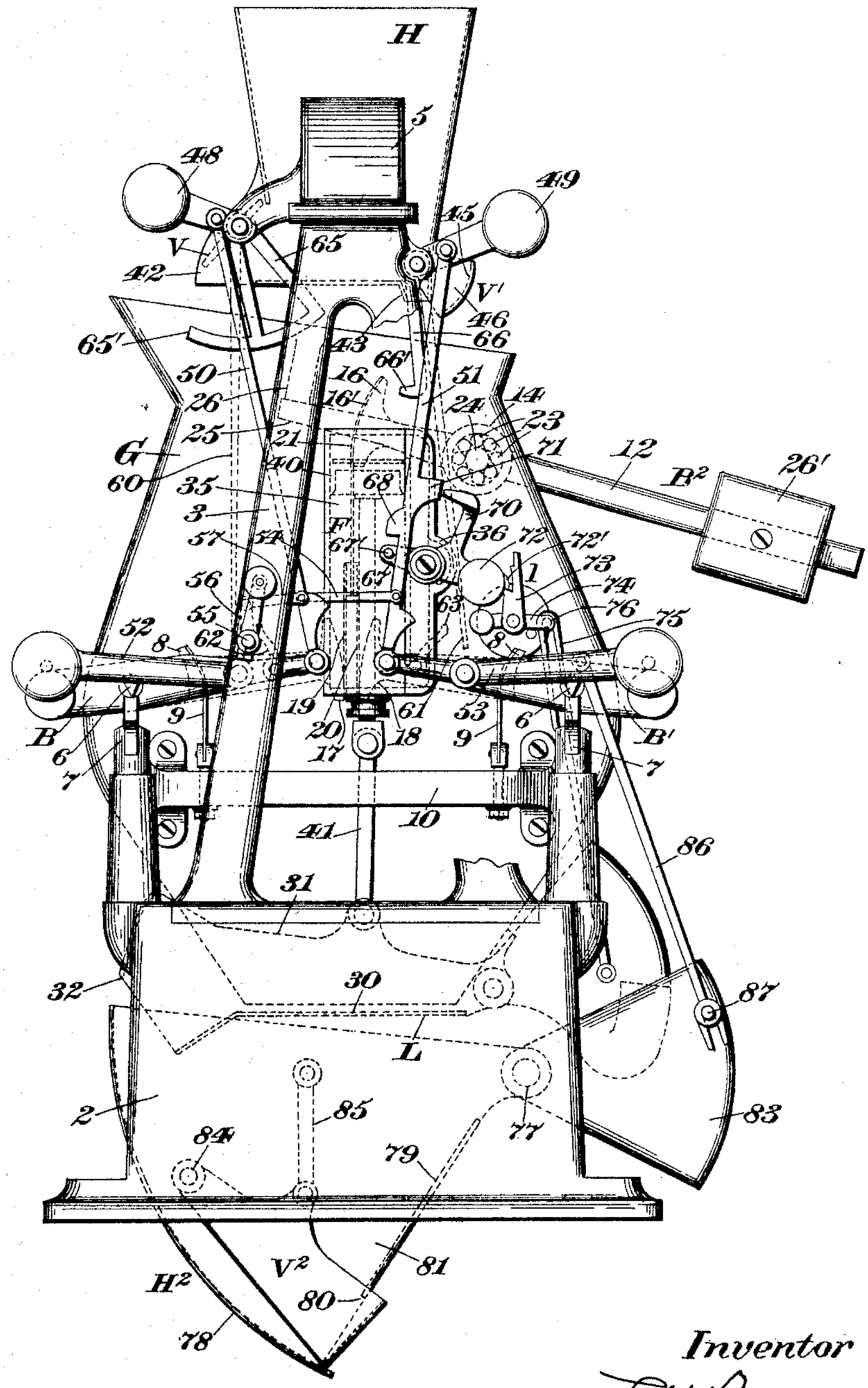
WEIGHING MACHINE.

No. 585,973. Patented July 6, 1897.

Fig. 2.



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(No Model.) 6 Sheets—Sheet 3.

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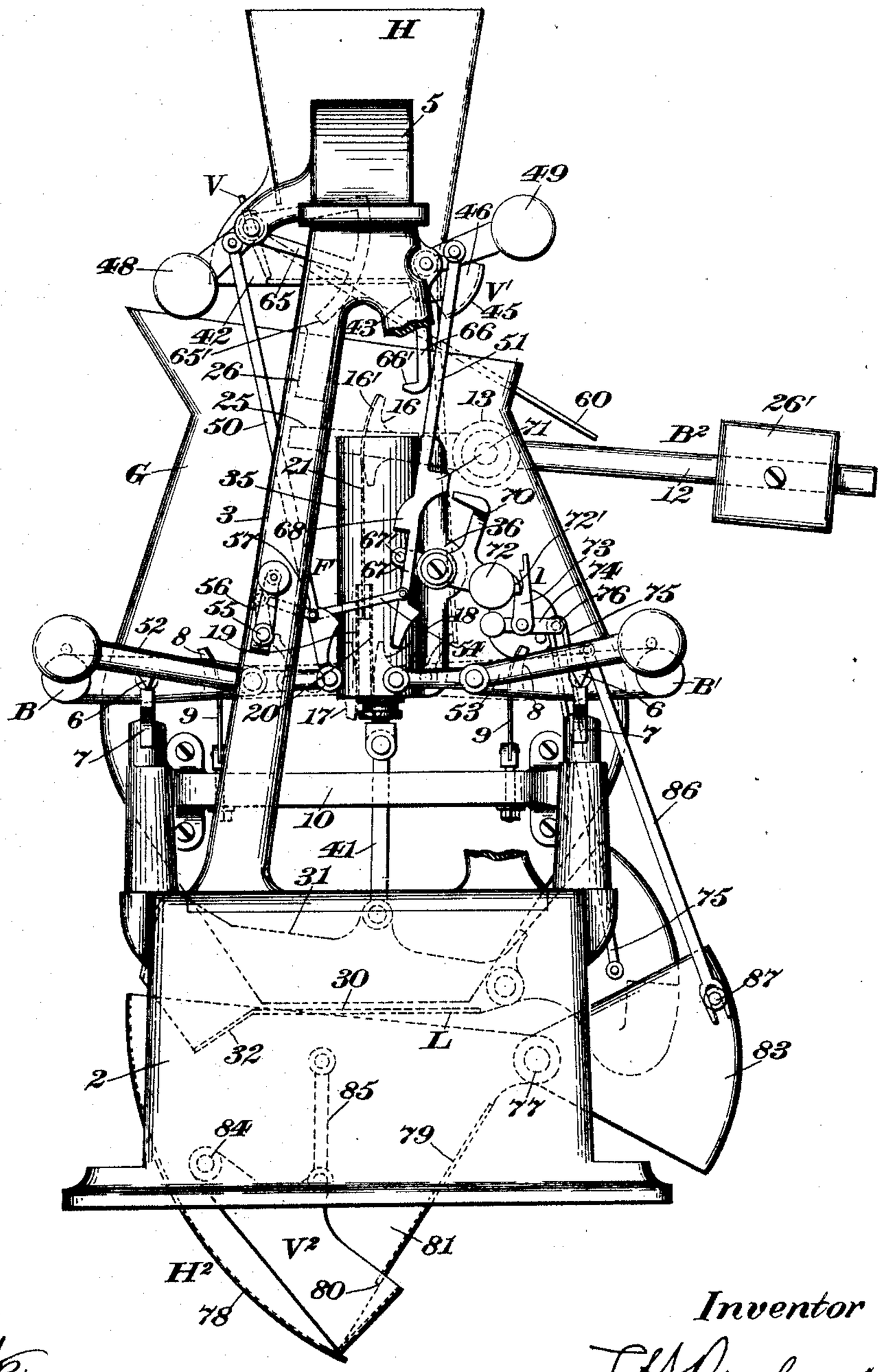
WEIGHING MACHINE.

No. 585,973. Patented July 6, 1897.

Fig. 3.



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6 Sheets—Sheet 4.

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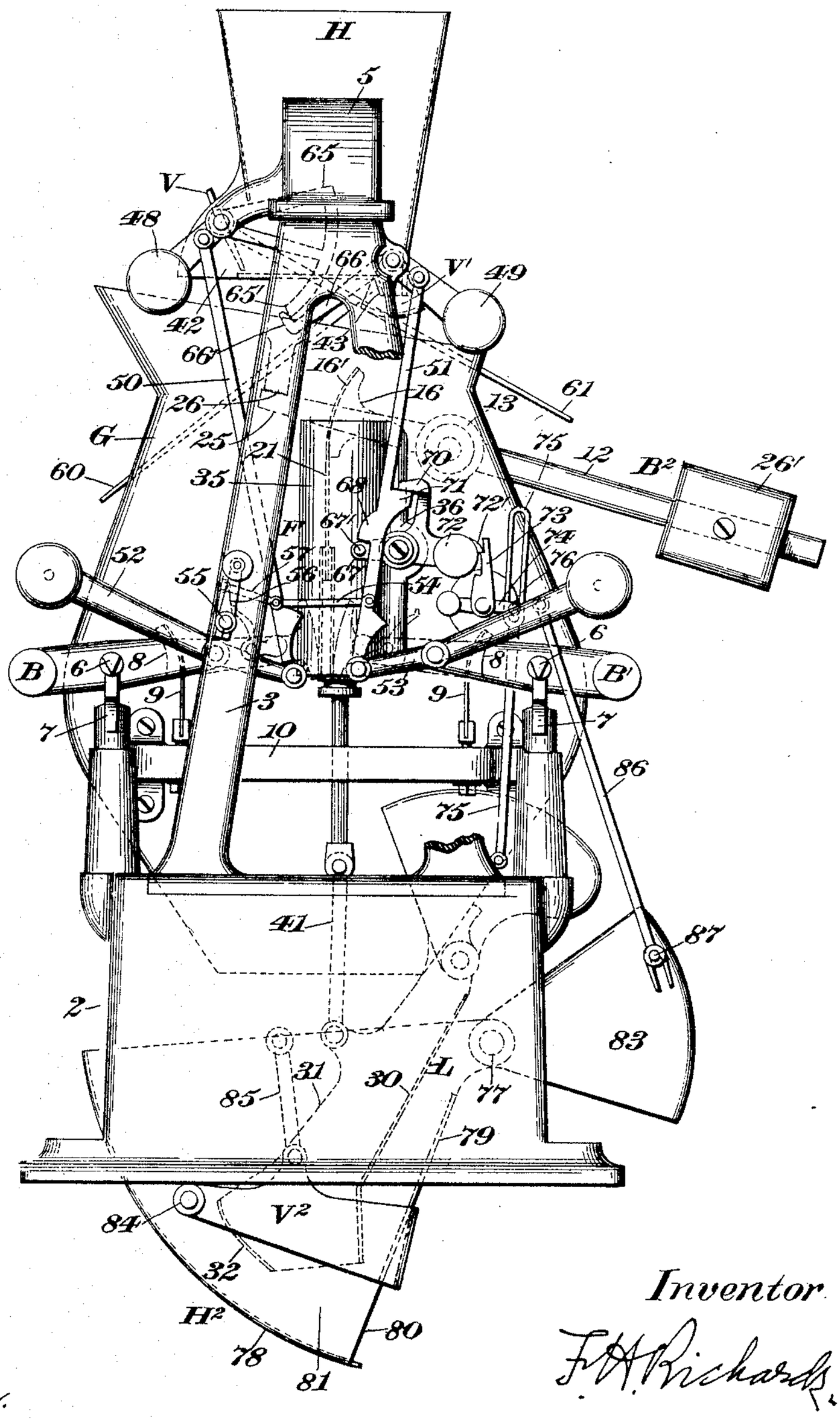
WEIGHING MACHINE.

No. 585,973. Patented July 6, 1897.

Fig. 4.



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(No Model.) 6 Sheets—Sheet 5.

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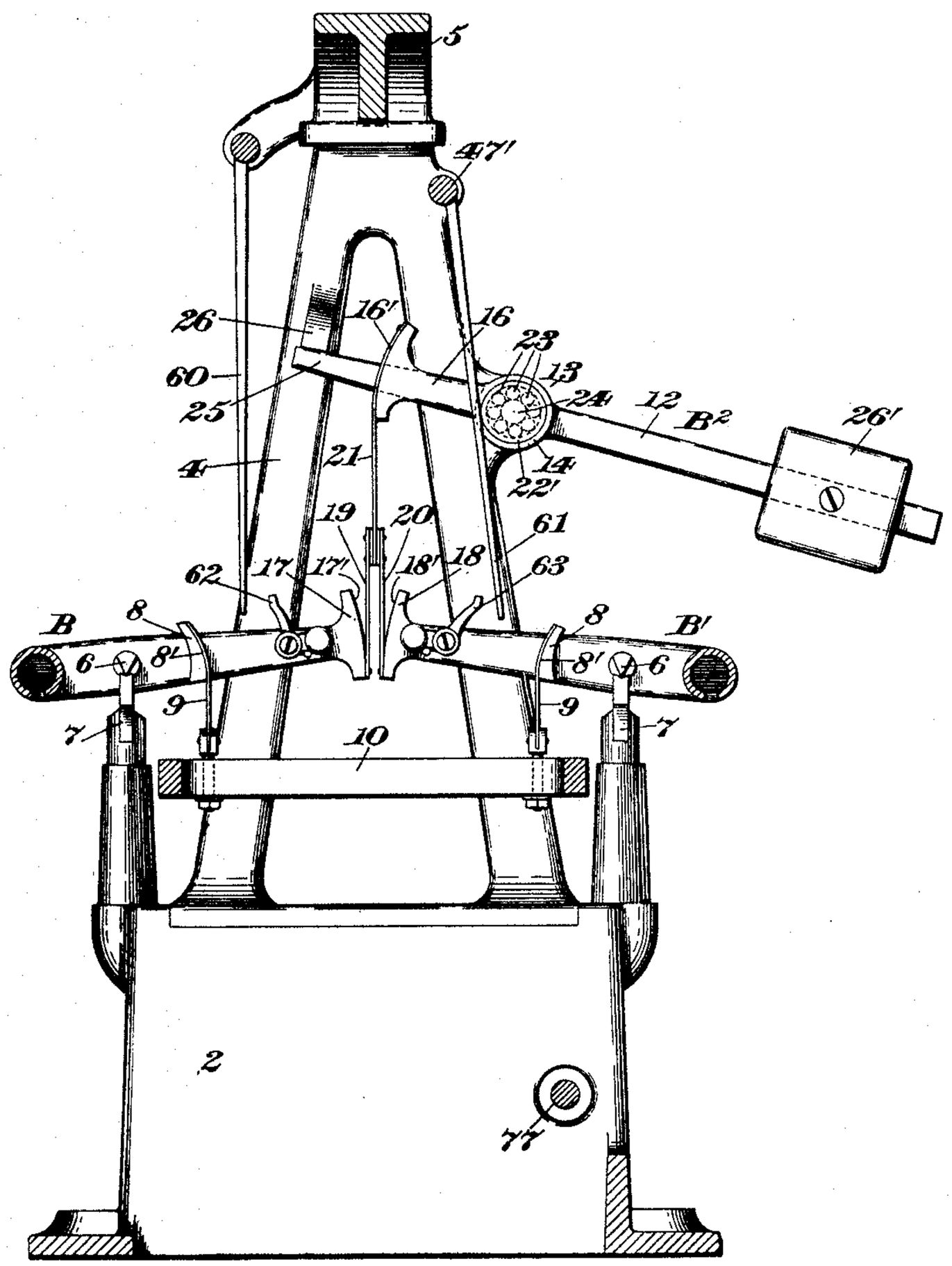
WEIGHING MACHINE

No. 585,973. Patented July 6, 1897.

Fig. 5.



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(No Model.) 6 Sheets—Sheet 6.

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WEIGHING MACHINE.

No. 585,973. Patented July 6, 1897.

Fig. 6.

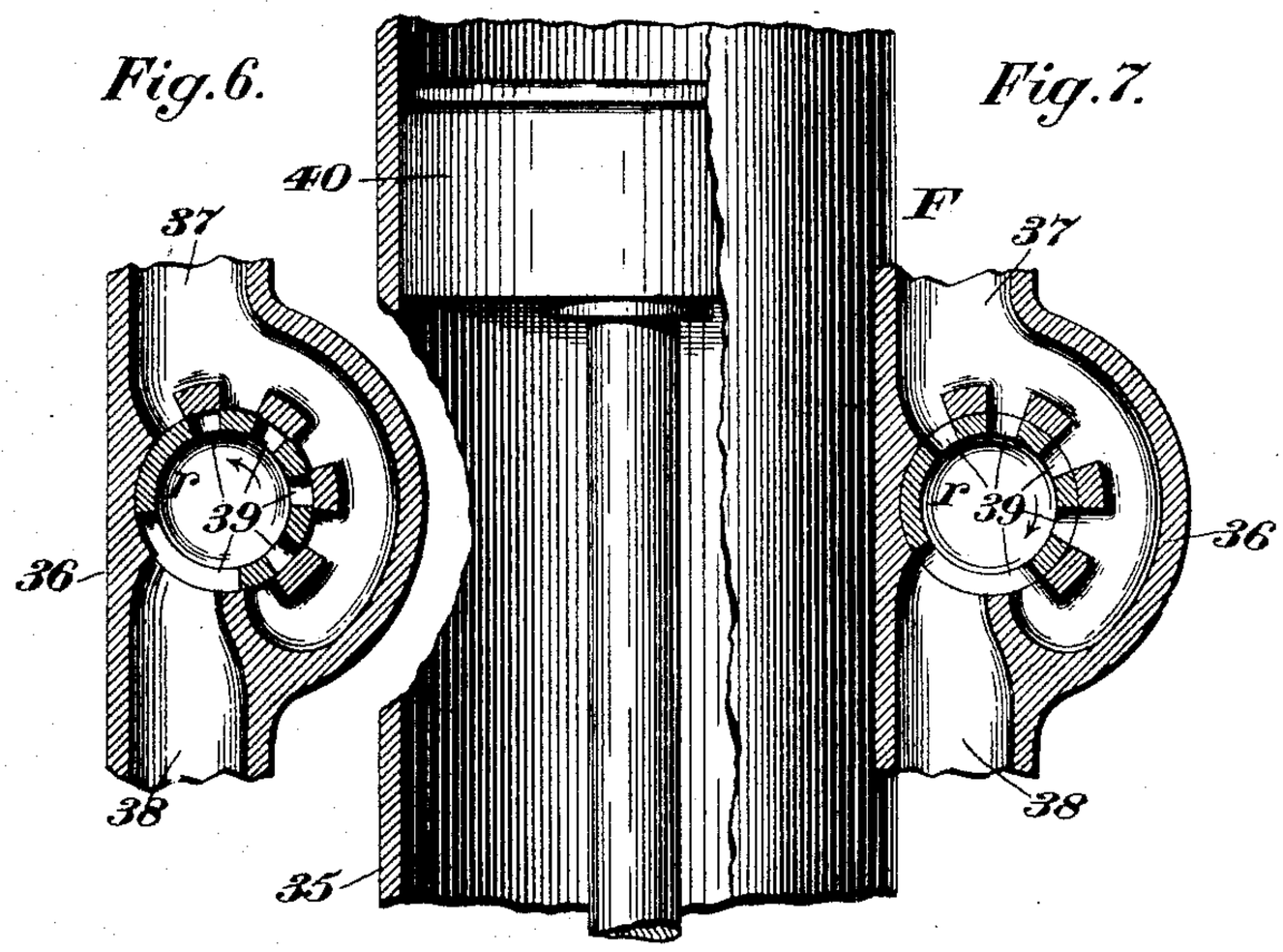

Fig. 7.

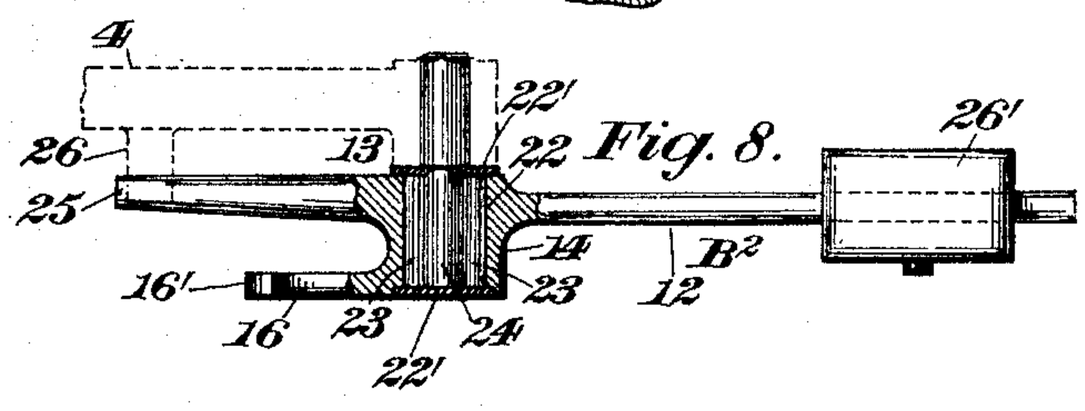

Fig. 8.

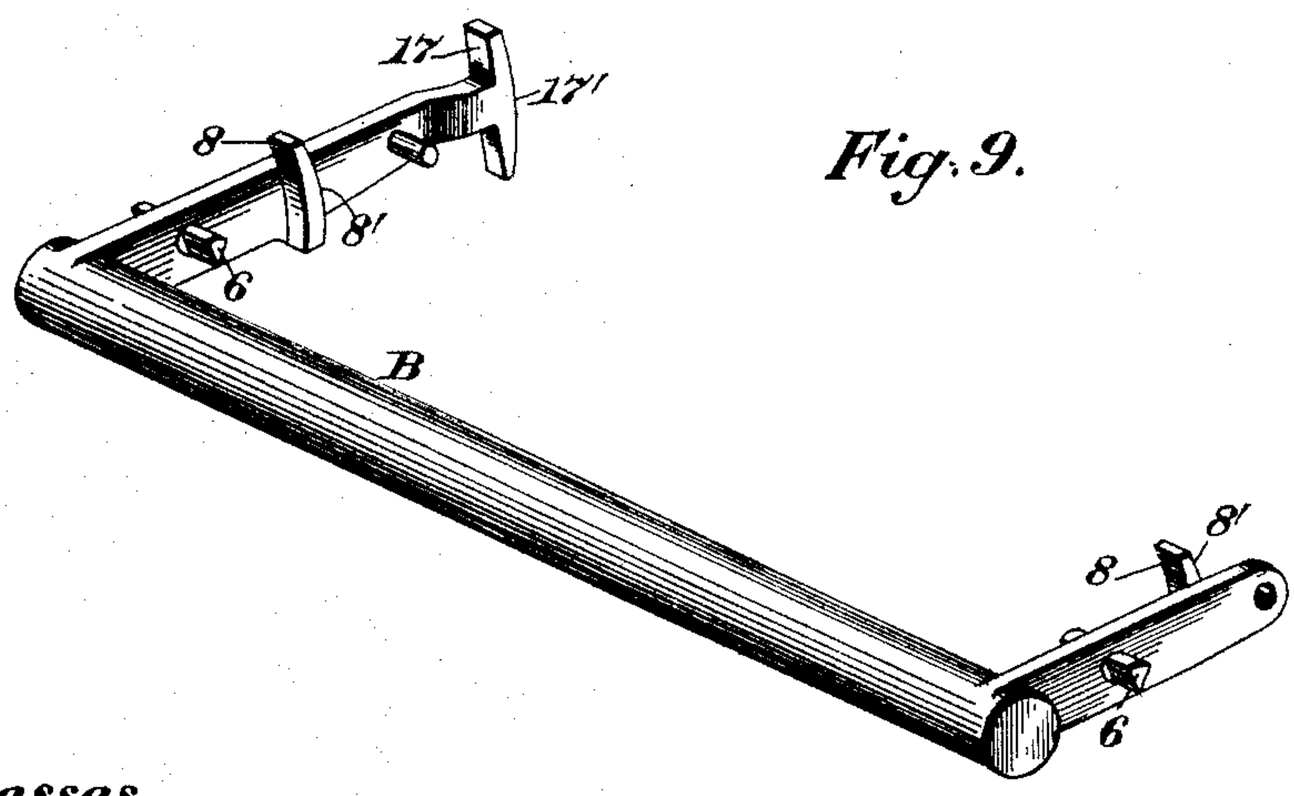

Fig. 9.

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UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT.

WEIGHING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 585,973, dated July 6, 1897.

Application filed January 6, 1897. Serial No. 618,139. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS H. RICHARDS, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Weighing-Machines, of which the following is a specification.

This invention relates to weighing-machines, one object of the invention being to furnish, in connection with oscillatory beam mechanism and a reciprocatory bucket of a weighing-machine, flexible hangers for the bucket, and the construction and organization of which hangers are such that the points of suspension of the bucket will during the reciprocations of the bucket and the oscillations of the beam mechanism be at all times located at corresponding distances from and in horizontal alinement with the pivotal points of the beam mechanism, thus maintaining a fixed relation between the sustaining-points of the bucket and the axes of the beam mechanism irrespective of the change in angles of the beams relatively to a horizontal line, and also obviating the injurious wear common to the usual bucket-supports in machines of ordinary construction, which is generally due to the shifting of the pivots on their supports during the oscillation of the beam mechanism.

A further object of the invention is to provide, in a weighing-machine, coöperative stop mechanism and safety devices constructed and organized to insure the proper sequential operations of the several mechanisms, including the load supplying and discharging mechanisms, during the operation of the machine.

A further object of the invention is to provide, in connection with the bucket and its closer and in connection with the valve mechanism, an improved fluid-controlled means comprehending instrumentalities for retarding the opening movement of the closer and for locking the valve against an opening movement until the closer is in its fully-closed position.

A further object of the invention is to provide, in connection with the bucket-closer and complemental mechanism, an improved regulator-hopper located below the bucket-closer and embodying instrumentalities for controlling the closing movements of the closer and through said closer the opening movement of the valve mechanism.

A further object of the invention is to provide, in a machine of the class specified, improved beam mechanism comprehending a pair of bucket-supporting beams and a beam-controlled or supplemental counterweighting-beam having a flexible connection with the two bucket-supporting beams, and to so construct and organize the beams and beam-controller that the bucket-supporting beams will move through equal arcs simultaneously during the reciprocations of the bucket, thus securing a more perfect balance of the bucket during the operation of weighing, as would be the case if one beam could by any possible means be depressed or elevated in advance of the other.

In the drawings accompanying and forming part of this specification, Figure 1 is a rear elevation of the weighing-machine embodying my present improvements. Fig. 2 is a side elevation of said machine, showing the main and drip valves open and in position to deliver material to the bucket of the weighing mechanism, the bucket-closer being in its closed position and the regulator-hopper in its elevated or load-receiving position with the valve thereof closed. Fig. 3 is a corresponding side elevation showing the drip-valve open and the main valve closed and in position to be locked against movement by the locking member of the drip-valve when said drip-valve is closed. Fig. 4 is a similar side elevation of the weighing-machine, showing both valves closed and locked against premature opening movement and also showing the bucket-closer in its open position and the regulator-hopper in its depressed or load-discharging position, the valve of the regulator-hopper being shown open. Fig. 5 is a longitudinal sectional view of the weighing-machine, taken in dotted line *a a*, Fig. 1, looking toward the right hand in said figure. Fig. 6 is a longitudinal section of a portion of the fluid closer-controller or valve-regulated dash-pot which controls the closing movements of the closer, the piston and valve being shown in the positions they occupy when the closer is in its closed position. Fig. 7 is a similar sectional view of a portion of the closer-controller, showing

the valve in position to permit a closer-opening movement of the piston. Fig. 8 is a plan view, partially in section, of the counterweighted auxiliary or supplemental beam, a portion of the framework being shown in dotted lines; and Fig. 9 is a perspective view of one of the bucket-supporting beams.

Similar characters designate like parts in all the figures of the drawings.

The framework for carrying the operative parts of the machine is shown in the accompanying drawings similar in a general way to the framework of the machine shown and described in the Letters Patent of the United States, No. 548,840, granted to me October 29, 1895, to which reference may be had, and said framework preferably comprises the chambered supporting-base 2, the side frames 3 and 4, supported on said base, and the top plate or beam 5, connecting the upper ends of said side frames and which beam supports the main supply chute or hopper II of the machine.

The bucket, which is designated in a general way by G and which is supported below the hopper II, is shown of the "single-chambered" type and is similar in a general way to the bucket described in the patent referred to.

The beam mechanism of the weighing-machine, which sustains the bucket G, is similar in construction and mode of operation, except in the particulars hereinafter fully described, to the beam mechanism shown and described in the patent referred to, and preferably comprises the two oppositely-disposed counterweighted beams B and B', respectively, each of which is shown pivotally supported intermediate the poising and counterpoising ends thereof, as hereinafter described, on supports rising from the base 2 of the machine.

Each scale-beam B and B' is shown in the drawings embodying two parallel beam-arms located one arm at each side the bucket and a shaft connecting the outer ends of said beam-arms, said shaft constituting the counterweight for the beam, and each beam-arm is provided, preferably at a point intermediate the poising and counterpoising ends thereof, with a knife-edge 6, which is pivotally supported upon a suitable bearing 7, which extends from the upper part of the base 2 of the machine, there being a pair of knife-edge bearings for each beam and the beams being supported in substantially the same manner as the beams of the machine described in the patent referred to.

As a convenient means for suspending the bucket G from the beams B and B', so that the points of suspension will be at all times in horizontal alinement with and at equal distances from the axes of movement of the scale-beams irrespective of the angles of the scale-beams with relation to the line of vertical movement of the reciprocatory bucket, to thereby obviate wear due to cramping or shifting of the bucket-supporting members, each beam-arm is furnished with a hanger-supporting member or flange 8, the working face of which is substantially concentric to the axis of movement of the beam-arm, and to each of said hanger-supports 8 is secured, near the upper end thereof, a hanger-strap 9, the lower end of which is secured to a bracket 10, fixed to a side of the bucket, as shown in Fig. 2 of the drawings.

The working faces 8' of the hanger-supporting members will preferably be located between the pivotal points and the inner ends of the respective beams, said supports being in the nature of curved flanges formed upon the inner faces of the beam-arms, as will be understood by reference to Fig. 9 of the drawings.

It is desired to state in the above connection that the particular constructions and locations of the hanger-supporting members 8 may be modified without departure from this invention and without affecting their utility or the beneficial results in operation.

For the purpose of positively insuring unitary movements of the two scale-beams B and B' and secure such a uniform balancing and distribution of effective weights of the parts of the beam mechanism as will effect an equalization of the work performed by the several parts, and consequently reduce frictional resistance to the minimum, I have provided in connection with the bucket-supporting means a counterweighted beam-controller, (designated in a general way by B^2,) which, in the preferred form shown in Figs. 2 and 8 of the drawings, is in the nature of a counterweighted lever or beam-arm 12, pivotally supported at 13 by an antifriction-bearing 14 on the framing and having at the inner end thereof a segment-arm 16, the working face 16' of which is concentric to the axis of movement of the lever 12 and is tangential to a vertical line drawn centrally between the two adjacent ends of the two opposing beam-arms, as will be understood by reference to Fig. 5 of the drawings. These adjacent ends of the two beam-arms are furnished with segment-flanges 17 and 18, respectively, whose working faces 17' and 18', respectively, are curved in opposing directions and are concentric, respectively, to the axes of movement of their respective beam-arms.

The connection between the counterpoising-beam and the bucket-supporting beams is shown in the drawings constituting two straps 19 and 20, joined at their lower edges to the lower edges of the working faces of the segment-flanges 17 and 18, respectively, and joined at their upper edges to a third strap 21, which is in turn fixed at its upper end to the upper edge of the segment-arm 16 of the counterpoise beam-arm 12. This beam-controller B^2, which in some instances may be referred to as the "supplemental" or "counterpoising" beam and which is located above the bucket-supporting beams, is shown transversely bored to form a bearing-chamber or

journal-box 22, in which are located a series of antifriction-rolls 23, which surround the outer end of a pivot-stud 24, fixed to a part of, and extending upward from, the framework of the machine, caps 22′ being provided to hold the rolls in place. This construction and organization provides a pivotal support capable of sustaining considerable weight and reducing the friction to the minimum. The inner end of the supplemental beam is furnished with a stop-arm 25, adapted to cooperate with an abutment 26 upon the framework, which limits the effective movement of said beam.

The counterweight 26′ of the supplemental counterpoising-beam of the supplemental beam B^2 will preferably be adjustably supported on the beam-arm 12 for the purpose of securing different counterpoising actions.

By pivotally supporting the beam-controller or supplemental counterweighted beam above, and connecting it in the manner described to, the adjacent ends of the bucket-supporting beams, and by suspending the bucket between the poising ends and pivotal points of said beams, the supplemental beam will not only exert a uniform pulling stress upon each bucket-supporting beam, and thus insure a synchronous movement of these beams during the operation of the machine, but a certain proportion of the weight of the load will be sustained by the antifriction-bearing of the supplemental beam, thus relieving the knife-edges of the bucket-supporting beams *pro rata* and reducing the wear of said knife-edges to the minimum.

The bucket-closer L, which is hinged to the lower edge of the bucket and is furnished with a counterweight in the usual manner, may be of any suitable general construction, it being shown in the drawings comprising a closer-plate 30, adapted to cover the discharge-orifice of the bucket, which plate is preferably furnished with side flanges 31, which are connected together at the end of the closer by an inclined spout 32, the extreme lower edge of which terminates at a point considerably below and in advance of the discharging end of the plate 30, the bottom wall of said spout constituting an inclined continuation of the bottom wall or plate 30 of the closer. The function of this spout is to regulate the volume of the stream of material when the closer is open, and, furthermore, to prevent a premature closing movement of the closer.

As a means for controlling the opening movement of the bucket-closer, I have provided in operative connection with said closer a fluid-controller, which is designated in a general way by F, and which in the preferred form (shown most clearly in Figs. 6 and 7 of the drawings) is in the nature of a valve-controlling dash-pot. This fluid-controller or dash-pot preferably comprises a piston-cylinder 35, supported on the bucket or load-receiver G, with its longitudinal axis preferably in the plane of the longitudinal axis of the bucket; a valve-chamber 36, having port-passages 37 and 38 respectively leading to the upper and lower ends of the piston-cylinder; a rotary valve (designated in a general way by *r*) supported in said valve-chest and having ports 39, adapted on the rotation of the valve from the position thereof shown in Fig. 6 to that shown in Fig. 7 for establishing communication between the upper and lower portions of the piston-cylinder 35; a piston 40, seated for reciprocatory movement in the piston-cylinder and having a piston-rod which extends through a bushed opening in the lower end of the piston-cylinder. The bucket-closer L is shown connected to the piston-rod by a link or closer-supporting rod 41, which rod is pivotally connected at its upper end to the piston-rod and similarly connected at its lower end to one of the side flanges of the bucket-closer. This fluid-controller F in the organization shown in the accompanying drawings constitutes not only a controller for the bucket-closer, but also constitutes, in connection with other instrumentalities hereinafter described, a locking device for the valve mechanism and prevents an opening movement of the valve until the closer is fully closed.

It is desired to state in the above connection that the fluid-controller may be employed with other elements of the machine than the bucket-closer, and it is not desired to confine this feature of the invention to the specific organization thereof shown in the accompanying drawings—that is to say, the specific fluid-controller in combination with any shiftable member or element of the machine is within the purview of my invention, as is also any manifest modification in construction and organization thereof.

The supply-hopper H, which may be of any suitable general construction, is shown having two independent discharge-spouts 42 and 43, respectively, the one 42 being shown in the drawings communicating with the interior of the hopper through the lower portion of the front wall of said hopper and constituting a main supply-stream discharger, and the one 43 being shown communicating with the interior of the hopper through the bottom wall, near the rear edge thereof, and constituting a supplemental or drip-stream discharger.

The main discharger 42 of the hopper H is shown in the nature of a horizontally-disposed spout, the discharge-opening thereof being located above the bottom wall of the hopper, and the supplemental discharger 43 is shown in the nature of a vertically-disposed spout and has its discharge-opening located preferably below the plane of the bottom of the hopper.

The valve mechanism in the organization shown in the accompanying drawings comprises two independently-operable valves or stream-controllers—to wit, a main valve V and

a supplemental or drip valve V'—and actuating and controlling instrumentalities for said valves. The main valve V, which is shown in the nature of a gate-valve, is pivotally supported between the side walls of the discharge-spout 42 and is organized to close the discharge-opening of said spout. This valve preferably comprises a flat plate, and is pivotally supported at its opposite ends and substantially midway of its width between the side walls of the discharge-spout, and is located somewhat in advance of the front of the wall of said hopper, said valve-plate when in its closed position lying in a plane substantially parallel to the plane of the front wall of said hopper.

The supplemental or drip valve V' is similar in a general way to the drip-valve described in Patent No. 573,418, granted to me December 15, 1896, it consisting of a curved plate 45, having end flanges 46 and 46', provided with outwardly-extended pivot-arms 47 and 47', which have bearings at their ends in the opposite side frames 3 and 4 of the machine, the axis of movement of said valve being substantially in alinement with the longitudinal axis of the supplemental discharger 43 and being located somewhat above the bottom wall of the hopper H, this valve-plate 45 when the valve is in its closed position being located below the discharge-spout opening 43 in position to cut off the drip-stream.

As a means for effecting a closing movement of the two valves V and V', said valves are provided with counterweighted arms 48 and 49, respectively, which extend outward in relatively opposite directions and constitute valve-closing actuators.

As a means for actuating the two valves V and V' to effect an opening movement thereof, I have provided in connection with said valves two thrust-rods 50 and 51, the one 50 of which is pivotally connected at its upper end to the main supply-valve V in advance of the axis of movement of said valve, and the one 51 of which is pivotally connected at its upper end to the supplemental valve V' in the rear of the axis thereof, and said thrust-rods are normally supported, respectively, upon the inner adjacent ends of two counterweighted levers 52 and 53, which are pivotally supported upon the scale-beams B and B' adjacent to the inner ends of said beams, said levers 52 and 53 constituting the valve-opening actuators. The two thrust-rods are shown pivotally connected together at their lower ends by means of a link 54, which tends to retain said lower ends in proper positions relatively to one another, and for the purpose of maintaining the lower ends of the thrust-rods in proper positions for coöperation with the inner ends of the counterweighted levers 52 and 53 I have provided a rock-shaft 55, which is journaled in one of the side frames of the machine and is furnished with a crank 56 at the inner end thereof, which is pivotally connected to one of the thrust-rods, as 50, by means of a link 57, and said rock-shaft is furnished at the outer end thereof with a counterweighted arm which is so disposed as to normally tend to rotate the rock-shaft in a direction for shifting the thrust-rod 50 toward the center of the machine and to retain the opposite thrust-rod in position to be engaged by a thrust-rod-engaging latch, as will be hereinafter more fully described.

The counterweights of the two thrust-rod actuators or levers 52 and 53 will normally rest upon the counterpoised ends of the scale-beams B and B', suitable stops being employed for maintaining the same in such relation that they become in fact fixed extensions of said scale-beams, whereby on the downward movement of the scale-beams during the loading period such levers constitute means for checking the closing movement of the valves.

The operation of each valve-opening actuator is substantially the same as that of the valve-opening actuator described in the patent hereinbefore referred to, the inner end of which actuator descending with the counterpoising end of the beam to which it is pivoted and during the descent of the bucket and being held in this position by a latch which cooperates with one of the valve-opening thrust-rods until the latch is released, subsequent to the discharge of the bucket-load, after which the counterweighted end of said actuator descends and effects, through the medium of the thrust-rod, an opening movement of the valve.

As a convenient means for arresting the valves V and V' at predetermined points in the closing movements thereof, so as to prevent the premature cutting off of the main and drip streams, said valves are furnished with stop-arms 60 and 61, respectively, and the inner ends of the oppositely-disposed beams B and B' are furnished with by-pass stops 62 and 63, which are pivotally supported thereon in positions to engage the lower ends of the stop-arms 60 and 61, respectively, during the closing movement of the two valves V and V' and hold said valves against further closing movement until the bucket and the poising ends of the beams have arrived at the requisite points in their descending movements.

In the organization of valve mechanism shown in the accompanying drawings the stop-arms and by-passes of the two valves are so arranged that the closing movement of the main valve will be interrupted at that point in the operation of the beam mechanism when the bucket has arrived approximately at its poised position, the by-pass releasing the stop-arm of the main valve as the bucket descends slightly below its poised position, and the supplemental valve will be held preferably by its stop-arm and by-pass in its fully-open position until the main valve is fully closed, after which the by-pass will release the stop-arm of said valve at the

requisite point in the descending movement of the bucket and effect a quick closing movement of said supplemental valve. Thus it will be seen that the closing movements of the main and supplemental valves take place in succession.

As a convenient means for locking the main valve against opening movement until the bucket has discharged its load and the bucket has returned to its normal closed position the main valve is furnished with a stop-arm 65 and the supplemental valve is furnished with the coacting stop-arm 66, adapted for engaging the stop-arm of the main valve after the supplemental valve is in its closed position, to thereby hold the same against premature opening movement.

The stop-arm of the main valve is shown in the nature of a segment or curved arm adapted to move in a path concentric to the axis of movement of said valve and has a stop-face 65′, and the stop-arm of the supplemental valve is shown as a straight arm having the projection or hook 66′ at the outer end thereof adapted for engaging underneath the stop-face 65′ of the stop-arm 65 on the main valve when the two valves are in the closed position shown in Fig. 4.

For the purpose of controlling the opening movement of the bucket-closer by the supplemental or drip valve V′ on the closing movement thereof the stem of the rotary fluid-valve *r*, which controls the flow of the fluid contained in the dash-pot or fluid-controller F, is furnished with an actuating-arm 67, having a projection 67′, located in the path of movement of a valve-actuating projection 68 on the thrust-rod 51 of said supplemental valve, said projection 68 being so located upon the thrust-rod that on the quick descending movement of said rod, due to the final closing movement of the valve, it will engage the projection 67′ upon the liquid-valve-actuating arm 67 and shift the valve from the position shown in Fig. 6 to that shown in Fig. 7, thus permitting the fluid, which before this operation was contained below and blocked the movement of the piston, to flow through the valve-ducts from the lower port-passage 38 to the upper port-passage 37 and thence into the upper portion of the cylinder 35, thus reducing the resistance of the fluid and facilitating a gradual opening movement of the bucket-closer.

As a means for locking the supplemental valve in its closed position and hold the same in such position until the bucket-closer has returned to the fully-closed position, (shown in Fig. 3,) the valve-stem of the fluid-valve *r* is furnished with a latch member 70 and the thrust-rod of the supplemental valve is furnished with a catch or projection 71, said latch member and catch being so disposed that when the thrust-rod has operated to shift the fluid-valve *r* from the closed position (shown in Fig. 6) to the open position (shown in Fig. 7) the latch will engage over the upper face of the catch upon said thrust-rod, as shown in Fig. 4, and lock the thrust-rod against premature ascending movement, thus preventing opening movements of the two valve-actuating levers 52 and 53, as will be understood by reference to said Fig. 4.

The fluid-valve *r* is shown having a counterweighted valve-closing actuator 72, so located as to automatically effect a closing movement of said valve, and as a means for locking this valve against a premature closing movement I have provided a counterweighted latch, (designated in a general way by *l*,) which is pivotally supported, preferably on the bucket G and embodies a stepped latch-arm 73, adapted for engaging the catch 72′ on the valve-closing actuator 72, which latch-arm is furnished with a counterweighted lever 74, adapted for holding one of the stepped portions of said latch-arm in operative engagement with the catch on the actuator 72 of the valve *r*, when the valve *r* is open, as will be understood by a comparison of Figs. 2, 3, and 4 of the drawings.

For the purpose of releasing the latch *l* from effective engagement with the actuator 72 of the fluid-valve *r*, to permit an automatic closing movement of said valve after the bucket-closer is in its fully-closed position and thereby block the closer against a premature opening movement, I have provided in connection with the counterweighted end of the bucket-closer a latch-actuating rod 75, which is pivotally connected at its lower end to this portion of the closer and is preferably slotted at its upper end to constitute a slideway in which is seated a projection 76 on the non-counterweighted end of the lever 74, the guideway of the latch-actuating rod being of sufficient length to permit a limited amount of movement of the bucket-closer without affecting the position of the latch which blocks the opening movement of the fluid-valve, the latch-actuating end of the guideway being so disposed with reference to the range of movement of the bucket-closer that it will act to release the latch-arm 73 from engagement with the actuator 72 of the valve *r* at the last stage of the closing movement of the bucket-closer.

From the foregoing it will be seen that the bucket-closer L is locked as against opening movement until both valves B and B′ are in their fully-closed positions and that said valves are both locked in their closed positions through the medium of the latch in connection with the fluid-valve *r* until the bucket-load is fully discharged and the bucket-closer has returned to its normal closed position, after which the supplemental valve is first opened to release the main valve, after which the opening movement of the main valve takes place.

For the purpose of controlling the final discharge of the bucket-load and for blocking the return movement of the beam mechanism until the bucket-closer is fully closed I have

provided a regulator-hopper (designated in a general way by H^2) which is pivotally supported at 77 below the discharge end of the bucket, which hopper comprises the curved front wall 78, which is preferably concentric to the axis of movement of said hopper, the radial and relatively straight bottom wall 79, which is preferably cut away at the forward end thereof, as shown at 80, to form a discharge-outlet, and the two side walls 81 and 82, respectively. This hopper is shown furnished with a counterweight 83, adapted for holding the same normally in its closed position.

For the purpose of closing the outlet (shown at 80) of the regulator-hopper I have provided in connection with said hopper a valve V^2, which is pivotally supported at 84 to the side walls of said hopper and has a cut-off plate at the free end thereof adapted for closing the opening 80 when the hopper is in the closed position shown in Fig. 2. This valve V^2 is so constructed and organized that it will have a closing movement imparted thereto simultaneously with the closing movement of the regulator-hopper H^2 and will have an opening movement imparted thereto simultaneously with the opening movement of said hopper. To effect this end, the valve V^2 has pivotally connected thereto, substantially midway between the front and rear ends thereof, an actuating-link 85, which link is pivotally connected at its upper end to the base 2 of the weighing-machine.

The means for blocking the closing movement of the hopper when the bucket is in its overpoised or discharged position consists of a link or rod 86, pivotally connected at its upper end to one of the valve-opening levers, as 53, and abutting at its lower end against a projection 87 upon the counterweighted portion of the hopper H^2, said rod being preferably bifurcated at the lower end thereof to retain the same in operative relation with the projection 87 during the different movements of the hopper and beam mechanism.

When the bucket-load is suddenly discharged from the bucket into the regulator-hopper, this being then in the position shown in Fig. 3 and the valve V^2 being closed, the material strikes chiefly on the bottom wall of the hopper and carries said hopper downward to the position shown in Fig. 4, thus, through the linkage connection 85, opening the valve V^2, allowing a free discharge of the material through the outlet 80 in said bottom wall, the valve arriving at its fully-open position simultaneously with the arrival of the hopper at its fully-open position. Therefore it will be seen that the volume discharged through the opening 80 of the regulator-hopper H^2 is gradually increased throughout the descending or opening movement of said hopper.

By the term "bucket" as herein employed is meant any suitable load receiving or sustaining medium.

Briefly stated, the sequential operations of various parts of the mechanism are as follows: Assuming the main and supplemental valves to be in their opening positions and the weighing mechanism to be in the position thereof illustrated in Fig. 2, the bucket gradually descends as the material flows therein from the main supply-hopper H until it traverses a distance equal to about three-fifths of its total movement. The main valve then closes. Bucket comes to a poise. The drip-valve is then shut off. The main valve is locked in its closed position by the locking member on the drip-valve. The fluid-valve r is opened through the medium of the supplemental-supply-valve thrust-rod simultaneously with the closing movements of said supplemental valve, and said thrust-rod is locked in its lowest position. The closer opens. The regulator-hopper descends to its open position. The closer shuts. The fluid-valve is unlatched and returns to its normal position, thus locking the closer in its closed position through the medium of the fluid contained in the fluid-chamber, which releases the thrust-rod of the supplemental valve. The regulator-hopper then closes, allowing the supplemental valve to open, which releases and permits an opening movement of the main supply-valve, said valves being opened in the order named by the valve-opening movements of the two actuators 52 and 53.

Having described my invention, I claim—

1. In a weighing-machine, the combination, with a load-receiver having a counterweighted shiftable load-discharge member and with a supply apparatus having a valve and means for actuating said valve, of a dash-pot comprising a piston-cylinder having a valve-chest and also having a piston in direct connection with the load-discharge member; a fluid-valve located in said valve-chest; means controlled by the supply-valve, on the closing movement thereof, for actuating the fluid-valve to effect an opening movement of the load-discharge member; and means in connection with and controlled by the fluid-valve and load-discharge member, on the opening movement thereof, for locking the supply-valve against opening movement until the load-discharge member is in its fully-closed position.

2. The combination, in a weighing-machine, of a load-receiver having a load-discharge member or closer; a supply-valve; valve-actuating means; a fluid-controller having a piston in direct connection with said closer; and a fluid-controlling valve actuated by the supply-valve, on the closing movement thereof, to effect a closer-opening movement of said piston.

3. A weighing-machine comprising a load-receiver having a shiftable load-discharge member; a supply apparatus having an oscillatory valve; a piston-cylinder having a valve-chest with port-passages communicating at opposite ends of said cylinder; a piston working in said cylinder and having a piston-

rod in operative connection with the load-discharge member; a fluid-valve supported for rotative movement in the valve-chest and having ports adapted for simultaneously communicating with the two port-passages; means controlled by the supply-valve, for imparting an opening movement to the fluid-valve to effect an opening movement of the load-discharge member; means carried by the load-discharge member, for imparting a closing movement thereto; a counterweighted fluid-valve-closing actuator; means controlled by the fluid-valve, on the opening movement thereof, for locking the supply-valve in its closed position; and means controlled by the load-discharge member, on the closing movement thereof, for unlocking the supply-valve.

4. In a weighing-machine, the combination, with two independent shiftable members, of a fluid-controller having a piston in operative connection with one shiftable member and also having a rotary fluid-controlling valve; means controlled by the other shiftable member, for imparting a rotative movement to the valve in one direction; means carried by the valve, for imparting to said valve a rotative movement in an opposite direction; and means for locking the valve temporarily in one of its positions.

5. The combination, in a weighing-machine, of a load-receiver having a shiftable discharge member; a supply apparatus having a shiftable stream-controller; a fluid-controller having a piston in operative connection with the load-discharger and having a fluid-controlling valve; means in connection with, and operated by, the stream-controller, for actuating the valve to facilitate a movement of the piston in one direction; means for temporarily locking the valve in this position; and means for effecting a movement of the valve in the opposite direction on the release of the locking means.

6. The combination, in a weighing-machine, of a load-receiver having a shiftable closer; load-supply means having a shiftable stream-controller; a dash-pot or fluid-controller having a piston in operative connection with the closer and also having a gravitative fluid-controlling valve; means operated by the stream-controller, on a closing movement thereof, for imparting an opening movement to the fluid-valve in one direction; a latch for locking the valve in its open position; and means controlled by the closing movement of the closer, for releasing the latch to facilitate a closing movement of said valve.

7. A weighing-machine comprehending a load-receiver having a shiftable discharger; a supply apparatus having a shiftable stream-controller; a fluid-controller embodying a piston in operative connection with the discharger; and a fluid-controlling valve for establishing and cutting off, alternately, communication between the upper and lower portions of the piston-cylinder; actuating means for the stream-controller; a thrust-rod carried by the stream-controller and effective for imparting an opening movement to the fluid-valve; a latch for locking the fluid-valve in its open position; means carried by the fluid-valve, for locking the stream-controller in its closed position; a latch-actuator carried by the load-discharger and effective, on the closing movement of said discharger, for actuating the latch to release, and facilitate a closing movement of, the fluid-valve and simultaneously unlock the stream-controller, to permit an opening movement thereof.

8. The combination, in a weighing-machine, of a load-receiver having a closer or discharge member; a supply apparatus having a shiftable stream-controller; a fluid-controller having a piston in operative connection with the closer and also having a rotative valve; an actuating member carried by the stream-controller, for imparting an opening movement to the valve on the closing movement of said controller, to thereby facilitate an opening movement of the closer; a gravitative locking device or latch for locking the fluid-valve in its open position; a latch carried by the fluid-valve, for engaging the actuating member and for locking the stream-controller temporarily in its closed position; means for imparting a closing movement to the closer; and means controlled by the closer, on the closing movement thereof, for releasing the fluid-valve-locking device; and means effective, on the release of said locking device, for imparting a closing movement to the valve and for simultaneously releasing the latch thereof from engagement with the actuating member of the stream-controller.

9. A weighing-machine comprehending a load-receiver having a load-discharge member; a supply apparatus having a stream-controlling mechanism; a fluid-controller having a piston in operative connection with the load-discharge member; a valve actuated by the stream-controlling mechanism and embodying meams for locking the stream-controlling mechanism in one position; and means controlled by the closing movement of the closer, for effecting an unlocking movement of the fluid-valve and to thereby lock the closer in its closed position.

10. In a weighing-machine, the combination, with a load-receiver having a discharge-opening, of a closer pivotally supported on said load-receiver and having a plate or bottom wall adapted for covering the discharge-opening of said load-receiver and also having at the discharge end thereof a spout having a bottom wall which is downwardly inclined with respect to the plane of the closer-plate and conjugate thereto, and having a curved upper plate for controlling the volume of the stream as it flows from the closer; and means for actuating said closer.

11. In a weighing-machine, the combination, with a load-receiver having a discharge member, of a regulator-hopper pivotally sup-

ported below said receiver and discharge member and having a discharge-opening; and a valve pivotally carried on said regulator-hopper in position to cover the discharge-opening thereof and having a pivotal connection with a fixed portion of the framework of the machine, whereby, on the descending movement of the regulator-hopper, an opening movement will be imparted to the hopper-valve.

12. In a weighing-machine, the combination, with the framework and with weighing mechanism embodying a load-receiver having a closer, of a counterweighted regulator-hopper pivotally supported on the framework and having a discharge-opening; a valve pivotally carried on the hopper and having a plate for closing the discharge-opening; and a link pivotally connected to the framework at one end and at its opposite end to the valve in such manner that an opening movement will be imparted to the valve on the descending movement of the hopper and a closing movement will be imparted thereto on the ascending movement of said hopper.

13. In a weighing-machine, the combination, with the framework thereof, of a hopper having two side walls connected together by a substantially straight bottom wall having an opening in one end thereof and a curved end wall terminating in juxtaposition to the opening in the straight wall; a valve pivotally supported on the side walls of the hopper and having a closer-plate located in position to close the bottom wall of said hopper; and a link pivotally connecting the valve to the framework in such manner that a descending movement of the hopper will effect an opening movement of the valve and an ascending movement of said hopper will effect a closing movement of said valve.

14. The combination, with beam mechanism and with a load-receiver having a discharge member, of a regulator-hopper pivotally supported under the load-receiver and having a valve-regulated opening; a valve pivotally carried on said hopper; an actuating-connector between the valve and a fixture of the framework of the machine and adapted for effecting an opening movement of the valve simultaneously with the discharge movement of the hopper; and a link connecting the hopper and beam mechanism.

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Witnesses:
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