No. 607,464. Patented July 19, 1898.

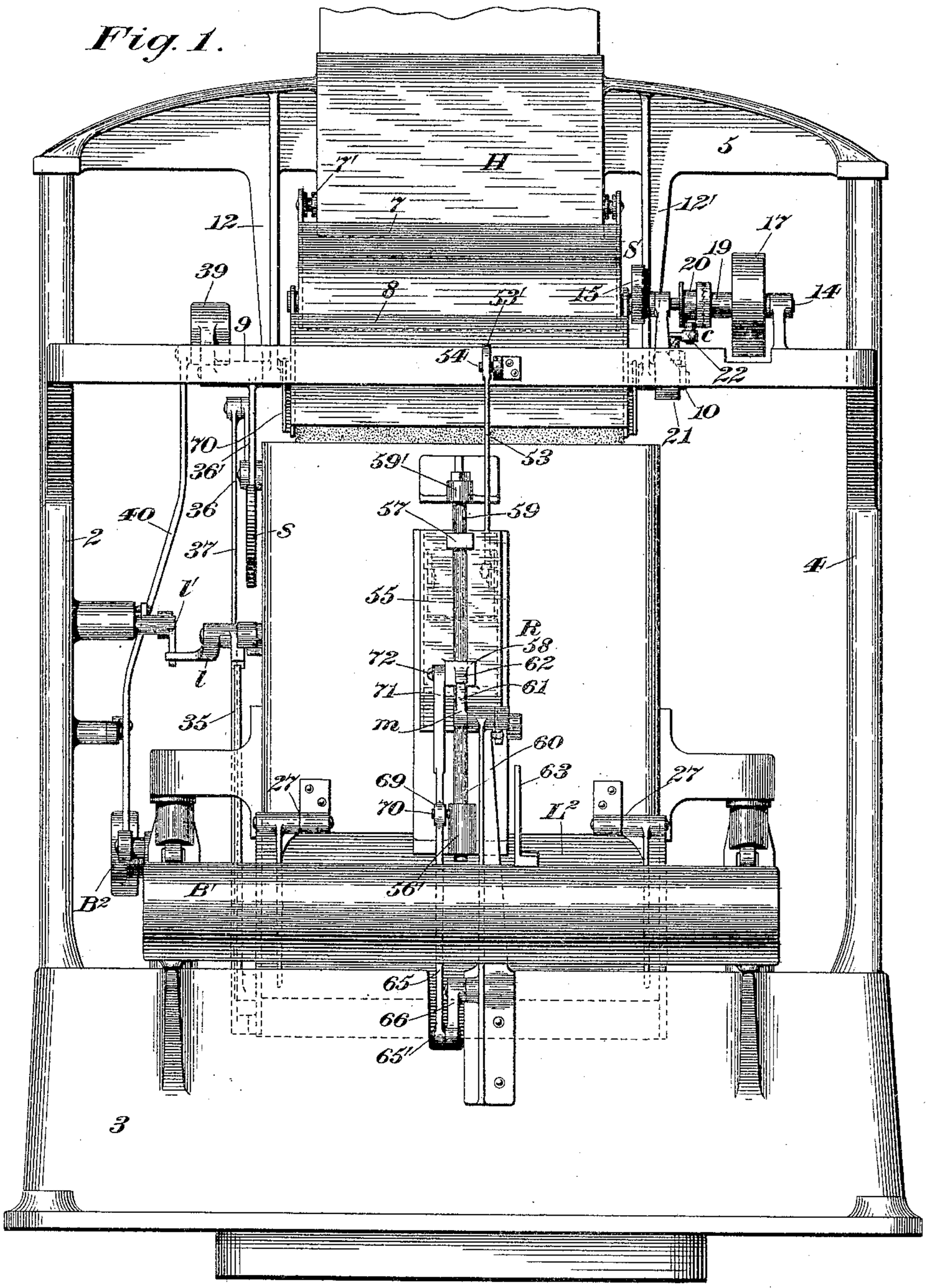
F. H. RICHARDS.

AUTOMATIC WEIGHING MACHINE.

(Application filed Oct. 26, 1897.)

(No Model.) 7 Sheets—Sheet 1.

Fig. 1.



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(No Model.) 7 Sheets—Sheet 2.

Fig. 2.

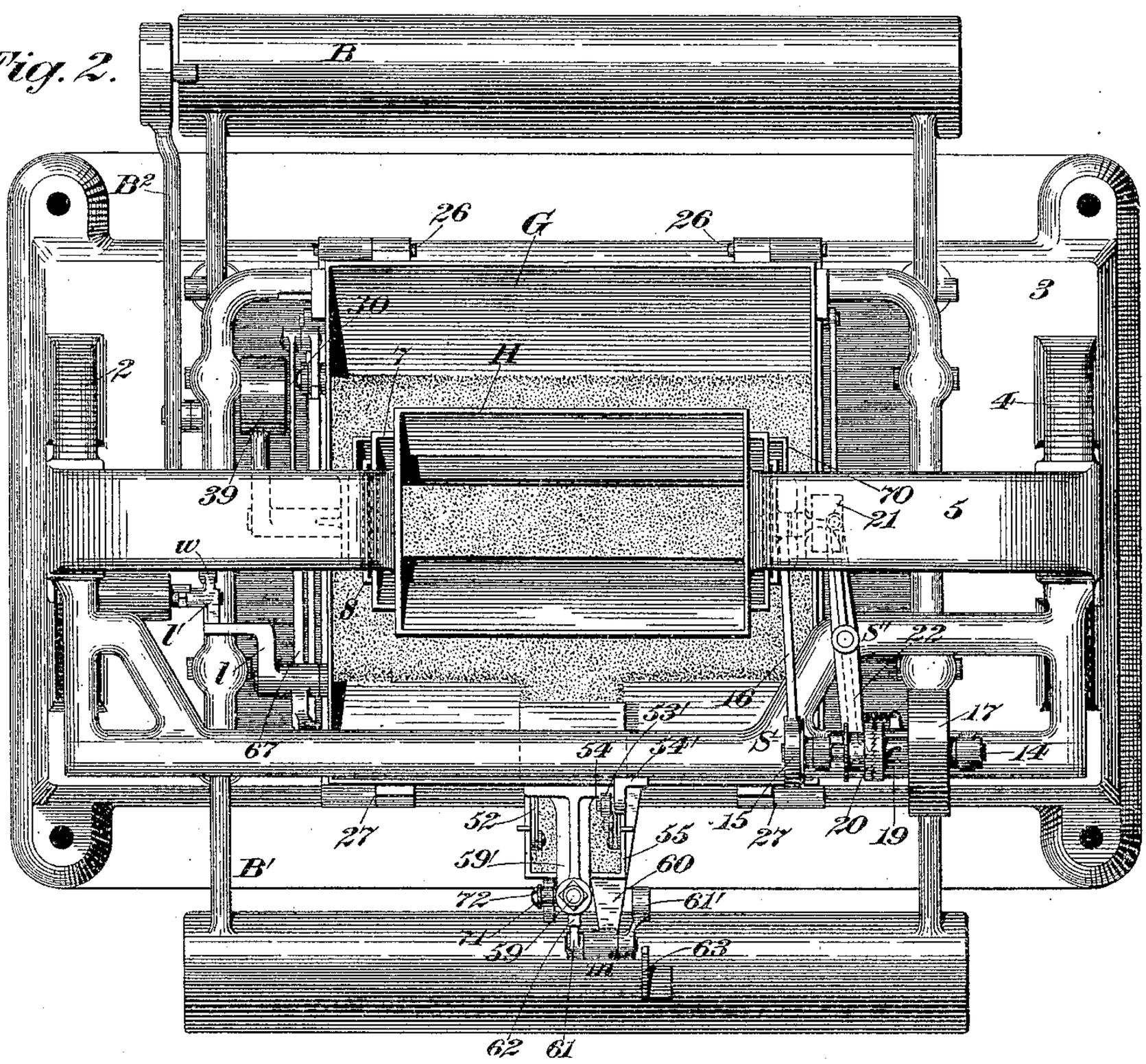

Fig. 3.

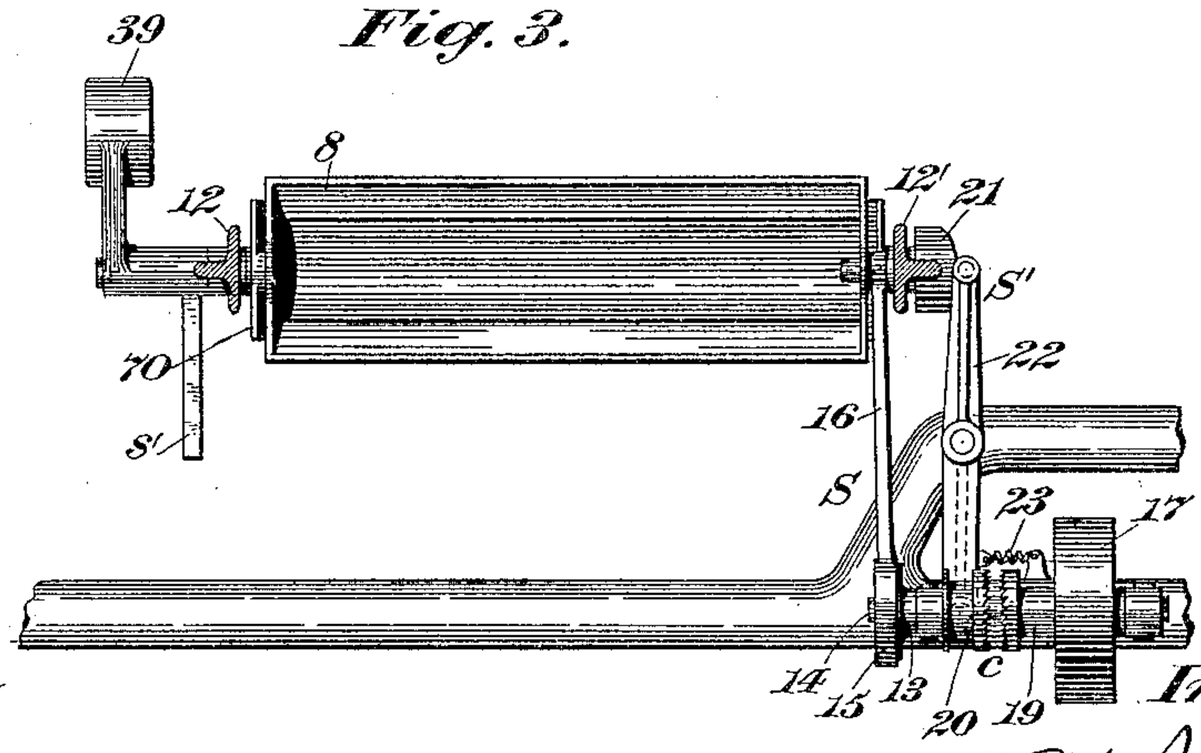

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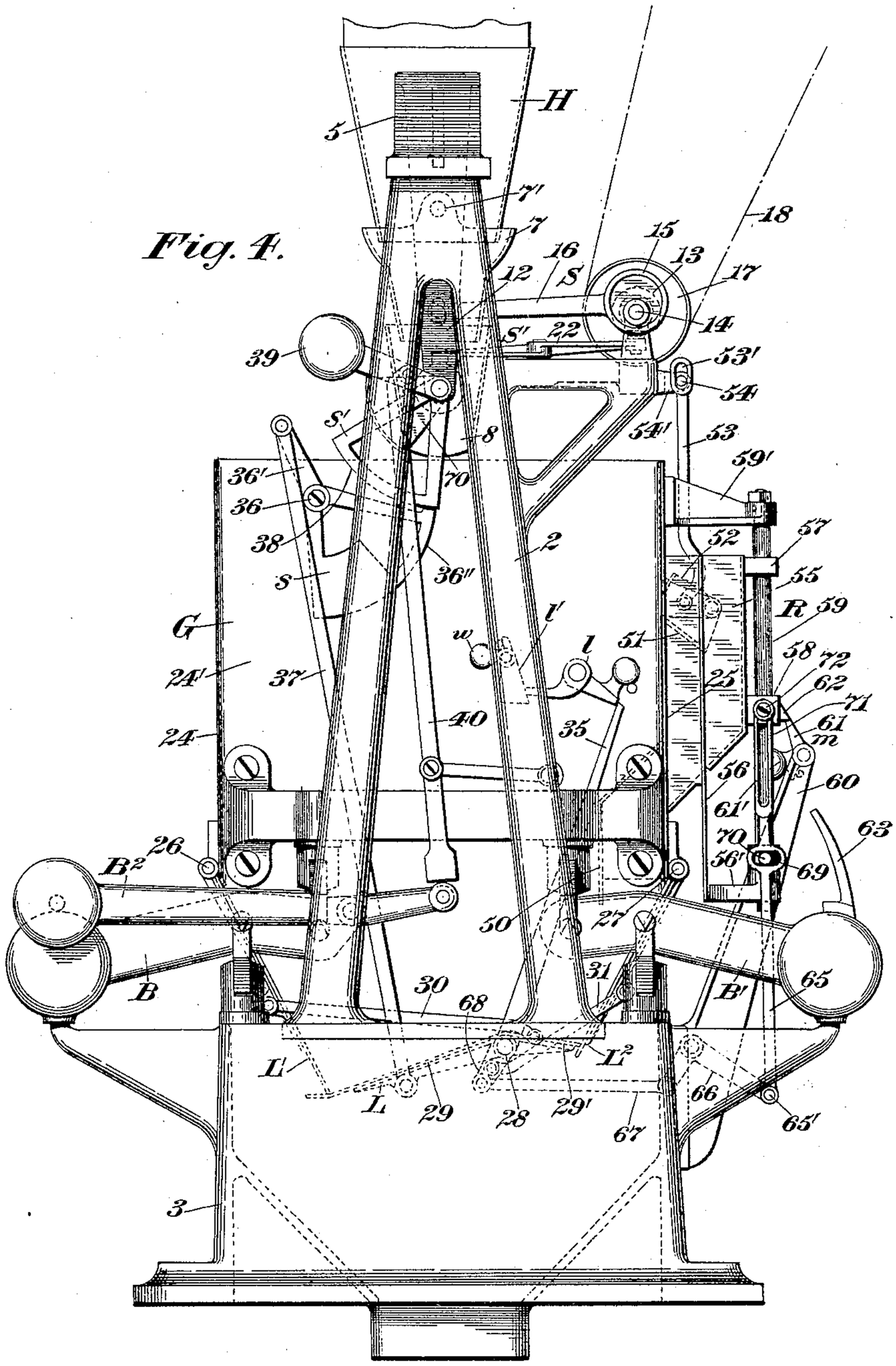
Fig. 4.



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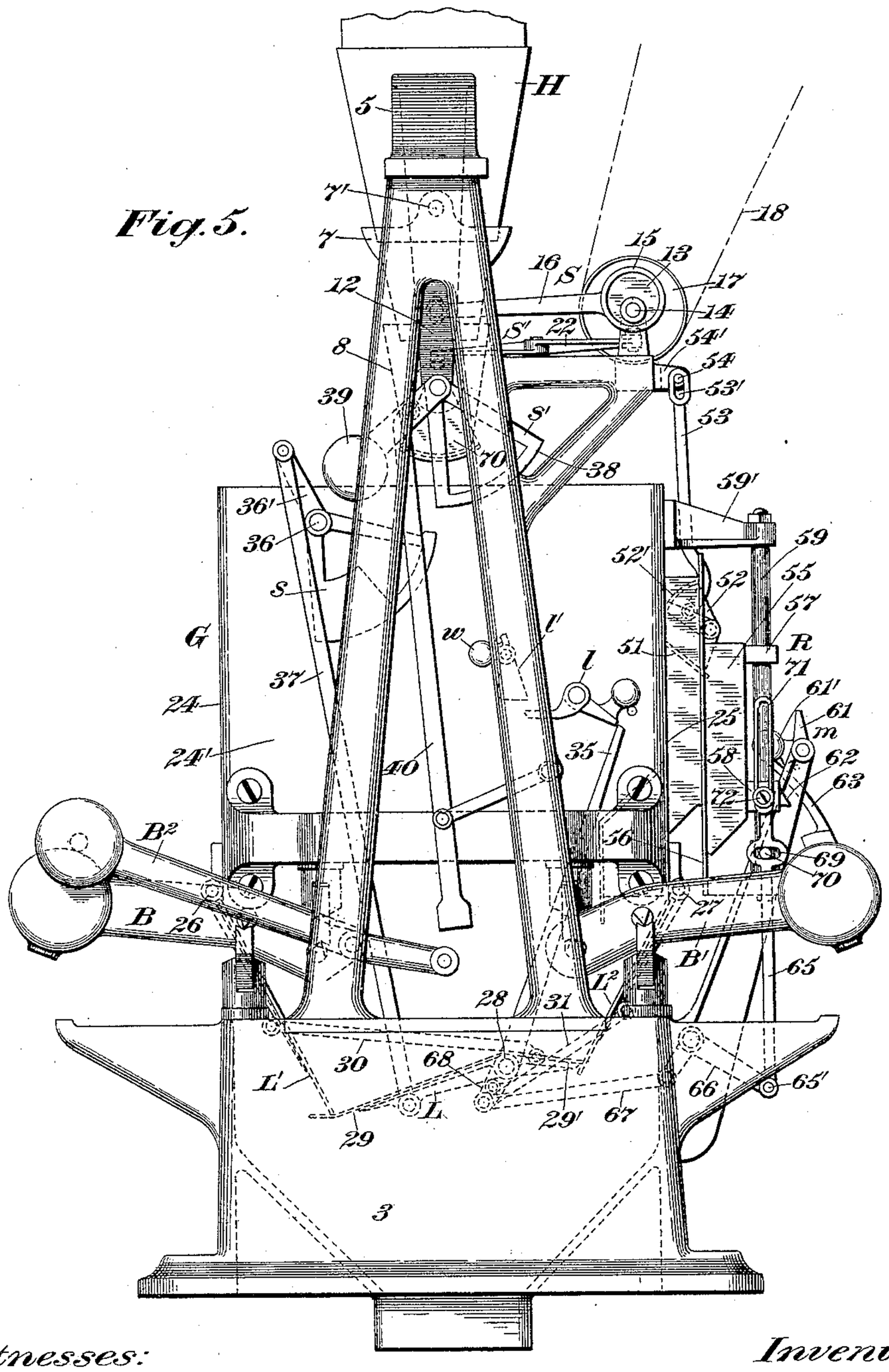
(No Model.) 7 Sheets—Sheet 4.

Fig. 5.



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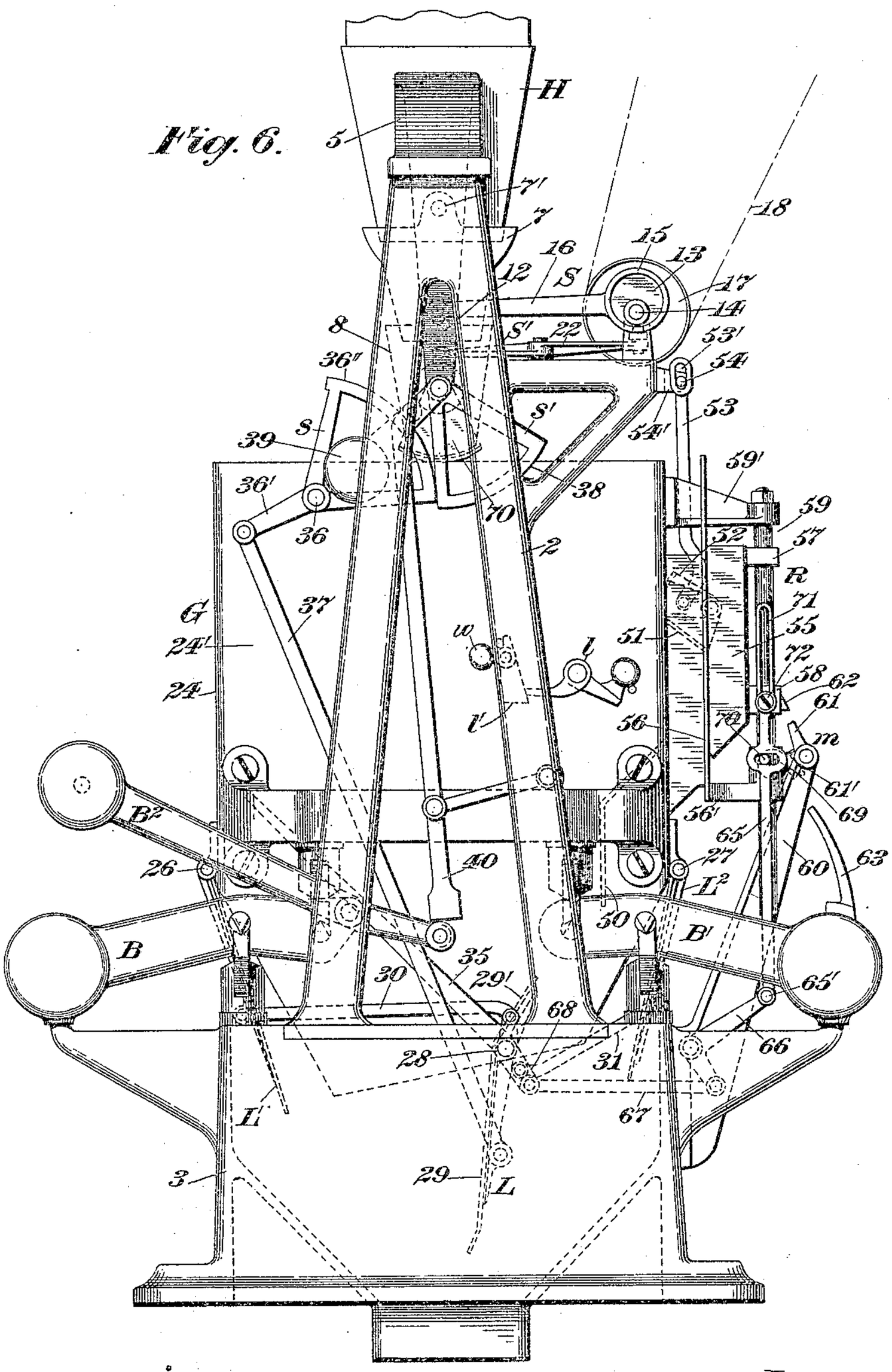
(No Model.) 7 Sheets—Sheet 5.

Fig. 6.



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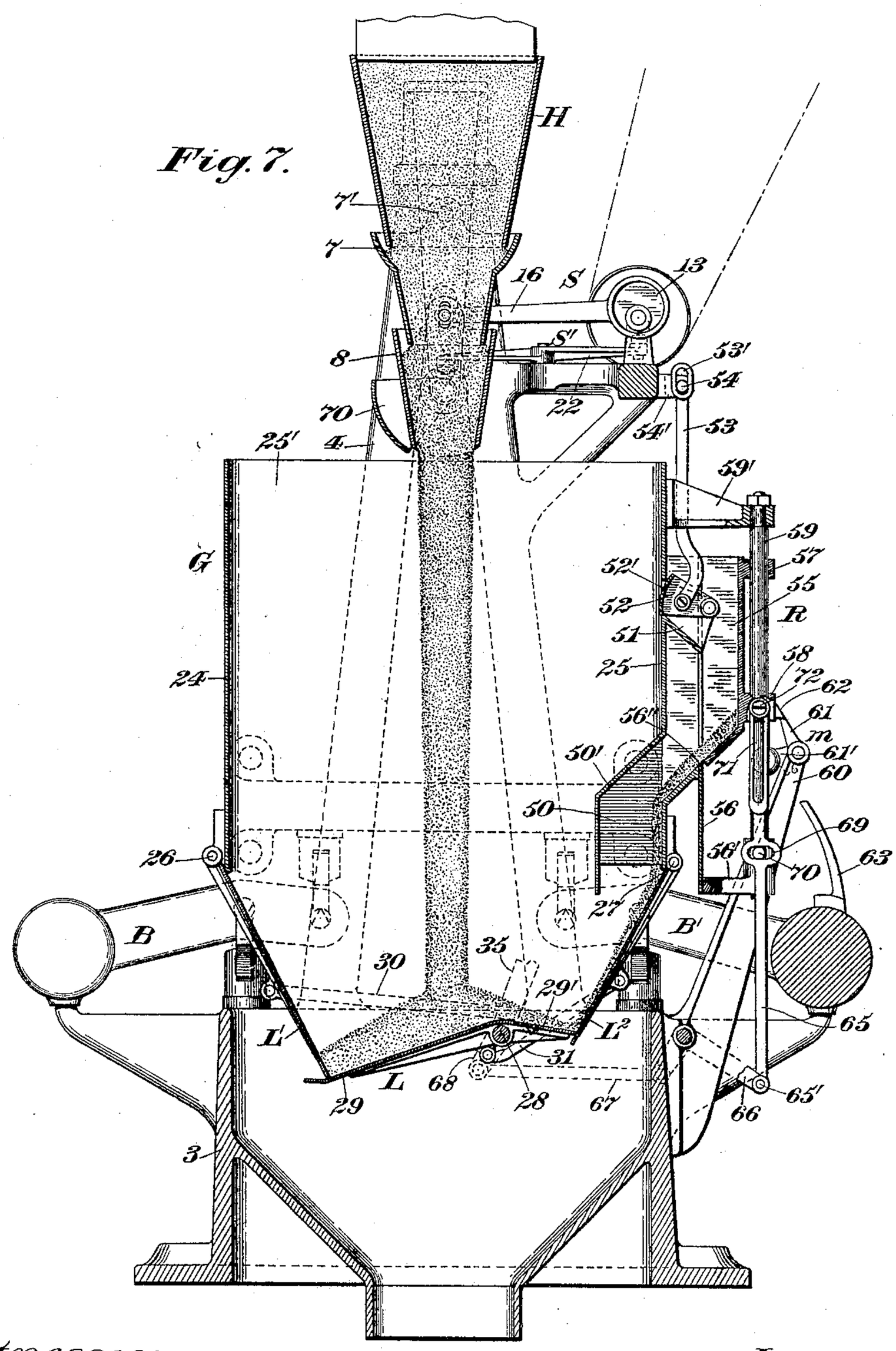
(No Model.) 7 Sheets—Sheet 6.

Fig. 7.



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(No Model.) 7 Sheets—Sheet 7.

Fig. 11.

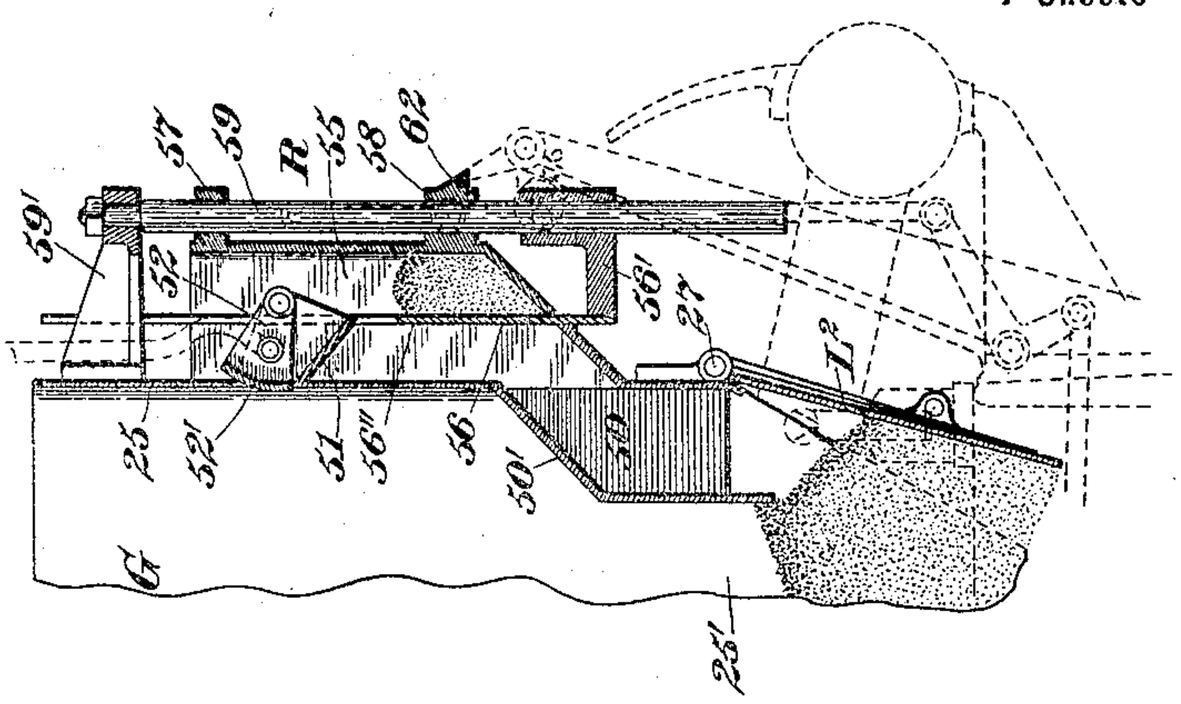


Fig. 10.

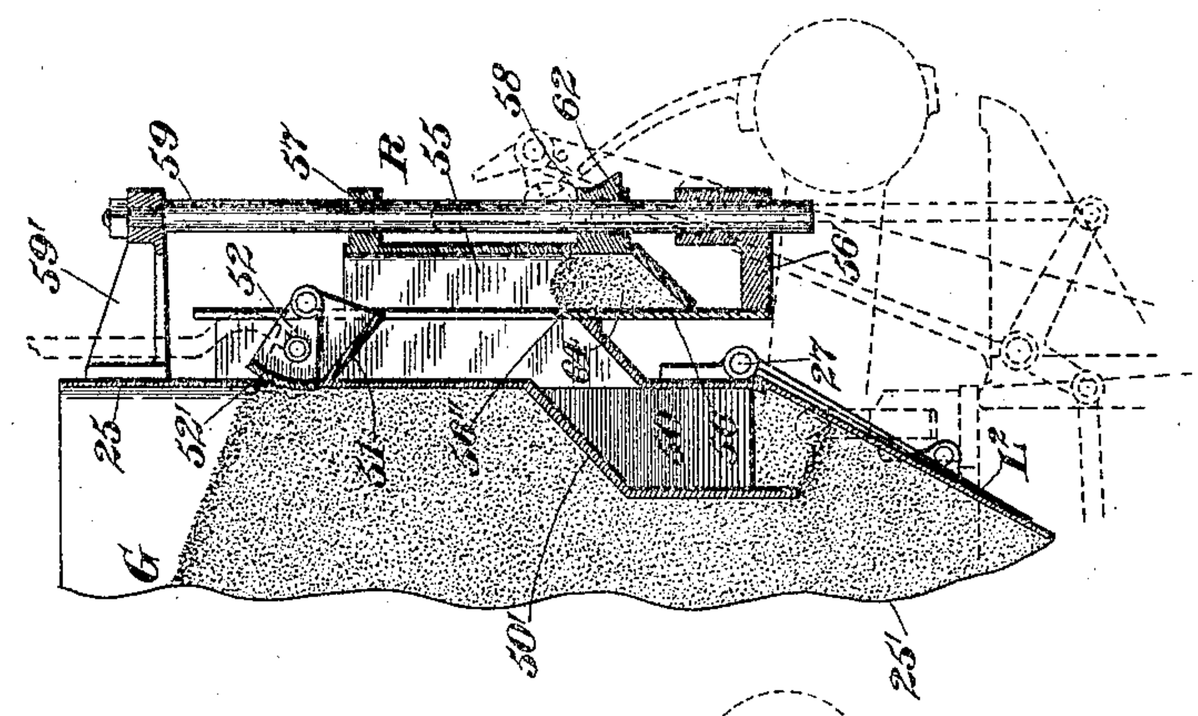


Fig. 9.

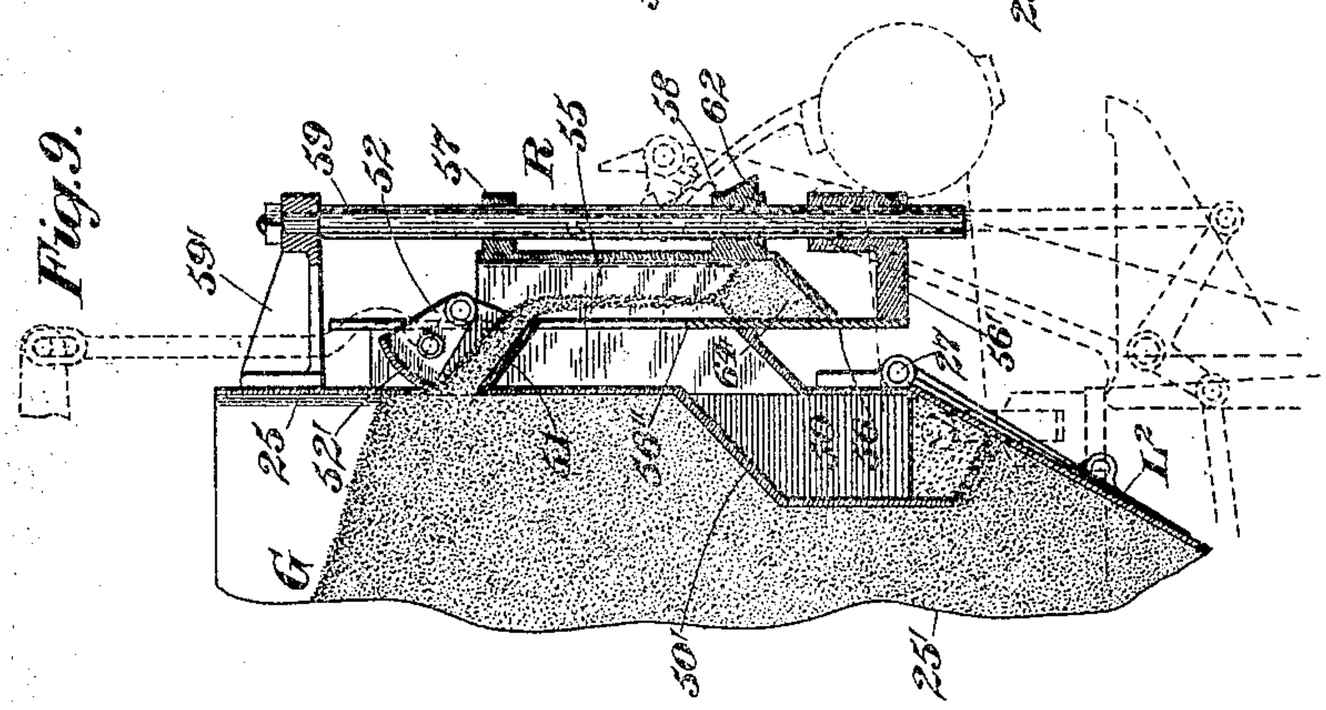
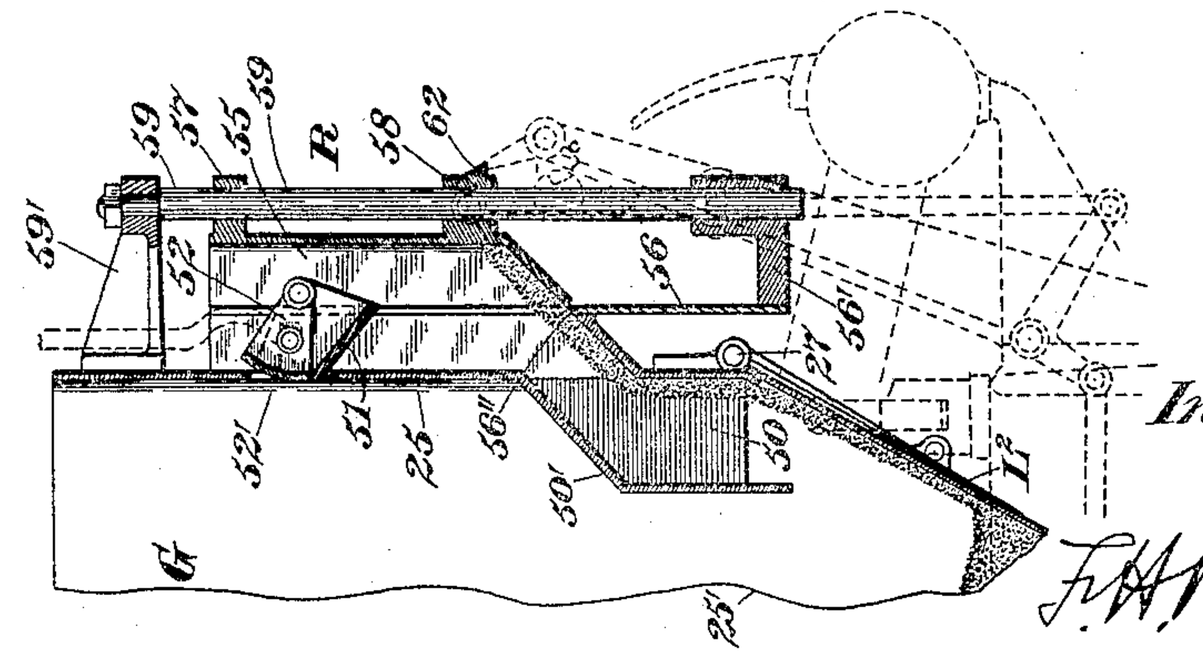


Fig. 8.



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UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT.

AUTOMATIC WEIGHING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 607,464, dated July 19, 1898.

Application filed October 26, 1897. Serial No. 656,458. (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 Automatic Weighing-Machines, of which the following is a specification.

This invention relates to that class of automatic weighing-machines known as "rising-poise" machines—that is, machines in which an overload is first supplied to the load-receiver or bucket and in which the surplus material is removed during the weighing operation to bring the load-receiver and weighing mechanism to a true poise, and after which the closer of the load-receiver is opened to discharge the completed load, and in which the surplus material removed from the discharged load is, after the weighing mechanism has returned to its normal load-receiving position, resupplied to the load-receiver as a part of the next succeeding load—a machine of this class being described in Letters Patent of the United States No. 572,067, granted to me November 24, 1896, to which reference may be had.

One object of my present invention is to provide, in an automatic weighing-machine embodying a vertically-reciprocatory load-receiver, improved overload-supplying means, surplus-discharging means, completed load-discharging means, and resupplying means, all operative in the order named, and the latter of which includes a reciprocatory surplus-receiver effective at a predetermined point in the ascending movement of the load-receiver for returning the surplus material to the load-receiver for making up a part of the next succeeding load.

A further object of my present invention is to provide a weighing-machine including two receivers supported side by side for reciprocatory movement relatively to one another in substantial parallel planes, and which receivers are reciprocally effective at predetermined points in their movements for supplying material to each other alternately, and also to provide improved means for controlling the reciprocatory movements of said receivers.

A further object of my present invention is to provide, in connection with weighing mechanism including a load-receiver, improved load-supplying means embodying a plurality of superposed chutes, a valve controlled by the weighing mechanism for regulating the discharge of material from the lower chute, and means controlled by the valve for vibrating one or more of said chutes to agitate the material during its flow therefrom.

Another object of my present invention is to provide, in connection with weighing mechanism including a load-receiver, improved load-discharging mechanism comprehending a plurality of pivotally-connected coöperative closers, two of which are supported at opposite sides, respectively, of and depend from the front and rear walls of the load-receiver and the other of which is supported upon a rock-shaft between the lower ends of the side closers and is connected to said side closers by oppositely-disposed links connected at their inner ends to the middle closer at opposite sides of the rock-shaft and at their outer ends to said side closers, the construction and organization of said closers being such that on an opening movement of the bottom closer an opening movement of shorter range will be imparted to the side closers.

A further object of my present invention is to provide, in connection with weighing mechanism including a load-receiver having an outlet and an inlet located the former above the latter and between the main receiving and discharging ends of said receiver, a load-reducing valve normally closing the outlet and adapted at a predetermined point in the descending movement of the receiver for uncovering said outlet to allow the surplus material to flow from the load-receiver, a vertically-reciprocatory surplus-receiver shiftable at a predetermined point in the descending movement of the load-receiver to a position for receiving the surplus flowing from said receiver and shiftable at a predetermined point in the ascending movement of said receiver to a position for discharging the surplus into the inlet of said receiver, and means controlled by certain parts of the weighing mechanism for actuating and controlling the movements of the surplus-receiver.

In the drawings accompanying and form-

ing part of this specification, Figure 1 is a front elevation of a weighing-machine embodying my present improvements. Fig. 2 is a plan view of the weighing-machine. Fig. 3 is a plan view, partially in section, of the main stream-controller or valve and a portion of the mechanism that controls the vibratory movements of the movable chute or chutes. Fig. 4 is a side elevation of the weighing-machine as seen from the left in Fig. 1, and shows the parts thereof in their normal positions, or in the positions they occupy when the main stream-controller or valve is in its open position and the load-receiver is in its normal elevated load-receiving position. Fig. 5 is a similar side elevation of the weighing-machine, showing the parts thereof in the positions they occupy when the weighing mechanism is in its overpoised position and the surplus material is being discharged from the load-receiver into the surplus-receiver to reduce the overload. Fig. 6 is a similar side elevation of the weighing-machine, showing the parts thereof in the positions they occupy during the discharge of the completed load from the load-receiver, the closers of the load-receiver being shown in full and dotted lines in their open positions, the surplus-receiver being shown in its elevated position, with the cut-off plate or slide thereof in position to prevent the return of the surplus material to the load-receiver while the closers are shut, and the stream-controller or main supply apparatus being shown blocked as against opening movement. Fig. 7 is a vertical longitudinal section of the weighing-machine, showing the parts in the positions they occupy during the supply of material to the load-receiver, sufficient material having been supplied to carry said receiver below its poising-line, and also showing the surplus-receiver and its cut-off plate in positions for facilitating the return of a surplus material to the load-receiver. Figs. 8, 9, 10, and 11 are sectional views similar to Fig. 7 of a portion of a machine, showing successive positions of the load reducing and resupplying mechanism during one cycle of operations of the parts of the weighing mechanism, Fig. 8 showing the load-reducing valve in its closed position and the resupplying instrumentalities in positions for returning the surplus material to the load-receiver, which load-receiver is in the position it occupies during the making of a load, Fig. 9 showing the load-receiver in its overpoised position, the load-reducing valve in its open position, and the surplus-receiver in the position it occupies when receiving the surplus from the load-receiver, Fig. 10 showing the load-receiver in its truly-poised position and the load-reducing valve in its closed position, and Fig. 11 showing the closer of the load-receiver in its open position, the load-reducing valve in its closed position, the surplus-receiver in its elevated position, and the cut-off plate in the position it occupies just before an opening movement is imparted thereto by the shutting of the closer of the load-receiver.

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

My invention is a species of that described in the Patent No. 572,067, of November 24, 1896, hereinbefore referred to.

For the purpose of illustrating the construction, organization, and mode of operation of the several elements comprising my present invention I have shown it in connection with weighing mechanism that is, in a general way, similar to that shown, described, and claimed in Letters Patent of the United States No. 572,071, granted to me November 24, 1896, to which reference may be had.

The framework for supporting the operative parts of the weighing-machine may be of any suitable general construction and is shown consisting of the two end frames or columns 2 and 4, mounted upon a chambered supporting-base 3, into which the completed loads are discharged from the load-receiver or bucket, said columns 2 and 4 being surmounted by a top plate 5 in the usual manner, which top plate supports the supply apparatus.

The supply apparatus in the present instance is shown comprising a supply chute or hopper II, which is preferably formed integral with the top plate 5, two stream-agitating chutes or spouts 7 and 8, located one above the other, the upper one of which is preferably pivotally supported at 7′ on the lower end of the main supply-chute II and the lower one of which is pivotally supported upon oppositely-disposed rocker-arms 9 and 10, (shown in dotted lines in Fig. 1,) journaled in bearings on hangers 12 and 12′, depending from the top plate 5 of the framework, and a stream-controller or valve 70, secured at its opposite ends on the rocker-arms 9 and 10 for movement therewith.

The stream-controller or valve 70 may be of any suitable general construction and is shown constructed, organized, and operating in substantially the same way as the valve or main stream-controller described in Patent No. 572,067, hereinbefore referred to.

The two spouts or chutes 7 and 8, which are preferably conical, their larger ends being uppermost, are shown supported for oscillatory movement, the one 8 being pivotally supported near its lower end on the rocker-arms 9 and 10 of the valve 70, as above described, and the one 7 being pivotally supported near the upper end thereof, preferably on the lower end of the main supply-chute II. The upper chute 7 has its smaller discharge end extended a short distance in the larger receiving end of the lower chute 8.

As a convenient means for vibrating the two chutes 7 and 8 upon their axes concurrently with the opening movement of the valve 70 and in such manner that their discharge ends will move simultaneously in opposite directions to loosen up and facilitate

the free flow of the material through said chutes I have provided, in operative connection with said chutes, an intermittently-effective chute-vibrator, (designated in a general way by S,) which includes a clutch device; and I have also provided, in connection with the valve 70 and clutch device, a clutch-actuator (designated in a general way by S′) for controlling the effective operation of said chute-vibrator.

In the preferred form thereof illustrated most clearly in Figs. 3 and 7 of the drawings the chute-vibrator S comprises an eccentric 13, fixed to a shaft 14, journaled in suitable bearings on the framework, an eccentric-strap 15, surrounding said eccentric and having a connecting-rod 16, pivotally secured at its inner end to the lower end of the upper vibratory chute 7 and the upper end of the lower vibratory chute 8, substantially midway between the pivotal points of said chute, a power-wheel 17, preferably loosely mounted upon the eccentric-shaft 14, which wheel will in practice be constantly driven from any suitable source of power by a belt 18, (shown in dotted lines in Fig. 7,) and a clutch device *c*, comprising two clutch members 19 and 20, one of which is fixed to the hub of the power-wheel and the other of which is splined to the eccentric-shaft 14 for movement longitudinally thereof and has a grooved periphery.

The clutch-actuator, in the preferred form thereof illustrated most clearly in Figs. 3 and 7 of the drawings, comprises an actuating-cam 21, fixed to one rocker-arm of the valve 70, a clutch-shifter, shown in the nature of a lever fulcrumed on the framework and having one end in engagement with the working face of the cam 21 and having at the opposite end thereof a stud or roll seated in the groove of the shiftable clutch member 20, and an advancing-spring 23, fixed at one end to the framework and fixed at its opposite end to the clutch-engaging end of the clutch-shifter 22, the working face of the cam 21 being so disposed as to impart a clutch-member-releasing movement to the clutch-shifter 22 during the closing movement of the valve 70 and the spring 23 being so disposed as to throw the clutch members 19 and 20 into engagement on the opening movement of said valve.

It will be obvious that the general construction and organization of the chute-vibrator and clutch-actuator may be modified without departure from my present invention.

The weighing mechanism proper comprises any desired form of beam mechanism and a suitable load-receiver into which the loads or charges of material are made up, the load-receiver in the present instance being shown as a bucket G, which is similar in a general way to the bucket shown in the Patent No. 572,071, hereinbefore referred to, the only difference between the bucket shown in the accompanying drawings and that described in the patent referred to residing in the configuration or disposition of the side walls.

For sustaining the load-receiver or bucket I have shown beam mechanism of the "duplicate" class, which is substantially the same as the beam mechanism described in said Patent No. 572,071, and it consists of the two oppositely-disposed counterweighted beams B and B′, fulcrumed on the base 3 and provided with suitable knife-edges on the poising sides thereof for supporting said bucket.

Inasmuch as the construction and organization of beam mechanism such as shown in the accompanying drawings are well known in the art and are fully described in said Patent No. 572,071, a detailed description thereof is deemed unnecessary in the present case. The bucket G is shown provided at the lower discharge end thereof with a load-discharger, comprising three closers (designated, respectively, by L, L′, and L^2) operatively connected together for concurrent opening and closing movements, as hereinafter more fully described.

As shown most clearly in Fig. 7 of the drawings, the front and rear walls 24 and 25 of the bucket are cut away at their lower ends to form front and rear openings, and the opposite side walls 24′ and 25′ of said bucket extend considerably below the front and rear walls 24 and 25 and have their lower front and rear edges inclined downward and toward the longitudinal axis of the bucket.

The two closers L′ and L^2, which for convenience will be termed the "side" closers, are pivotally supported at their upper ends, as at 26 and 27, respectively, on brackets secured to the extreme lower ends of the front and rear walls 24 and 25 and are adapted when in their closed positions to lie in close contact with the inclined front and rear edges of the side walls 24′ and 25′, said closers being of such length that their lower or discharge ends terminate in close proximity to the lower front and rear edges of the side walls 24′ and 25′.

The main or bottom closer L is shown in the accompanying drawings fixed to a horizontally-disposed rock-shaft 28, which in practice will be journaled at opposite ends thereof in suitable brackets (not shown) depending from opposite side walls 24′ and 25′ of the load-receiver or bucket. This closer when the same is in its closed position lies slightly inclined relatively to a horizontal plane and covers an opening between the lower ends of the side closers L′ and L^2. Said closer L is pivotally supported at one side the longitudinal axis of the load-receiver and in closer proximity to the lower end of the closer L^2 than to the lower end of the closer L′ and comprises a material-supporting plate having two oppositely-inclined portions 29 and 29′, respectively, the portion 29 extending from a point above to a point below the axis of oscillation of said closer when said closer is in its closed position and having its discharge end extended underneath and slightly beyond the lower end of the closer L′ and the portion

29′ of said material-supporting plate extending forward and bearing at its inner end against the inner face of said closer L^2, near the lower end thereof.

As a means for facilitating an opening movement of the two side closers L′ and L^2 concurrently with the opening movement of the main closer L, I have provided an actuating-connector between the three closers, which, in the preferred form thereof shown in full and dotted lines in the accompanying drawings, comprises two oppositely-disposed closer-actuating links 30 and 31, pivotally connected at their outer ends to the two side closers L′ and L^2 and pivotally connected at their inner ends to the bottom closer L at opposite sides thereof and at opposite sides of the rock-shaft 28, the disposition of the links 30 and 31 being such that upon the opening and closing movements of the main or bottom closer L concurrent opening and closing movements will be imparted to the side closers L′ and L^2.

By referring to the accompanying drawings, and especially to Fig. 7 thereof, it will be seen that the preponderance of weight of material rests upon the rearwardly-extending longer portion 29 of the bottom closer L and in the rear of the axis of movement of said closer and that notwithstanding the links 30 and 31, which connect the main closer L and the side closers L′ and L^2, may be substantially in their dead-center positions the stress exerted by the preponderance of material on the rearwardly-extended longer portion of the closer L will tend to overcome the resistance due to the dead-center positions of the connections between this closer and the two side closers and will when the main closer is unlatched, as will be hereinafter fully described, effect an opening movement of the main closer and concurrent opening movements of the two side closers.

By referring to Fig. 6 of the drawings it will be seen that the two side closers L′ and L^2 have a very short range of movement as compared with that of the main closer L.

As a means for normally locking the closers in their closed positions, as shown in Figs. 4, 5, and 7, and for retaining the same in these positions until the load-receiver or bucket G on the ascending movement thereof has arrived at its truly-poised position I have provided closer-locking instrumentalities, which, in the preferred form thereof illustrated in said figures, comprise a by-pass latch *l*, of usual construction, supported on the load-receiver, and a detent-arm 35, fixedly secured at its lower end on the rock-shaft 28 of the main closer L and having its upper end in position for engaging the latch *l* when the closers are in their closed positions; and as a means for tripping the latch *l* at a predetermined point in the ascending movement of the load-receiver G, I have provided a latch-tripper *l′*, pivotally supported on the framework and having a counterweight *w* for retaining the lower end thereof normally in the path of movement of one arm of the latch *l*, as shown most clearly in Figs. 4, 5, and 6 of the drawings.

As a means for blocking the opening movement of the closers when the main supply-valve 70 is in its open position in case the latch *l* should be accidentally tripped and for blocking the opening movement of the valve 70 when the closers are in their open positions I employ interlocking mechanism, which, in the form shown in the accompanying drawings, is of substantially the same general construction, organization, and operation as that described in Letters Patent No. 548,840, granted to me October 29, 1895, and which interlocking mechanism comprises two reciprocally-effective stop members, (designated by *s* and *s′*, respectively,) one of which, as *s*, is connected with and is controlled in its movements by the main closer L and the other of which, as *s′*, is connected to and is controlled in its movements by the main supply-valve 70.

The stop member *s* is shown as a counterweighted segment-disk pivotally supported at 36 on the side wall of the load-receiver and having a rearwardly-extending arm 36′, to which is pivotally connected a closer-actuating rod or link 37, which rod is pivotally connected at its lower end to the main closer L in the rear of the axis of movement of said closer. This stop member *s*, which is counterweighted and constitutes a closer-shutting actuator, has a curved stop-face 36″, against which one face of the stop member *s′* abuts when the valve 70 is in its closed positions and the closers of the load-receiver are in their open positions, as shown in Fig. 6, and the stop member *s′*, which is of a construction similar to the stop member *s*, also has a curved face 38, against which a portion of the stop member *s* abuts when the valve 70 is in its open position and the closers of the load-receiver are in their closed positions, as shown in Fig. 4.

As a convenient means for imparting a closing movement to the valve 70 said valve is shown furnished with a counterweighted valve-closing actuator 39, the disposition of such valve-closing actuator being such that on the descending movement of the load-receiver said actuator will impart a gradually-closing movement to said valve, and as a convenient means for imparting an opening movement to said valve and for preventing a premature movement thereof I have provided a valve-opening actuator, which is similar in construction and organization to the valve-opening actuator described in Patent No. 548,840, referred to, and consists of a counterweighted auxiliary beam B^2, fulcrumed intermediate its ends on the inner end of one of the scale-beams, as B, and a thrust-rod 40, normally resting at its lower end upon the inner end of the beam B^2 and pivotally connected at its upper end to the valve-closing actuator 39.

The construction and arrangement of the valve-opening actuator are such that on the descending movement of the load-receiver the outer end of the beam B^2 will be carried upward by the scale-beam B, and the inner end thereof will be depressed, allowing the thrust-rod to descend, thus permitting the valve-closing actuator 39 to impart a gradually-closing movement to the valve. On the ascending movement of the load-receiver the inner end of the beam B rises and engages the lower end of the thrust-rod simultaneously with the opening movements of the closers, which opening movements of the closers throws the stop member *s* into a position for blocking the opening movement of the valve 70, thus also blocking the further ascending movement of the inner end of the beam B^2 until the closers return to their closed positions, which carries the stop member *s* out of position for blocking the opening movement of the valve and permits the counterweighted end of the beam B^2 to descend and impart a quick opening movement to said valve through the medium of the thrust-rod 40, this operation of the valve being substantially similar as the operation of the valve described in Patent No. 572,067.

The load-receiver or bucket G is shown furnished intermediate the receiving and discharging ends thereof with two oppositely-disposed conduits or spouts 50 and 51, which communicate with the interior of the load-receiver through an inlet and an outlet, respectively, formed in the front wall thereof, and which conduits may, on account of their functions, be consistently termed the "surplus-conduit" and "return-conduit," respectively, the material-supporting wall of the upper or surplus-discharge conduit 51 extending downwardly in an inclined plane and the return-conduit 50 having the material-supporting wall thereof extending upwardly in an inclined plane.

Located within the load-receiver and constituting the rear wall of the return-conduit is a material-deflecting plate 50′, the upper portion of which is inclined in parallelism with the material-supporting bottom wall of the return-conduit and the lower portion of which is disposed, preferably, in parallelism with the front wall 25 of the load-receiver and depends slightly below a horizontal line intersecting the axes of the two side closers L′ and L^2, so that the material as it passes into the receiver through the return-conduit 50 will fall directly upon the side closer L^2. This deflecting-plate 50′, as will be seen by reference to Figs. 9, 10, and 11 of the drawings, prevents the material in the load-receiver from entering and obstructing the passage-way through the return-conduit 50, and also forms a repository for the surplus material returned to the load-receiver in case said receiver is filled to a point above the lower end of the return-conduit before the surplus is returned to said receiver.

Extending upward from the side edges of the material-supporting bottom wall of the return-conduit 50 and preferably outside the front wall of the load-receiver are two side walls, which terminate, preferably, at a point slightly above the surplus-discharge conduit 51, said side wall constituting practically an upward extension of the conduit 50, which extension is shown open at its front side.

The upper conduit 51 is shown provided with a counterweighted valve 52, preferably pivoted at its forward end between the side walls of said conduit and having a cut-off plate 52′ for closing the outlet of said conduit, said valve in practice being so weighted as to remain normally closed.

The load-reducing valve 52 has an opening movement imparted thereto by the load-receiver on the descending movement of said load-receiver below its poising-line. To effect an opening movement of the valve 52 on the descending movement of the load-receiver below the poising-line thereof, said valve is pivotally supported, as before described, at its forward end between the side walls and at the forward end of the discharge-chute 51 and has pivoted thereto at a point intermediate the pivotal point and cut-off plate 52′ thereof a sustaining-rod 53, having at the upper end thereof an elongated slot 53′ of a length substantially equal to the distance traversed by the load-receiver in descending from its normal elevated position to its poising position, into which slot is extended a pin or projection 54 on an arm 54′, which constitutes a fixture of the framework and is located considerably above the upper end of the load-receiver.

By the construction and organization of valve instrumentalities described in the preceding paragraph it will be seen that during the first stages of the descending movement of the load-receiver the valve and its sustaining-rod will descend therewith, the valve remaining in the position shown in Fig. 7 until the load-receiver arrives at its poising-line, at which time the upper wall of the elongated slot 53 of the sustaining-rod will strike the pin 54, which will prevent a further descending movement of said rod and valve with the load-receiver. After the load-receiver arrives at the poising-line in its descending movement and descends below said poising-line the pivotally-supported end of said valve 52 will descend with said load-receiver, thus rocking the valve on the pivot connecting it to the lower end of the sustaining-rod 53 and cause the cut-off portion of said valve to be elevated to the position shown in Fig. 9, thus uncovering the outlet of the discharge-spout and permitting the surplus material in the load-receiver to flow out through said conduit 51. On the ascending movement of the load-receiver the operation of the valve will be obviously reversed.

The conduit 51, its valve, and the means for facilitating the opening movement of said

valve during the descending movement of said load-receiver constitute what is herein termed the "load-reducing" means, and the return-conduit 50 constitutes one element of what is herein termed the "resupplying" means.

For the purpose of receiving and disposing of the surplus material after it is discharged from the load-receiver I have provided a surplus receiving and resupplying apparatus, which is designated in a general way by R, and embodies, in addition to the return-conduit 51, a surplus-receiver 55, supported in operative relation with the discharge and return conduits 51 and 50, respectively, for vertical reciprocatory movement relatively to and in substantial parallelism with the line of vertical reciprocation of the main load-receiver G, and also embodies a gate or cut-off plate 56 for alternately cutting off and opening communication between the surplus-receiver 55 and the return-conduit 50 of the load-receiver at predetermined points in the reciprocatory movement of said receiver. This surplus-receiver 55 is in the nature of a conduit or hopper having an inclined bottom wall adapted, when the receiver is in its extreme elevated position, to lie with its inner face in alinement with the material-supporting face of the return-conduit 50, as shown in Figs. 7 and 8 of the drawings, said receiver having an opening at its rear side which registers its entire length, when in its elevated position, with a corresponding opening at the front side of the extension of the return-conduit 50, sufficient space being left between the adjacent edges of the side walls of the surplus-receiver and the conduit extension to form a guideway for and facilitate the reciprocatory movement of the cut-off plate 56, which is interposed between the surplus-receiver and said conduit extension.

As a means for facilitating a vertical reciprocatory movement of the surplus-receiver said receiver is furnished with guide-arms 57 and 58, respectively, on the forward side thereof, through which is extended a guide-rod 59, fixed at its upper end to the bracket 59′, secured to the front wall of the load-receiver, near the upper end thereof.

As a means for holding the surplus-receiver 55 in its elevated position, as shown in Figs. 7 and 8, when the load-receiver is in its fully-elevated load-receiving position I have provided a receiver-engaging latch *m*, pivotally supported at the upper end of a latch-carrying arm 60, fixed at its lower end to the base 3 of the weighing-machine. This latch *m* has an arm 61 located normally in position for engaging a projection 62 on the lower guide-arm 58 of the surplus-receiver and retaining said receiver in its elevated position until said latch is tripped by means hereinafter described. Said latch also has a counterweighted arm 61′ for normally retaining the receiver-engaging arm 61 in the path of movement of the catch 62 on said receiver.

In practice the surplus-receiver will when the main load-receiver is in its elevated position be located in position for discharging the surplus material contained therein through the return-conduit 50 into said load-receiver.

As a means for tripping the latch *m* during the descending movement of the load-receiver and when the same has arrived at or has passed its poising-line I have provided a latch-actuator, which in the form thereof shown in the accompanying drawings is in the nature of a curved arm 63, fixed to the counterweighted end of the scale-beam B′ in position and adapted for striking the counterweighted end of the latch *m* when the beam mechanism has arrived during the descending movement of the load-receiver at its poising-line and tripping said latch to release the same from engagement with the catch 62 and allow the surplus-receiver to drop to the position illustrated in Fig. 9, with its material-supporting bottom wall below the material-supporting wall of the return-conduit 50. On the falling of the surplus-receiver from the position shown in Fig. 8 to that shown in Fig. 9 a pocket 64 will be formed between the cut-off plate 56 and the walls of said receiver of sufficient area to store the surplus material as it is discharged at this time through the discharge-conduit 51 by the opening of the reducing-valve 52.

By reference to Figs. 8 to 11, inclusive, of the drawings, which illustrate the operation of the surplus receiving and resupplying means during one cycle of operations of the parts of the weighing-machine, it will be seen that the surplus-receiver 55 remains in the depressed position shown in Figs. 9 and 10 until the reducing-valve is closed during the ascending movement of the load-receiver and until the completed load is discharged from the load-receiver G by the opening of the closers.

The cut-off plate 56 is furnished with an arm 56′, having a sleeve at the forward end thereof which surrounds and is shiftably mounted on the guide-rod 59 considerably below the surplus-receiver 55. This cut-off plate is constructed and organized to have an ascending movement in unison with the surplus-receiver 55 and to have a descending receiver-opening movement independent of said surplus-receiver, and is also so constructed that when the surplus-receiver is in its extreme elevated position, as shown in Fig. 8, and the cut-off plate is in its lowest position, as shown in said figure, the upper edge of the cut-off portion 56″ of said plate will lie flush with the material-supporting faces of the surplus-receiver 55 and return-conduit 50, so as to establish communication between said receiver and conduit and allow the material to pass from the surplus-receiver to the main load-receiver G.

As a convenient means for elevating the surplus-receiver concurrently with the discharge of the load from the main load-receiver G, and also for subsequently retracting or de-

pressing the cut-off plate 56 to open communication between the two receivers G and 55, respectively, and concurrently with the closing movement of the closers of the load-receiver, to thereby allow the surplus material to pass from the surplus-receiver into the load-receiver simultaneously with the opening movement of the main stream-controller or valve 70, I have provided, in operative connection with the bucket-closer L, the surplus-receiver 55, and the cut-off plate 56, actuating instrumentalities which, in the preferred form thereof shown most clearly in Fig. 7 of the drawings, comprise a vertically-disposed actuating-rod 65, pivotally connected at its lower end, as at 65′, to one arm of an angle-lever 66, which is pivotally supported intermediate its ends on the bracket 60, secured to the base 3 of the machine, and has its other arm pivotally connected to the forward end of the link 67, which in turn is pivotally connected at its rearward end to the depending crank-arm 68, fixed to the rock-shaft 28 of the main closer L, the organization of the angle-lever 66, crank-arm 68, and connecting-link 67 being such that on an opening movement of the closer L the actuating-rod 65 will be thrust upward and on the closing movement of said closer said rod will be pulled downward. This actuating-rod 65 has a transverse elongated slot 69 intermediate its ends, into which extends a pin or projection 70 on the guide-arm 56′ of the cut-off plate 56, and also has at the upper end thereof an elongated slot 71, whose longitudinal axis is coincident with the longitudinal axis of the rod, and into which slot 71 extends a stud or projection 72, fixed to the lower guide-arm 58 of the surplus-receiver 55.

By reference to Fig. 7 of the drawings it will be seen that when the surplus-receiver is in its elevated position, the closers of the load-receiver G being in their closed positions, the stud 72 on the receiver 55 is seated in the slot 71, near the upper end thereof, and that when the latch *m* is tripped by the latch-actuator 63, which occurs when the weighing mechanism comes to its poised position to release the surplus-receiver 55, said receiver descends independent of any movement of the actuator-rod 65 until the stud 72, seated in the slot 71, strikes the lower wall of said slot 71 and arrests the further descending movement of said receiver.

On the opening movement of the closers, assuming the surplus-receiver 55 and cut-off plate 56 to be in the positions illustrated in Figs. 9 and 10, an upward thrust will be imparted to the actuator-rod 65, carrying the surplus-receiver 55 and cut-off plate 56 upward concurrently to the positions thereof shown in Fig. 11, at which time the latch *m* reëngages the catch 62 on the surplus-receiver and holds the same against accidental descending movement. On the closing movement of the closers of the load-receiver G the actuator-rod 65 will be drawn downward through the medium of the connections hereinbefore described, thereby retracting or depressing the cut-off plate 56 and opening communication between the surplus-receiver 55 and the load-receiver G, allowing the surplus material to reënter said receiver G to make up a part of the succeeding load, the main stream-controller or valve 70 at this time being in its open position to supply an overload to said receiver G.

By comparison of the several figures, as 8 to 11, inclusive, of the drawings it will be understood that during the descending movement of the load-receiver from its normal elevated position the main valve 70 will be gradually closed, and that on the first stage of said descending movement the material-supporting wall of the return-conduit 50 will be carried slightly below the material-supporting wall of the surplus-receiver 55, and that by the time the receiver arrives at its poising-line on the descent thereof the entire material contained in the surplus-receiver will have been discharged into the load-receiver G through the return-conduit 50. On the arrival of the main receiver and beam mechanism at its poising-line during the descending movement thereof the actuator 63 will strike the latch *m*, releasing the surplus-receiver and allowing the same to drop to the position shown in Fig. 9 and in position to receive the surplus as it is discharged through the discharge-conduit 51 into said receiver 55, the reducing-valve 52 being opened immediately after the receiver G arrives at its poising-line in its descent.

On the tripping of the latch *m* and on the descent of the surplus-receiver 55 the cut-off plate has the upper edge of its material-obstructing portion 56″ extending somewhat above the material-supporting wall of the return-conduit 50, as shown in Fig. 9, where it remains until the load-reducing valve 52 has returned to its closed position during the ascending movement of the load-receiver and until the load is discharged from the load-receiver G, after which said cut-off plate and surplus-receiver are elevated simultaneously to the positions thereof shown in Fig. 11, which positions are maintained until the closers of the load-receiver have been returned to their closed positions, which, as before stated, retracts or depresses the cut-off plate and allows the surplus contained in the surplus-receiver to be discharged into the main load-receiver.

On the opening movement of the main supply-valve 70 the clutch members of the chute-vibrator are thrown into operative engagement, which imparts a vibratory movement to said chute, loosening the material therein and facilitating a free flow thereof through the supply apparatus into the load-receiver G, and on the closing movement of the valve 70, which takes place during the descending movement of the load-receiver, the clutch

members of the chute-vibrator are thrown out of engagement, rendering the chute-vibrator ineffective for vibrating the chute.

In the construction and organization of reducing-valve mechanism hereinbefore described the main load-receiver G constitutes the reducing-valve actuator and is effective at a predetermined point in the descending movement thereof for imparting an opening movement to the load-reducing valve 52. It will be obvious that the instrumentalities for actuating the surplus-receiver 55 and cut-off plate 56 may be variously modified within the purview of this invention.

Having described my invention, I claim—

1. A weighing-machine embodying two receivers supported one by the other side by side for independent reciprocatory movements in substantial parallel planes relatively to each other, and which receivers are reciprocally effective at predetermined points in their movements for supplying material to each other, and means for controlling the reciprocatory movements of said receivers.

2. The combination, with weighing mechanism including a reciprocatory load-receiver and with overload-supplying means, of alternately-effective load-reducing means and resupplying means the former of which includes a reducing-valve and the latter of which includes a surplus-receiver supported by the load-receiver for reciprocatory movement relatively to, and in parallelism with, the line of reciprocation of said load-receiver, and means for controlling the reciprocatory movements of the two receivers.

3. The combination, with weighing mechanism including a reciprocatory load-receiver having a discharge-conduit between the upper and the lower ends thereof and with overload-supplying means, of a valve pivotally supported on said conduit for controlling the discharge of surplus material; a valve-sustaining rod pivotally supported at its lower end on the valve in the rear of the pivotal point thereof and having an elongated slot at the upper end thereof; a fixed arm located above the load-receiver and having a projection extending into the elongated slot of said sustaining-rod, whereby on the descending movement of the load-receiver the valve and its sustaining-rod will have a limited amount of descending movement with the load-receiver, and whereby on the arrival of the load-receiver at its poising-line during the descending movement thereof, the further descent of the cut-off end of said valve will be arrested and the load-receiver will carry the pivoted end of said valve downward and thereby effect an opening movement of the cut-off end thereof.

4. The combination, with weighing mechanism including a reciprocatory load-receiver having a discharge-conduit and a return-conduit between the upper and the lower ends thereof, the former of which is furnished with a valve, of means for actuating the valve at a predetermined point in the descending movement of the load-receiver for discharging the surplus; and a surplus-receiver supported for independent reciprocatory movement in parallelism with, and at one side, the load-receiver, and in position to receive the surplus discharged from said receiver.

5. The combination, with weighing mechanism including a reciprocatory load-receiver having load-reducing means and with overload-supplying means, of a return-conduit located below the load-reducing means and communicating with the interior of the load-receiver; a surplus-receiver supported for independent reciprocatory movement in parallelism with, and at one side of, the load-receiver, and in position to receive material supplied by the load-reducing means and effective for discharging material into the return-conduit; and means controlled by the weighing mechanism for actuating the surplus-receiver.

6. The combination, with weighing mechanism including a load-receiver having a discharge-conduit and a return-conduit located intermediate the upper and the lower ends thereof and with overload-supplying means, of a receiver-actuated valve in operative relation with the discharge-conduit; and a vertically-shiftable surplus-receiver in operative relation with the discharge and return conduits; and means for actuating said surplus-receiver.

7. The combination, with weighing mechanism including a reciprocatory load-receiver and with overload-supplying means, of load-reducing means; surplus receiving and resupplying means, the former of which includes a discharge-conduit communicating with the interior of the load-receiver and having a valve operative for opening and closing the inlet of said discharge-conduit at predetermined points in the reciprocatory movements of the receiver, and the latter of which includes a return-conduit in communication with the load-receiver, a surplus-receiver supported for vertical reciprocatory movements independent of the load-receiver, and a reciprocatory cut-off plate located between the surplus-receiver and the return-conduit; and means controlled by the weighing mechanism for controlling the movements of the surplus-receiver and cut-off plate.

8. The combination, with weighing mechanism including a load-receiver having a closer and also having a discharge-conduit and a return-conduit located one above the other and intermediate the upper and the lower ends of said receiver, of a valve in operative relation with the discharge-conduit; means for actuating said valve; a surplus-receiver supported for movement crosswise of the receiving end of the return-conduit; a cut-off plate supported between the surplus-receiver and return-conduit for movement with, and also independent of, the surplus-receiver; and means controlled by the

closer of the load-receiver for actuating the surplus-receiver and cut-off plate.

9. The combination, with weighing mechanism including a load-receiver having a closer and also having a discharge-conduit provided with a valve and also having a return-conduit below said discharge-conduit and communicating with the interior of said receiver, of surplus receiving and resupplying means comprehending a surplus-receiver supported for vertical reciprocatory movement crosswise of the receiving end of the return-conduit, and a cut-off plate supported for reciprocatory movement between the surplus-receiver and return-conduit; and means controlled by the weighing mechanism on the descending movement of the load-receiver for effecting a descending movement of the surplus-receiver to bring its material-supporting wall below the material-supporting wall of the return-conduit, and in position to receive and store the surplus material discharged from the load-receiver; means controlled by the weighing mechanism on the ascending movement of the load-receiver for elevating the surplus-receiver and cut-off plate in unison; and means controlled by the closer of the load-receiver, on the closing movement thereof, for actuating the cut-off plate to establish communication between the surplus-receiver and return-conduit.

10. The combination, with weighing mechanism including a load-receiver having a surplus-discharger and a return-conduit in communication therewith and with overload-supplying means, of a surplus-receiver disposed to receive the surplus as it is discharged from the load-receiver; a shiftable cut-off plate supported between the surplus-receiver and return-conduit of the load-receiver; and means operative at a predetermined point in the ascending movement of the load-receiver for actuating the cut-off plate to establish communication between the surplus-receiver and return-conduit.

11. The combination, with weighing mechanism including a load-receiver having a closer and also having a valve-controlled discharge-conduit and a return-conduit having a vertically-inclined material-supporting wall, of means for actuating the closer; a surplus-receiver supported at one side of the discharge and return conduits and having a downwardly-inclined material-supporting wall; means controlled by the closer, on the opening movement thereof, for elevating the surplus-receiver to bring the material-supporting walls of said receiver and return-conduit in substantial alinement; a cut-off plate supported between the surplus-receiver and return-conduit and shiftable, upon the opening movement of the closer, into a position for covering the receiving end of the return-conduit; means for locking the surplus-receiver in its elevated position during the closing movement of the closer; and means controlled by the closers, on the closing movement thereof, for retracting the cut-off plate to establish communication between the surplus-receiver and return-conduit and allow the material contained in the surplus-receiver to flow into the load-receiver.

12. The combination, with weighing mechanism including a load-receiver having a closer and also having a valve-controlled discharge-conduit and a return-conduit having a vertically-inclined material-supporting wall, of means for actuating the closer; a surplus-receiver supported at one side of the discharge and return conduits and having a downwardly-inclined material-supporting wall; means controlled by the closer, on the opening movement thereof, for elevating the surplus-receiver to bring the material-supporting walls of said receiver and return-conduit in substantial alinement; a cut-off plate supported between the surplus-receiver and return-conduit and shiftable, upon the opening movement of the closer, into a position for covering the receiving end of the return-conduit; means for locking the surplus-receiver in its elevated position during the closing movement of the closer; means controlled by the closers, on the closing movement thereof, for retracting the cut-off plate to establish communication between the surplus-receiver and return-conduit and allow the material contained in the surplus-receiver to flow into the load-receiver; and means controlled by the weighing mechanism, on the descent of the load-receiver, for unlocking the surplus-receiver thereby to effect a descending movement of the same and bring the material-supporting wall thereof below the material-supporting wall of the return-conduit and below the upper edge of the cut-off plate and into a position for receiving and storing the surplus material.

13. The combination, with weighing mechanism including a load-receiver having a valve-controlled discharge-conduit and a return-conduit in communication with the interior thereof, of overload-supplying means including a valve controlled in its opening and closing movements by the beam mechanism, on the descending and ascending movements, respectively, of the load-receiver; means for opening and closing the valve of the surplus-discharge conduit at predetermined points in the descending and ascending movements, respectively, of the load-receiver; a surplus-receiver supported at one side of the load-receiver for vertical reciprocatory movements independent of said receiver, and located in position to receive material from the discharge-conduit; means carried on the load-receiver for guiding the movements of the surplus-receiver; a cut-off plate supported between the surplus-receiver and entrance end of the return-conduit for reciprocatory movements in parallelism with the line of reciprocation of the load-receiver;

and means controlled by the moving parts of the weighing mechanism for actuating the surplus-receiver and cut-off plate at predetermined points in the reciprocatory movements of the load-receiver, whereby the surplus-receiver will, on the descending movement of the load-receiver, receive and store the surplus material discharged from the load-receiver and will discharge said surplus into the return-conduit upon the arrival of the load-receiver at its normal load-receiving position.

14. The combination, with weighing mechanism including a load-receiver having a closer and also having a surplus-discharger and a return-conduit in communication with the interior thereof and with overload-supplying means, of an independent vertically-reciprocatory surplus-receiver; and means in connection with the closer for actuating said receiver.

15. The combination, with weighing mechanism including a load-receiver having a closer and also having a valve-controlled discharge-conduit and a return-conduit in communication with the interior thereof, of a surplus-receiver supported for reciprocatory movement crosswise of the discharging and receiving ends of the discharge-conduit and return-conduit, respectively; means for actuating the closer; and instrumentalities actuated by the closer and beam mechanism for effecting ascending and descending movements, respectively, of the surplus-receiver, to bring the same into position for first receiving the surplus discharged from the load-receiver and for subsequently discharging said surplus into the said load-receiver.

16. The combination, with weighing mechanism including a vertically-reciprocatory load-receiver having a closer and also having a valve-controlled discharge-conduit and a return-conduit located the former above the latter and intermediate the upper and lower ends of said receiver, of a surplus-receiver supported for ascending and descending movements in operative relation with the discharge and return conduits; a latch operative when the load-receiver is in its normal load-receiving position for holding the surplus-receiver in an elevated position and in position to discharge material into the return-conduit; a latch-actuator operative at a predetermined point in the movement of the weighing mechanism for tripping the latch to permit a descending movement of the surplus-receiver; a cut-off plate supported for vertical movement between the surplus-receiver and return-conduit and effective for controlling the discharge of material from the surplus-receiver to the load-receiver; means actuated by the closer of the load-receiver for imparting ascending and descending movements to the cut-off plate on the closing and opening movements, respectively, of the closer, and which means is connected to the surplus-receiver and is effective on the closing movement of the closer for elevating said receiver.

17. The combination, with weighing mechanism including a load-receiver having a closer and also having a valve-controlled discharge-conduit and a return-conduit located the former above the latter and between the upper and the lower ends of said receiver, of a vertically-disposed guide carried on the load-receiver; a surplus-receiver supported on said guide for vertical movements independent of the receiver and in operative relation with the discharge and return conduits; means operative, when the load-receiver is in its elevated position, for holding the surplus-receiver in a load-discharging position; means controlled by the weighing mechanism for effecting a descending movement of the surplus-receiver; means controlled by the closer, on the closing movement thereof, for elevating the surplus-receiver; means effective during the weighing of a load for cutting off the supply of material from the surplus-receiver and the return-conduit, and also effective after the discharge of the weighed load and on the shutting of the closer for establishing communication between the surplus-receiver and load-receiver.

18. The combination, with weighing mechanism including a load-receiver having a closer and with closer-actuating means, of load-reducing means in connection with the load-receiver; a surplus receiving and resupplying device including a vertically-shiftable surplus-receiver and a return-conduit in communication with the load-receiver; means effective, when the load-receiver is in its load-receiving position, for holding the surplus-receiver in an elevated position; means controlled by the weighing mechanism for releasing and effecting a descending movement of the surplus-receiver and including an angle-lever pivotally supported on the framework and having one of its arms pivotally connected to the main closer of the load-receiver; an actuator-rod pivotally connected at its lower end to the other arm of the angle-lever and having at its upper end an elongated slot; a stud or projection on the surplus-receiver extending into said slot, the construction and organization of the actuator-rod, including the lever and its connection with the closer, being such that on the opening movement of the closer a shifting movement will be imparted to the surplus-receiver; and a cut-off plate shiftably supported between the surplus-receiver and return-conduit and connected to the actuator-rod in such manner that on the opening movement of the closer said cut-off plate will be elevated in unison with the surplus-receiver, and on the closing movement of the closer said cut-off plate will be depressed to establish communication between the surplus-receiver and return-conduit of the load-receiver.

19. The combination, with weighing mech-

anism including a load-receiver, of supply apparatus comprehending a series of supply-chutes pivotally connected and supported for oscillating movements in opposite directions respectively; a main supply-valve controlled by the weighing mechanism for regulating the discharge of material from the supply-chutes to the load-receiver; a power-driven chute-oscillator in operative connection with the oscillatory chutes; and means in connection with, and controlled by, the supply-valve for throwing the chute-oscillator into and out of action.

20. The combination, with weighing mechanism including a load-receiver, of a supply apparatus including a chute supported for vibratory movement; a valve for opening and closing the discharge ends of the supply apparatus; means controlled by the weighing mechanism for imparting an opening movement to said valve; a chute-vibrator in operative connection with the vibratory chute and including a clutch for throwing the chute-vibrator into and out of action; and means carried by the valve for actuating the clutch.

21. The combination, with weighing mechanism including a load-receiver, of a supply apparatus including a series of chutes located one above the other and one or more of which is supported for vibratory movement; an oscillatory stream-controller in connection with one of said chutes; means controlled by the weighing mechanism for imparting an opening-and-closing movement to the stream-controller; a power-driven chute-vibrator in connection with the vibratory chute or chutes and embodying a clutch device; a cam carried on the stream-controller; and means connecting said cam and clutch device and effective on the opening-and-closing movement of the stream-controller for actuating the clutch device to render the chute-vibrator effective in its operation for vibrating the chute.

22. The combination, with weighing mechanism including a load-receiver, of a supply apparatus including a vibratory chute; an oscillatory stream-controller supported in position to open and close the discharge end of the supply apparatus; an eccentric-actuating shaft journaled in bearings on the framework and having an eccentric in operative connection with the vibratory chute; a power-driven wheel mounted upon said shaft; a clutch device intermediate to, and effective for locking, the power-wheel and eccentric-shaft together and for disengaging said power-wheel and eccentric-shaft; a clutch-actuating lever pivotally supported on the framework and having one end in engagement with the shiftable clutch member of the clutch device; a cam carried on the stream-controller and having a working face in engagement with the opposite side of the clutch-actuating lever and effective, on the opening movement of the stream-controller, for shifting said lever to a position for throwing the members of the clutch device into operative engagement, to thereby cause the eccentric to impart vibratory movement to the chute.

23. The combination, with weighing mechanism including a load-receiver, of a supply apparatus having a vibratory chute and also having an oscillatory valve for controlling the discharge of material to the load-receiver; means controlled by the weighing mechanism for effecting a closing-and-opening movement of the valve at predetermed points in the movements of the load-receiver; a cam carried on the valve; a power-driven chute-vibrator including an eccentric in pivotal connection with the vibratory chute and a power-wheel, each of which has a clutch member in connection therewith; a clutch-actuating lever pivotally supported on the framework and having one end thereof in engagement with one of the clutch members and having its opposite end in engagement with the working face of the valve-cam, and which lever is effective, on opposing movements of the valve, for actuating the clutch member to render the chute-vibrator alternately effective and ineffective.

24. The combination, with a load-receiver, of a horizontally-disposed closer-supporting rock-shaft having its axis at one side the longitudinal axis of the receiver; a closer fixedly secured to said rock-shaft with its supporting-plate transverse to the line of flow of the material; and two oppositely-disposed side closers pivotally supported at their upper ends to the front and rear walls, respectively, of the load-receiver, and having their lower ends in juxtaposition to the opposite ends of the first-mentioned closer; two side-closer-actuating rods pivotally connected at their inner ends to the middle closer at opposite sides, respectively, of the rock-shaft, and pivotally connected at their outer ends to the two side closers, whereby, on the opening movement of the middle closer, an opening movement will be simultaneously imparted to the side closers.

25. The combination, with weighing mechanism including a load-receiver having closer-openings in the front and rear walls at the lower end thereof and also having a discharge-opening in the bottom thereof, of a horizontally-disposed rock-shaft carried on the load-receiver at the lower end thereof; a bottom closer carried near one end on the rock-shaft and having that portion of its material-supporting plate of greatest area located in the rear of the axis of said rock-shaft; two oppositely-inclined side closers pivotally supported at their upper ends on the front and rear walls, respectively, of the load-receiver in position to cover the side openings, and having their lower ends, when in their closed positions, in contact with the front and rear ends of the bottom closer; means for normally locking the closers in their closed positions; means operative at a predetermined point in the movement of the

load-receiver for releasing said locking means to effect an opening movement of said closers; toggle-links operatively connecting said side closers and bottom closer in such manner that on the opening-and-closing movement of the bottom closer corresponding movements will be imparted simultaneously to the side closers; and means in connection with the bottom closer and operative, at a predetermined point in the movement of the load-receiver, for imparting a closing movement to said side closers.

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