(No Model.)

6 Sheets—Sheet 1.

F. H. RICHARDS.

WEIGHING MACHINE.

No. 561,521. Patented June 2, 1896.

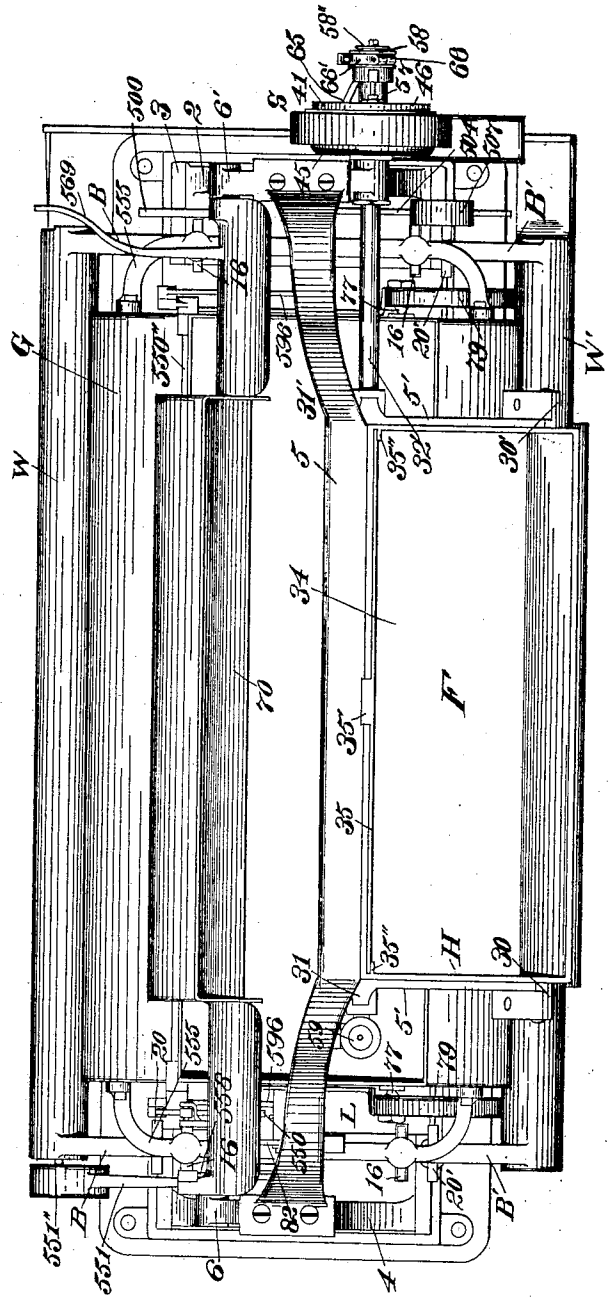

Fig. 1.

Witnesses
R. W. Pittman
Fred. J. Dole.

Inventor:
F. H. Richards.

(No Model.) 6 Sheets—Sheet 2.

F. H. RICHARDS.

WEIGHING MACHINE.

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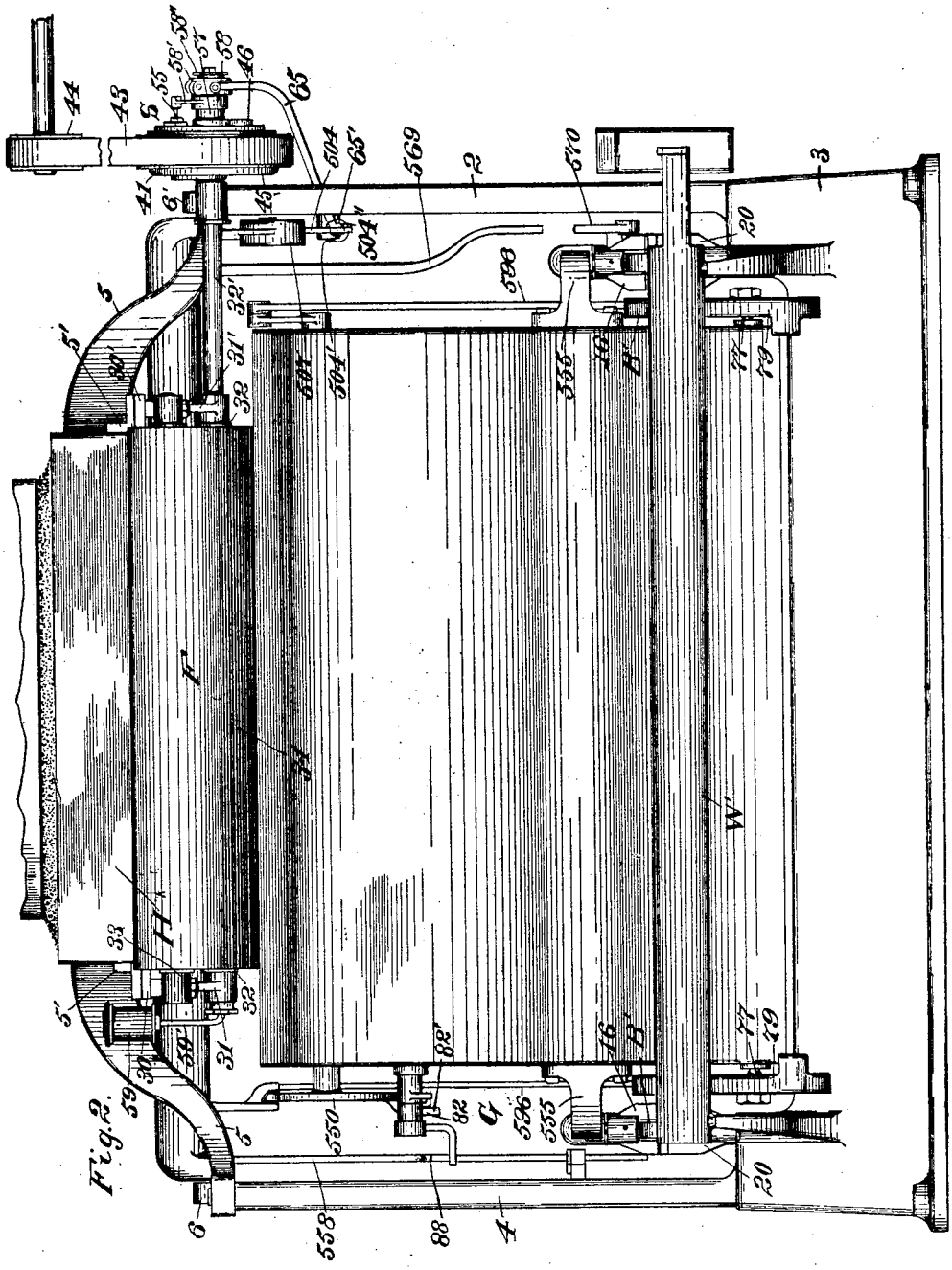

Witnesses:
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Inventor:
F. H. Richards.

(No Model.)

6 Sheets—Sheet 3.

F. H. RICHARDS.

WEIGHING MACHINE.

No. 561,521. Patented June 2, 1896.

Fig. 4.

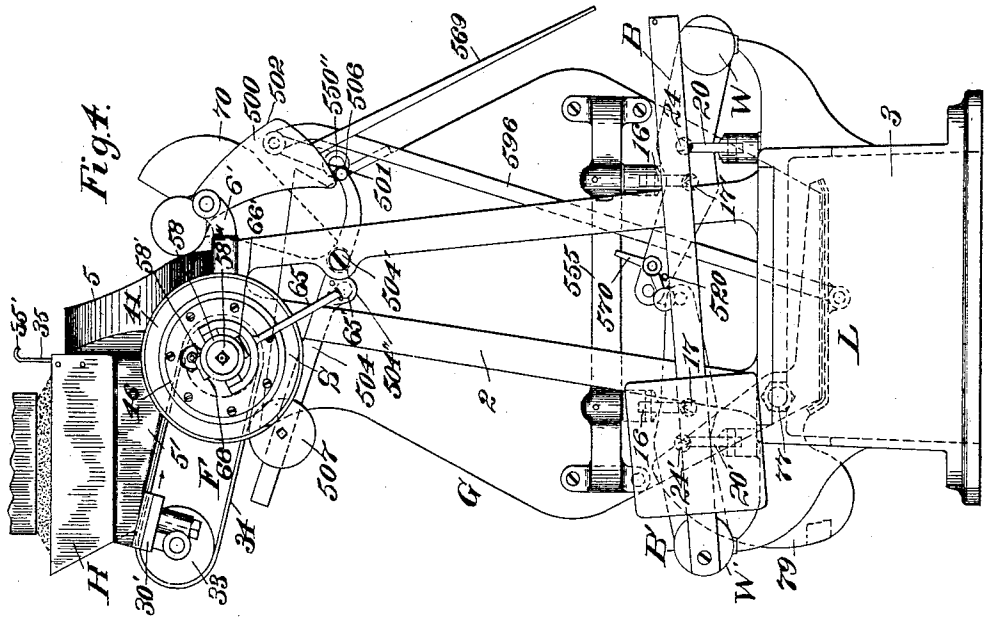
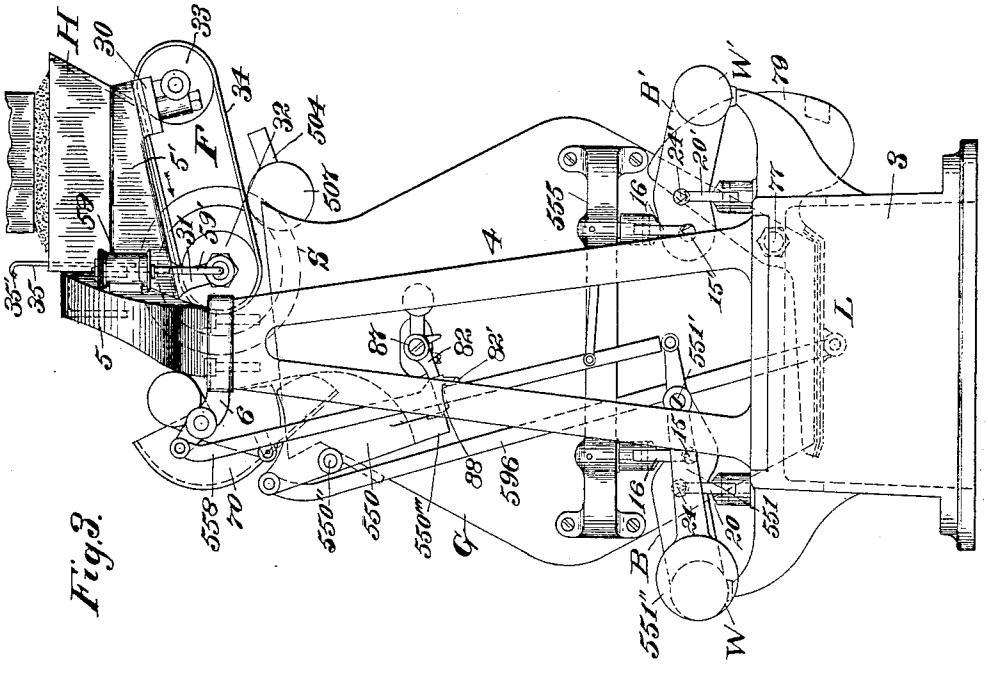


Fig. 3.



Witnesses:
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F. H. Richards.

(No Model.) 6 Sheets—Sheet 4.

F. H. RICHARDS.

WEIGHING MACHINE.

No. 561,521. Patented June 2, 1896.

Fig. 6.

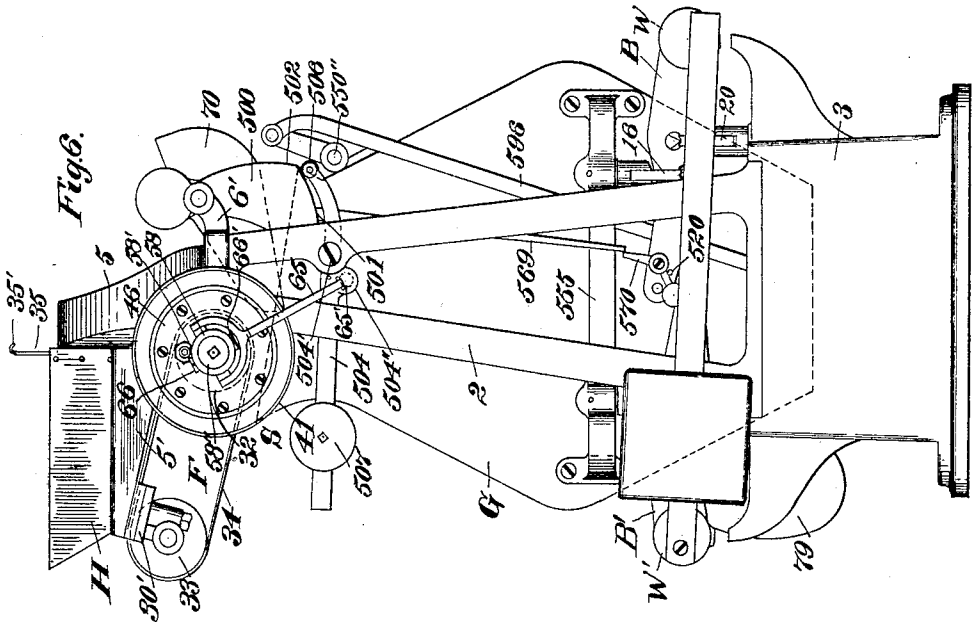
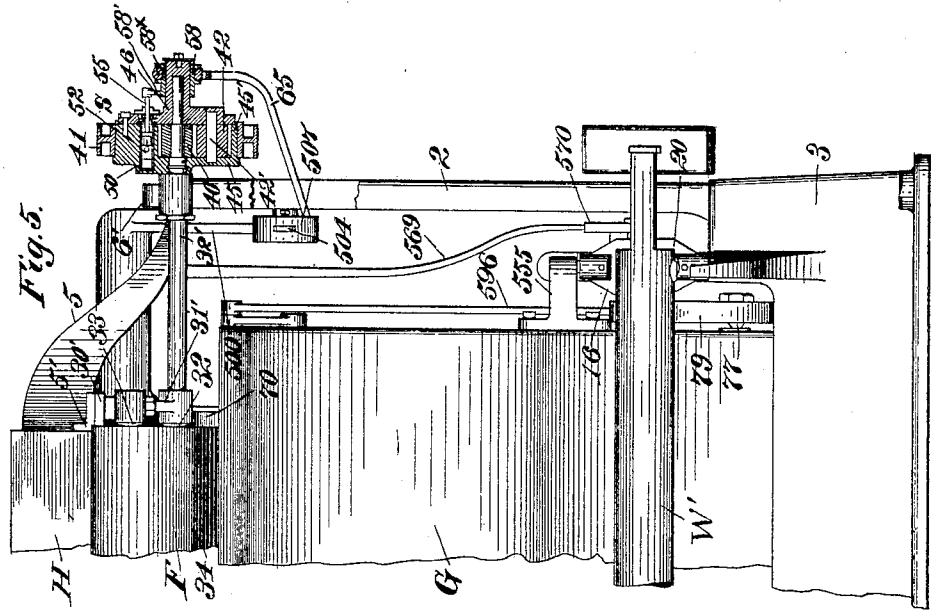


Fig. 5.



Witnesses:
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(No Model.) 6 Sheets—Sheet 5.

F. H. RICHARDS.

WEIGHING MACHINE.

No. 561,521. Patented June 2, 1896.

Fig. 8.

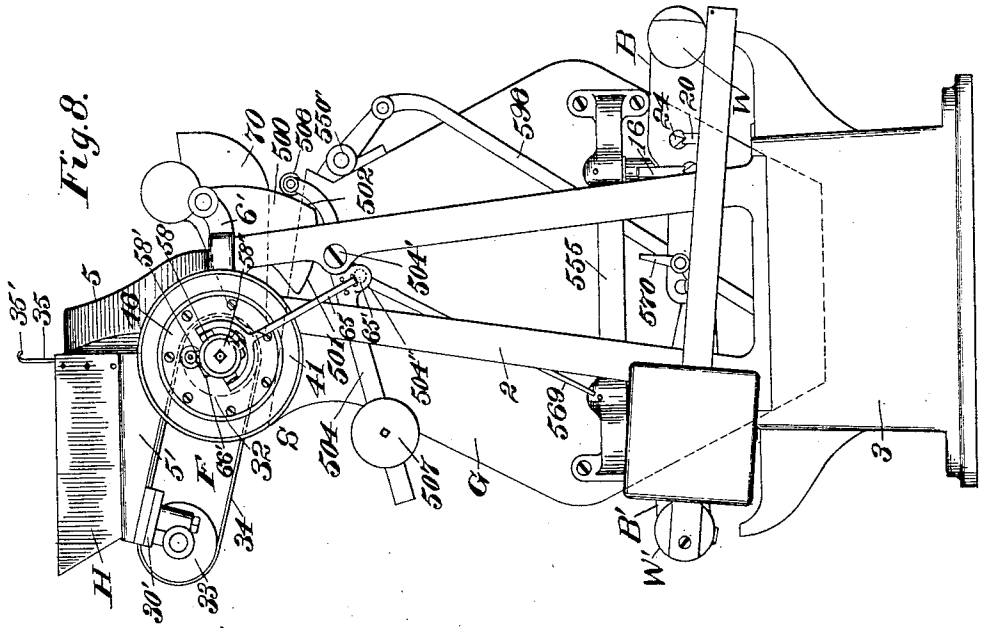
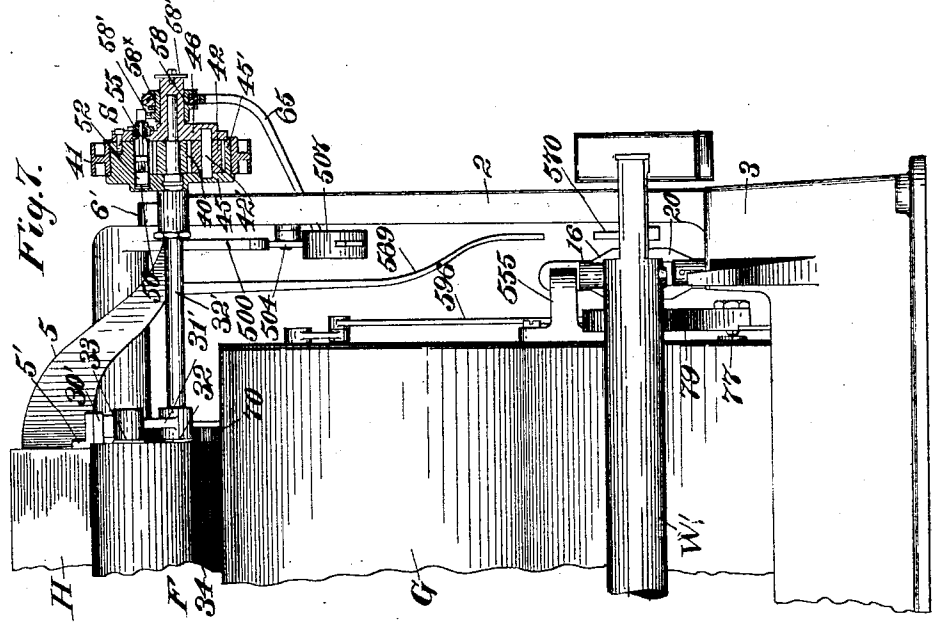


Fig. 7.



Witnesses:
R. W. Pittman
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(No Model.)

6 Sheets—Sheet 6.

F. H. RICHARDS.

WEIGHING MACHINE.

No. 561,521. Patented June 2, 1896.

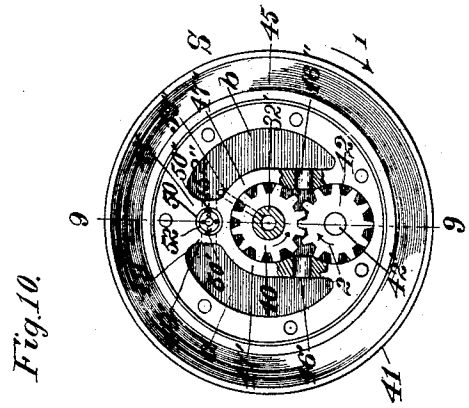


Fig. 10.

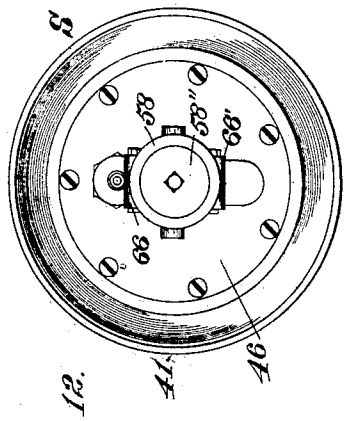


Fig. 12.

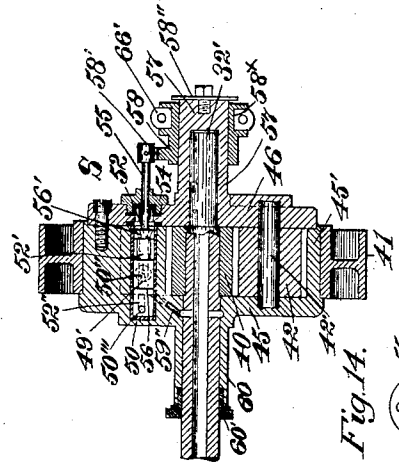


Fig. 9.

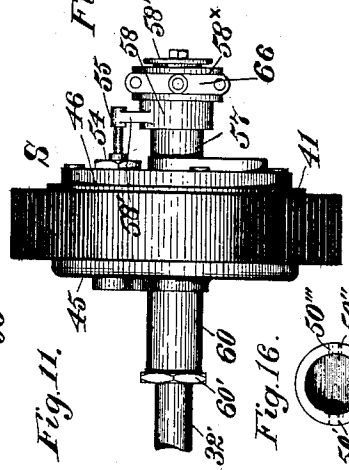


Fig. 11.

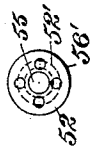
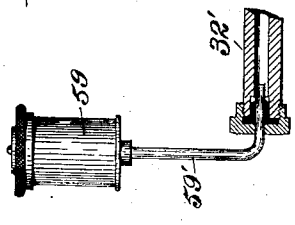


Fig. 14.

Fig. 16.



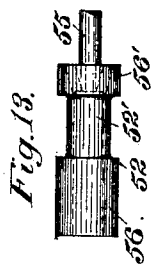


Fig. 13.

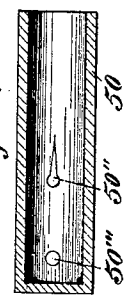


Fig. 15.

Witnesses:
R. W. Pittman
Fred. J. Dole.

Inventor:
F. H. Richards.

UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT.

WEIGHING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 561,521, dated June 2, 1896.

Application filed November 21, 1895. Serial No. 569,627. (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.

My invention relates to weighing-machines, the object being to provide an improved weighing-machine particularly adapted for weighing lumpy and sluggish materials, the present improvements embodying, in part, a power-driven variable-speed feeder for feeding or forcing a stream of material of variable volume to the bucket of the machine.

In the drawings accompanying and forming part of this application, Figure 1 is a plan view of a weighing-machine embodying my present improvements. Fig. 2 is a front elevation of the machine Fig. 3 is an end elevation seen from the left in Fig. 1 and illustrating the machine at the commencement of operation. Fig. 4 is an end elevation seen from the right in Fig. 2 and illustrating the machine in a position corresponding with the preceding figure. Fig. 5 is a rear elevation of a part of the machine and illustrates in section a form of speed-converter for varying the speed of the feeder. Fig. 6 is a view similar to Fig. 4 and illustrates the position of the machine succeeding that illustrated by Fig. 4. Fig. 7 is a view similar to Fig. 5 and illustrates the machine in a position corresponding with Fig. 8. Fig. 8 is a view similar to Figs. 4 and 6 and illustrates the position of the machine at the close of an operation and just preceding the discharge of the bucket-load. Fig. 9 is a central section on the line 9 9, Fig. 10, and illustrates, on a larger scale, the speed-converter shown in Figs. 5 and 7. Fig. 10 is a face view of the speed-converter with the face or front plate thereof removed to better illustrate its internal mechanism. Fig. 11 is an elevation seen from the left in Figs. 4, 6, and 8 of the speed-converter. Fig. 12 is a view similar to Fig. 10, showing the face or front plate of the device in position. Figs. 13, 14, 15, and 16 are enlarged details of a form of piston or slide valve and its seat or casing.

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

For convenience in illustrating the nature and purpose of my present improvements these are shown applied to the improved weighing-machine disclosed by Letters Patent No. 548,840, granted to me October 29, 1895, and the weighing-machine so illustrated will be briefly described, but with sufficient particularity to clearly show the operation of my present improvements. It will be understood, however, that I do not limit the application of the present improvements to any particular form or type of weighing-machine.

The framework for carrying the operative parts of the weighing-machine may be of any suitable construction, and is shown in the drawings comprising two side frames or uprights 2 and 4, mounted upon a chambered supporting-base 3 and connected by a top plate 5. The top plate 5 is illustrated carrying a hopper H, (hereinafter more particularly described,) which will be secured thereto in some suitable manner, such as by the tie-plate 5'. (Shown attached, respectively, to the top plate 5 and to the supply-chute or hopper H.)

The base 3 of the machine is illustrated provided with beam-supports, as V-shaped bearings 20 and 20', for supporting the beam mechanism, which latter carries the bucket mechanism consisting of the bucket and its operative devices.

As a means for supporting the bucket or load-carrying receptacle, (designated in a general way by G,) a pair of oppositely-disposed counterweighted beams are shown at B and B', respectively, pivotally mounted on the beam-supports 20 and 20' by means of the pair of pivots or knife-edges 24 and the oppositely-disposed pair of pivots or knife-edges 24' and having bucket-supports located intermediate of said beam-supports, these bucket-supports being illustrated as two remotely-disposed pairs of pivots or knife-edges 15 and 15' and 17 and 17'.

Each of the scale-beams B and B' is shown in the drawings having a pair of beam-arms joined by a combined connecting-shaft and counterpoise, the counterpoise for the beam B being designated by W and that for the beam B' being designated by W'.

The bucket G is pivotally mounted on the oppositely-disposed scale-beams and is shown

herein having V-shaped bearings 16, corresponding in number and position with the knife-edges 15 and 15′ and 17 and 17′, and said bearings 16 are illustrated carried by the hangers 555, secured to each end of the bucket G.

The machine will have the usual poising and counterpoising mechanisms. All that part of the beam mechanism located outside of the knife-edges 24 and 24′ constitutes the counterpoising mechanism of the machine, and all that part of the beam mechanism located between said knife-edges, including the bucket mechanism which is supported by the beam mechanism for ascending and descending movements therewith, constitutes the poising mechanism of the machine.

The bucket mechanism embodies two members, one of which is shiftable relatively to the other for discharging the bucket-load, and the bucket-closer L is illustrated constituting the shiftable member of the bucket mechanism.

The bucket-closer L is shown provided with a pair of counterweighted plates 79, preferably formed integral therewith for returning said closer to its closed position. The closer is also shown pivoted at 77 to the lower side of the bucket G and adjacent to one side of the discharge-opening thereof.

As a means for supporting the bucket-closer an inverted toggle is shown connecting the closer and the bucket. This toggle connection is so positioned as to be engaged by a closer-latch. In the form of toggle illustrated this comprises a suitable rocker, such as 550, pivoted adjacent to the upper rearward side of the bucket G and having a long connecting-rod 596 pivoted to said rocker and also to the closer in such a manner that when the closer is shut the two pivots of said connecting rod or member will be nearly in line with, and the upper of said pivots will be above, the rocker-pivot, whereby when the rocker is engaged by the bucket-closer latch and held in that position the closer will be supported with a minimum pressure in the latch, as practically all of the weight of the bucket contents will be carried on the pivot 550″ of the rocker. The closer-latch for locking the rocker in position when the closer is shut (designated by 82) is shown pivoted at 87 to the bucket G and as having a detent or stop in position for engaging a coöperating detent on the toggle (herein shown as the detent 550‴, carried by the rocker 550) when the parts are in the closed position previously described.

The bucket-closer latch 82 is shown counterweighted, and will be limited in its movement toward the detent of the toggle connection by means of suitable stops. It will be noticed that as illustrated the closer-latch 82 swings upward to engage the rocker-detent 550‴, and it will be evident that said latch 82 will be released by a downward movement or pressure. When the latch is released, the weight of material in the bucket supported by the closer is effective for instantly opening said closer.

In weighing granular and similar materials it is customary and necessary in any successfully-operating machine to provide for a drip-stream, which flows into the partially-loaded bucket, its purpose being to complete the bucket-load. Various methods are employed for securing this drip-stream. One well-known method is by the employment of two valves for controlling the supply-stream, which flows from a supply-chute or hopper and into the bucket, one of these valves or the larger constituting a reducing-valve and the other constituting a cut-off valve. The reducing-valve during the descent of the bucket gradually closes, and by reducing the size of the discharge-orifice of the supply-chute or hopper consequently reduces the volume of the supply-stream to a drip-stream. The drip-stream, commencing to flow at the commencement of the poising period, continues to flow into the bucket until the load therein is completed, when the cut-off valve is operated for cutting off the drip-stream.

Another well-known method for securing the drip-stream is by the employment of a single valve, which combines in one valve the functions of these reducing and cut-off valves. This single valve has two movements—a reducing movement, reducing the size of the discharge-orifice, as does the reducing-valve above mentioned, followed by a corresponding reduction in the volume in the drip-stream. At the commencement of the poising period this valve is held against further closing movement by proper means to permit the drip or reduced stream to flow into the partially-loaded bucket, and when the bucket-load is completed the valve is released, and is thereby operative for cutting off the drip-stream.

While excellent results are obtained by the above-mentioned and other types of valve mechanisms in weighing free-running materials, it has been found, after experiments in weighing very coarse, lumpy, and sluggish materials, to be impossible to secure a satisfactory drip-stream, and as this is a very important factor it is apparent that failing to secure this stream disastrous results must follow. For example, when weighing lumpy materials, such as coal, and a more than ordinarily large lump in the mass descends this cannot pass through the reduced opening of the supply-chute, thus causing a blocking in the supply-chute and consequently a stoppage of the machine until the difficulty is removed by hand. The same disadvantageous results are present in weighing sluggish materials of various characters, as during the drip period such materials always clog and block in the chute, not being able to flow through the reduced chute-opening.

My improved machine embodies as a part thereof a variable-speed feeder and auto-

matically-operable means for regulating or changing the speed of said feeder.

The feeder or feeding device (designated in a general way by F) positively feeds or forces a stream of material from the chute H into the bucket. At the commencement of each operation of the machine the feeder or feeding device will have a relatively great or accelerated speed, which will be progressively decreased or reduced at proper points or intervals in the descent of the bucket. It will be apparent, then, that the volume of the supply-stream is variable, being much larger at the commencement of the operation of the machine and gradually decreasing as the bucket descends.

The feeder will be preferably rotary, and the form of feeder shown consists of a pair of rolls operatively connected by a belt or apron, which extends a proper distance beyond the front, rear, and end walls of the supply-chute, so as to prevent accidental escape of any of the material from the chute. I wish it understood, however, that the invention is not limited to the particular form of feeder or feeding device shown, as it is obvious that other equally efficacious forms of feeders may be substituted for that illustrated without departing from the scope of my invention.

One of the rolls or members of the feeder or feeding device F constitutes the driving or power roll and will be operatively connected with suitable driving mechanism or a motor, and the other roll will be driven by said power-roll.

The supply-chute H is illustrated carrying hangers or brackets 30 and 30′ and 31 and 31′, provided with suitable journal-openings for receiving the ends of the shafts of the two rolls. The power or driving roll is illustrated at 32 and the complementary roll of the feeder at 33, and the axes of these rolls will be located slightly in advance of the front wall and to the rear wall of the supply-chute H. The rolls 32 and 33, as hereinbefore stated, will be operatively connected by a belt or apron, as 34, which may be of any suitable material—as, for example, canvas or leather.

The front wall of the supply-chute H is shown provided with a stream-discharge opening or orifice, extending from end wall to end wall thereof and of a height to freely permit the passage therethrough of any large lumps that may be in the mass. The path of movement of the belt 34 is indicated by the arrow in Fig. 3. It will be apparent that when said belt moves in the direction indicated a wide stream of material will be fed into the bucket, and that when the belt is at rest it will act as a support for the mass in the chute.

Means will be provided for regulating the height of the stream opening or orifice of the supply-chute or hopper H, and the means shown consists of a vertically-slidable plate or gate 35, which will be mounted for sliding movement in slideways or grooves 35″, formed on the supply-chute. A finger-piece 35′ will also be provided, so that the regulating gate or plate 35 may be readily raised or lowered to either increase or decrease the height of the supply-stream orifice of the supply-chute for weighing material of different characters.

The main or driving roll 32 will be operatively connected with suitable driving mechanism or motor for conveying motion thereto, and to its mate, through the belt or apron 34, for feeding or forcing the stream of material by the belt into the bucket G.

A speed-modifier or speed-modifying device is shown for gradually varying the feeding movement of the feeder or feeding device F at successive points in the operation of the machine.

I wish it also understood that I do not limit the invention to the particular form of speed-modifier, that shown being substantially similar to the one described and claimed in my application, filed contemporaneously herewith, Serial No. 569,626.

The speed-modifier will preferably be placed between a driving mechanism and the feeder, and the former will be continuously operative, so that as the speed of the feeder is successively varied movement of the driving mechanism will not be stopped, but will continue uninterrupted.

The speed-modifier (designated in a general way by S) is illustrated located between and coöperative, respectively, with the feeder and with the driving mechanism, and motion will be imparted by the latter to the feeder through the agency of the speed-modifier.

The speed-modifier shown is in the form of a fluid-operated controlling device or governor, fluid being employed as a brake for checking the movement of the internal mechanism of the speed-modifier, and for this purpose any suitable fluid may be employed—for example, ordinary lubricating-oil, with which very satisfactory results have been obtained.

The speed-modifier shown involves, in part, pressure and storage compartments and planet-gearing, comprising fast and movable members or pinions. The first-mentioned pinion will be carried by the shaft of the driving-roll of the feeder, and the loose pinion or planet-gear will be movable and will have its rotative movements checked by the pressure of the fluid in the pressure-compartment, the flow of the fluid from said pressure-compartment to the storage-compartment of the speed-modifier gradually reducing this pressure, causing a slowing down in rotative movement of the planet-pinion and consequent reduction in speed of the feeder F.

The shaft 32′ of the main roll of the feeder F is shown extending some distance beyond the side frame 2 and bearing therein and is also shown hollow, the purpose of which will be hereinafter apparent. The shaft 32′ is shown carrying a loose pulley 41, provided interiorly thereof with the speed-reducing apparatus, and said shaft is also shown car-

rying a pinion 40, which constitutes the driven or fixed pinion of the planet-gearing hereinbefore mentioned. This pinion will be secured to the shaft in some well-known manner, and will mesh with a normally movable pinion or planet-gear 42, constituting a driving-pinion, which is also located within the pulley 41 and against which latter the pressure of the fluid in the high-pressure compartment acts, and by preventing the movement or rotation of the loose pinion makes the latter, for the time being, a fixed pinion, whereby it will be effective for imparting rotative movement to the driven pinion or sun-gear and through the latter to the feeding device for feeding the stream of material into the bucket. As the pressure in the pressure-compartment is gradually reduced, due to the passage of the fluid from the pressure to the storage compartment, the checking influence of the fluid is gradually removed, permitting a slipping movement or slowing down of the driving-pinion, followed by a corresponding reduction in rotation of the fixed pinion 40, and hence the movements of the feeder or feeding device F. When the pressure in these two compartments is equal or balances, the driving-pinion will be perfectly free to again rotate, and when rotating it cannot impart motion to the pinion 40, the result being a stoppage of the feeder F.

The pulley 41 is illustrated operatively connected with a motor or driving mechanism, and a belt 43 is illustrated passing around said pulley 41, and also around the power or drive wheel 44 (see Fig. 2) of some suitable motor. (Not shown.)

The pulley 41 has been described as operating a pair of members or pinions, one of which is fixed to the feeder-shaft, and hence is operative therewith and also with the feeder, and the other a variable-speed or movable pinion, which, when held against movement in the manner described, is operative through the driving mechanism for imparting variable motion to the feeder or feeding device F.

The pulley 41 is shown embodying a back plate 45 and an annular wall 45′, joined thereto, and a removable front or face plate 46, secured to said wall 45′ by means of screws or other fastening devices, said wall and plates forming an interior fluid-chamber, and this chamber being adapted for containing the operative parts and controlling device of the speed-reducing means. The front and back plates, respectively, of the pulley 41 are shown provided with journal-openings for the reception of the opposite ends of the shaft 42′ of the driving-pinion. The interior chamber or compartment of the pulley 41 is subdivided into two chambers or compartments, constituting, respectively, the pressure and storage compartments hereinbefore mentioned.

The fluid employed for controlling the movement of the pinion 42 will be maintained in circuit form. Starting at the commencement of each operation of the machine from the pressure-compartment it will slowly flow therefrom into the storage-compartment, a valve being illustrated as employed for regulating and controlling this flow of the fluid. As the fluid flows or leaks from the pressure-compartment to the storage-compartment the pressure of the fluid against the pinion 42 will be gradually decreased, permitting a gradual reduction in rotative movement of the movable pinion 42 until the pressure in these two compartments is equal, when the pinion 42 will be free to rotate, and will thereby be ineffective for imparting movement to its mate or driven pinion 40, causing, consequently, a stoppage of the feeder movements. When the bucket G has reached its normal position, the normal capacity or pressure of the pressure-chamber will have been restored in a manner hereinafter described, when this operation will be repeated.

The interior chamber of the pulley 41 is subdivided by a bifurcated partition 47, between the branches of which the two pinions will rotate. This partition 47, transversely intersecting the chamber of the pulley 41, forms two separated compartments, the one constituting a pressure and the other a storage compartment. The two pinions 40 and 42 will rotate between the branches of the partition, and the inner faces of these branches are shown circular, the arc defining said faces being struck from the axes of the two pinions, so that the teeth of said pinions, when rotating, will have a rubbing contact with said curved faces and will also tightly mesh to prevent the passage of the fluid in any other than the desired manner. To also insure the proper flow of the fluid the outer faces of these two pinions will have a rubbing contact with the inner faces of the back and front plates of the pulley.

The high-pressure compartment of the speed-modifier is designated by *a* and the storage-compartment by *b*, and the branches 47′ and 47″ of the partition or wall 47 are each shown provided with ports 46′ and 46″. (See Fig. 10.) It will be assumed that the pulley 41 is rotating in the direction of the arrow, Fig. 10, and that the fluid-chamber thereof does not contain any fluid. On the rotation of the pulley 41 the movable pinion 42 will revolve about the axis of the pulley, and meshing with the pinion 40 will be rotated about its axis in a direction reverse or opposite to the direction of rotation of the pulley 41. A fluid being introduced into the pressure-compartment *a* and flowing through the port in the branch 47′, and its pressure acting against the teeth of the pinion 42, effectually blocks or prevents the rotation of the pinion 42, making it for the time being a fixed pinion, so that on the rotation of the pulley by the driving mechanism said pinion will then be effective for driving or rotating the pinion 40 and through the latter the feeder F. As the pressure in the high-pressure compartment

decreases a reduction in rotative movement of the pinion 42, due to the decreased pressure, is caused, and hence the movement of the feeder F will be correspondingly decreased, and when the pressure in these two compartments is equal or balances the pinion 42 will again be free to rotate or move, and consequently will be ineffective as a power-transmitting factor.

As a means for controlling or regulating the flow of the fluid from the high to the low pressure compartment a valve will preferably be employed, and for this purpose I prefer to employ a balanced slide-valve, whereby the action of the same is rendered absolutely positive and the power necessary to actuate the same is minimized.

The wall or partition 47, which separates the high and the low pressure compartments, is shown having a relatively wide portion 49, provided with a circular conduit or opening 49′, through which the fluid passes from the pressure to the storage compartment, and the flow or leakage of which is regulated by the fluid-controlling valve 52 mentioned. This relatively wide portion 49 of the partition 47 is provided with a socket transversely disposed relative to the bore therein, which is adapted for receiving the valve-casing or cylinder of the fluid-controlling valve. This valve-casing is illustrated at 50, (detailed in Fig. 15,) having an open end.

The wall of the valve-casing 50 is shown provided, at diametrically opposite sides thereof, with two ports, one an induction-port and the other an eduction-port, and both of which are illustrated, each communicating with the bore or conduit 49′ of the portion 49 of the partition 47. The induction-port of the valve-casing is illustrated at 50′ and the eduction-port at 50″, and the fluid flowing from the pressure-compartment *a* passes through the port 50′, through the valve-cylinder 50, and out of the port 50″, and thence into the storage-compartment *b*. These ports 50′ and 50″ are illustrated as tapered openings, the peculiar function of which will now be described. The valve, also termed a "fluid-controlling valve," for regulating the flow of the fluid from the high to the low pressure compartment, is illustrated at 52, and is in the nature of a balanced piston-valve, and will have a reciprocative movement in the valve-casing, and the movements of said valve will be controlled by some movable part of the machine. At the commencement of the operation the valve 52 will close the ports 50′ and 50″, thereby preventing the passage of oil from the high-pressure compartment, and it will be evident that this flow being prevented by the valve (see Fig. 9) the pressure of the fluid in the pressure-compartment *a*, acting against the pinion 42, holds said pinion against rotative movement in the manner hereinbefore described, whereby it may rotate the pinion 40. As the bucket descends the valve 52 will be pushed inwardly or opened, partially opening the tapered ports 50′ and 50″, permitting a stream of fluid of very small volume to flow or leak from the high to the low pressure compartment and a reduction in speed of the feeder F. On the further inward or opening movement of the valve 52, due to the farther descent of the bucket G, a larger stream will flow through said ports, and a reduction of the blocking influence of the fluid on the pinion 42 being the result, said pinion will gradually slip and the feeder consequently will materially slow down. At the commencement of the poising period the pressure in the pressure-compartment will have been considerably reduced, being but little more than that in the storage-compartment, thus causing a material reduction in speed of the feeder movement, and hence a material reduction in volume of the fed or forced stream. This reduced stream constitutes the drip-stream.

Suitable means, to be hereinafter described, are employed for controlling the duration of flow of the drip-stream, the means employed holding the valve 52 against further inward movement and releasing the same at the close of the poising period. Being in this position, the pressure in the pressure-compartment is instantly reduced until it approximates that in the storage-compartment, when the pinion 42 will be free to rotate and will be ineffective as a power-transmitting medium, consequently stopping the feeder F. It will be assumed that the pressure in the two compartments is equal, the feeder having been stopped, and it will be remembered also that the pulley 41 is continuously rotative. It will be assumed also that the bucket has discharged its load, has ascended, and is again in its normal or stream-receiving position. The part that pushed the valve 52 inwardly to permit the flow of the gradually-increasing stream from the high-pressure compartment quickly closes the ports 50′ and 50″ during the ascent of the bucket, so that said ports are closed when the bucket has reached its normal position. The pressure in the two compartments being equal and the pulley rotating in the direction of the arrow 1, Fig. 10, and the valve being closed, Fig. 9, the pinion, rotating in the direction of the arrow 2, will suck or draw the fluid through the port 46″ in the branch 47″ of the partition, and each tooth of the pinions—these rotating, it will be understood, in opposite directions—will carry a small portion of the fluid from the storage-compartment to be discharged into the pressure-compartment through the port 46′ in the branch 47′ of the partition, thereby creating or restoring the pressure in the pressure-compartment *a* to its normal capacity and decreasing that of the compartment *b*; but a partial rotation of the pulley 41 is necessary to again create an excess of pressure in the compartment *a*, so that when the bucket has reached its stream-receiving position the peculiar checking action of the fluid against the pinion 42 may be again exerted.

The valve-cylinder 50 is shown provided with a stuffing-box 54, having a central bore to permit of the entrance of the valve-stem 55 of the valve 52. This valve-stem 55 will be operatively connected with some movable part of the weighing mechanism for sliding the same in and out to either open or close the ports 50′ and 50″ to permit or prevent the flow of the fluid from the pressure to the storage compartment of the speed-modifier S.

The valve-body is shown having a reduced portion 52′, about which the fluid flows when passing from the high to the low pressure compartment. The valve 52 is also shown provided, in the portion 56 thereof, with a single bore, and in the portion 56′ with branch bores which communicate therewith. (See dotted lines in Fig. 13.) The valve-cylinder 50 is shown provided with an opening 50‴, which communicates with the conduit 52″, which also communicates with the storage-compartment *b*, and fluid will flow through the conduit 52″ from the low-pressure compartment *b* and into the cylinder 50 through the opening 50‴ in the cylinder, and thence through the bores of the valve, so that there will be maintained at each end of the valve a body of fluid, each of which, on the reciprocative movements of the valve, balances the other and insures an even movement of the valve from one to the other of its positions.

The back plate 45 of the pulley 41 is shown provided with a longitudinal projecting portion 60, in which the feeder-shaft 32′ rotates, accidental escape of oil being prevented by the stuffing-box 60′, which is provided for this purpose. The face-plate 46 of the pulley is also shown provided with a projecting portion 57, having a closed end, and this serves effectually as a means for preventing escape of the fluid from that side of the pulley. The projecting portion 57 serves as a support for a slidable clutch member 58, which, by means of the integral arm 58′ thereof, is illustrated operatively connected with the valve-stem 55, and this slidable member 58 is also illustrated operatively connected with a movable part of the machine, and as also rotative with the pulley 41, so that when the slidable member 58 is moved in one direction the valve 52 will open the ports in the cylinder 50 to permit the flow of oil from the pressure to the storage compartment, and when slid in the opposite direction the valve 52 will close said ports to prevent the return flow of the fluid therethrough from the storage into the pressure compartment.

It will be remembered that the feeder-supporting shaft 32′ has been described as hollow. This feeder-shaft 32′ will communicate with the storage-compartment *b*, and if from any cause the fluid employed should escape fluid sufficient to compensate for that escaped may flow through the hollow shaft and into the said storage-compartment *b* and be from there sucked or drawn into the pressure-compartment *a* by the rotation of the pinions 40 and 42, thereby maintaining an even pressure at all times in the pressure-compartment *a*. A fluid-cup is illustrated at 59, having a small tube 59′ in its bottom, adapted to be inserted in and communicate with the conduit of the shaft 32′. The cup or receptacle 59 also has a removable screw-threaded cap, which may be removed when it is desired to replenish the same with fluid.

A small port is illustrated at 59″, and this will communicate with the bore of the hollow shaft, the fluid passing from said bore through the port 59″ and into the compartment *b*, from whence it may be sucked or drawn into the pressure-compartment *a*.

It will be remembered that the feeder or feeding device has been described having a variable feeding movement for feeding or forcing the supply-stream into the bucket G and that its speed is progressively decreased at proper points in the descent of the bucket. During the first part of the operation a stream of relatively large volume will be fed or forced into the bucket, the volume of the supply-stream being gradually reduced until this is brought to a drip-stream.

A valve also termed "a stream-controlling valve" is preferably employed for catching the last portion of the supply-stream, which is then in the form of a drizzle or very fine stream; and the valve for this purpose is illustrated at 70 and is substantially similar to the improved valve described and claimed in Letters Patent No. 435,727, granted to me March 12, 1895. This valve, during the gradual reduction of the stream, has a slow closing movement and will act as a chute to direct the supply-stream into the bucket during the stream-reducing period, until at the close of the poising period—that is, on the completion of the bucket-load—this valve will be given an accelerated forward or closing movement intersecting the line of flow of the reduced stream and cutting off the same.

The valve 70 is shown as an oscillatory valve pivotally supported for oscillatory movement between the arms or brackets 6 and 6′, projecting from the top plate 5 of the machine. As a means for opening the valve, the mechanism disclosed and claimed in Letters Patent No. 548,842, granted to me October 29, 1895, will preferably be employed, and said mechanism will be briefly described.

The valve 70 is illustrated provided with a relatively long connecting-rod 558 to the rear of the pivot thereof, which projects downward and is in position to be engaged by a valve-opening actuator for imparting a thrust to said rod 558 for opening the valve 70.

The scale-beam B is illustrated provided with a supplemental counterpoise, which normally forms a part of the counterpoising mechanism, but is shiftable therefrom and onto the poising mechanism of the machine at a predetermined point in the movement of the bucket, and on the return thereof to its

normal position this supplemental counterpoise is effective for opening the valve 70, through the rod 558. This supplemental counterpoise is illustrated at 551 and pivoted to the beam B at 551′, the weight 551″ normally exerting its force on the counterpoising side of said beam. Hence it will be evident that the valve-opening actuator is in the nature of a counterweighted lever carried by the beam mechanism of the machine. This supplemental counterpoise, falling from under the connecting-rod 558, also permits a closing movement by the valve-closing actuator, which is illustrated as a counterweighted lever 504.

As a means for closing the valve the mechanism disclosed and claimed in Letters Patent No. 548,842, granted to me October 29, 1895, will preferably be employed, and said mechanism will now be briefly described.

A valve-closing cam is illustrated at 500, having two faces, (shown, respectively, at 501 and 502,) the latter being of relatively greater power than the former. A lever is illustrated at 504, pivoted at 504′ to the side frame 2. This lever is shown having an antifriction-roll 506 in position to engage the cam-surfaces 501 and 502. Said lever is shown also provided with a weight 507 at the end thereof opposite to that provided with the roll 506, and said weight, exerting an upward tendency forward of the pivot of the lever, tends, by the riding of the antifriction-roll 506 over the cam-faces 501 and 502, to close said valve. The antifriction-roll 506 during the reducing period of the operation of the machine is on the face 501 of the cam 500, the effect being a very slow closing movement of the valve 70. At the commencement of the poising period, the valve 70 being held against further closing movement to permit the flow of the drip or reduced stream into the bucket, the roll 506 will be about at the intersection of the cam-faces 501 and 502. The valve 70 being released, said roll 506, leaving the cam-face 501 and entering the cam-face 502 of relatively greater efficiency than the former, is effective, through the weight 507, for instantly closing the valve 70, thereby catching the drizzle or last part of the drip-stream.

It will be remembered that a fluid-controlling valve 52 has been described for regulating or controlling the flow of the fluid from the pressure to the storage compartment of the speed-modifier, and that the movements of said valve have been described as controlled by some movable part of the machine, and for controlling the movements of the fluid-controlling valve 52 I prefer to employ the descending valve-closing lever 504.

The projecting portion 57 of the face-plate 46 of the pulley 41 is shown provided with a slidable clutch member 58, which has been described as operatively connected with the fluid-controlling valve 52. This slidable member will also be operatively connected with the valve-closing actuator, so that as the stream-controlling valve 70 closes, the fluid-controlling valve will be opened to permit the reduction in pressure of the high-pressure compartment, and hence when the pressures in these two compartments are equal the stoppage of the feeder or feeding device F will follow. It will be evident then that the stream-controlling valve 70 has its closing movement during the opening movement of the fluid-controlling valve 52.

The slidable member 58 is shown provided with a peripheral groove or channel 58×, in which are seated the connected straps 66 and 66′, and the support for said slidable member 58 is shown provided with a stop, as 58″, for limiting the outward movement of said member 58.

The valve-closing lever 504 is shown provided with a socket 504″ at a point relatively adjacent to the center of movement 504′ thereof, which socket is adapted to receive the ball end 65′ of the actuating-lever 65 of the fluid-controlling valve 52. This actuating-lever is shown bifurcated, and the branches thereof are adapted to be pivotally secured to the straps which encircle the slidable clutch member 58, and which lie in the peripheral groove or channel thereof, and which, it will be understood, are not rotative with said slidable member 58. On the closure of the valve 70 this lever 504 has a descending movement, and, in descending, will exert an inward pull on the fluid-controlling-valve-actuating lever 60, which operation forces the fluid-controlling valve slowly inward, permitting a slow reduction in pressure in the pressure-compartment *a* and an increase in pressure in the storage-compartment *b*, due to the flow of the fluid from the pressure to the storage compartment.

It will be remembered that as the pressure decreases in the high and increases in the low pressure compartment a reduction in speed of the feeder F results. The feeder F gradually slows down in its movement until the commencement of the poising period, when the movement is very slow, resulting in forcing or feeding into the bucket a very small stream. At this point the fluid-controlling valve will be held temporarily against opening movement, so that the feeder may for the moment run at a uniform speed for the purpose of forcing a drip-stream of uniform volume into the bucket.

The stream-controlling valve 70 is shown provided with a relatively long depending rod 569, adapted to be engaged by a suitable stop at the commencement of the poising period, to thereby hold the valve 70, and hence the fluid-controlling valve 52, through the described connections, against further opening movement. The coöperating stop for engaging said depending rod 569 is in the nature of a counterweighted by-pass stop 570, pivoted for oscillatory movement on the beam B. The upper arm of said by-pass is of such a length relatively to said depending rod 569

as to engage said rod at the commencement of the poising period to hold the valves 70 and 52 against further movement and to release the same at the close thereof to permit the further closing movement of the valve 70 to cut off the last portion of the supply-stream and permit also the pushing in of the fluid-controlling valve to instantly equalize the pressures in the pressure and storage compartments by the passage or leakage of the fluid from the high to the low pressure compartment. A suitable stop, as 520, is also provided for maintaining the by-pass 570 in an operative position. At the commencement of the poising period the valve 70 is held as just described, and the fluid-controlling valve 52 is also held against inward or opening movement at this time by the described connections. At this point in the operation of the machine the antifriction-roll 506 is near the end of the cam-face 501, slowly moving the valve 70 toward the stream-cut-off position. At the time the roll 506 has reached the intersection of the cam-faces 501 and 502 the upper arm of the by-pass 570 will have nearly released the depending rod 569 for permitting a closing movement of the valve 70. At the close of the poising period this by-pass 570 will release said rod 569, and simultaneously therewith the roll 506, leaving the cam-face 501 and riding over the cam-face 502, will instantly close the valve 70 for cutting off the drizzle or last part of the drip-stream, and, descending, will instantly force the slidable member 58 inwardly on its support, thereby pushing the fluid-controlling valve inward to permit the passage of a stream of relatively large volume from the pressure-compartment *a* to the storage-compartment *b* of the speed-modifier S and an equalization of pressure of the storage and pressure compartments, thus causing a freeing, succeeded by the rotation, of the pinion 42 and stoppage of the feeder F.

It will be remembered that a latch has been described as normally holding the shiftable member against movement. For releasing this latch I prefer to employ a releaser device substantially similar to that described in Letters Patent No. 548,840, granted to me October 29, 1895. This releaser device is illustrated at 88 and has a descending movement into engagement with a proper stop carried by the latch 82. This stop on the latch is illustrated at 82′. When the valve 70 has been held against closing movement by the detent 570 described, this releaser device 88 is nearly in contact with the stop 82′ of the latch 82. On the release of the valve 70 the releaser device 88, operative therewith and having a descending movement on the further closure of the valve, will trip said latch 82, when the weight of material resting on the closer L will open the same, whereby the bucket-load may be discharged.

Having thus described my invention, what I claim is—

1. In a weighing-machine, the combination with beam mechanism, of a bucket supported thereon for ascending and descending movements; a power-driven feeder; and speed-reducing means operative, during the descent of the bucket, for decreasing the speed of the feeder.

2. In a weighing-machine, the combination with beam mechanism, of a bucket supported thereon; a supply-chute; a feeder for said chute; continuously-operative driving mechanism for said feeder; and a speed-modifier coöperative with the driving mechanism and with the feeder, for varying the movements of the latter without stopping the movement of the driving mechanism.

3. In a weighing-machine, the combination with beam mechanism, and with a bucket supported thereon for ascending and descending movements; of a supply-chute; a feeder for said supply-chute, said feeder having a progressively-decreasing speed during the descending movement of the bucket; and driving mechanism for said feeder.

4. In a weighing-machine, the combination with beam mechanism, and with a bucket supported thereon for ascending and descending movements; of a supply-chute; a feeder embodying a rotatable member; driving mechanism for said member; and speed-reducing means intermediate the driving mechanism and said rotatable member, operative for reducing the speed of said member during the descent of the bucket.

5. In a weighing-machine, the combination with beam mechanism, and with a bucket supported thereon for ascending and descending movements; of a supply-chute; a feeder therefor embodying two rolls operatively connected by a belt; driving mechanism for one of said rolls; and speed-reducing means intermediate the driving mechanism and said roll, and operative for reducing the speed of said roll and thereby the feeder during the descending movement of the bucket.

6. In a weighing-machine, the combination with beam mechanism, and with a bucket supported thereon for ascending and descending movements; of a supply-chute; a feeder having a variable speed during the descent of the bucket, to thereby feed a stream of material of variable volume to the bucket; a valve operative for cutting off a portion of said stream of material; and actuating mechanism for said valve.

7. In a weighing-machine, the combination with beam mechanism, and with a bucket supported thereon for ascending and descending movements; of a supply-chute; a feeder therefor; driving mechanism for said feeder; and a speed-modifier coöperative with the driving mechanism and with the feeder, for reducing the speed of the feeder during the descending movement of the bucket and for also stopping the movement of said feeder when the bucket has reached a predetermined point.

8. In a weighing-machine, the combination

with beam mechanism and a bucket supported thereon; of a supply-chute; a feeder therefor; driving mechanism for said feeder; and a speed-modifier embodying a driven and a movable member; and means for holding said movable member against movement, whereby when said member is so held it will be effective for imparting movement to the driven member.

9. In a weighing-machine, the combination with beam mechanism, and with a bucket supported thereon; of a supply-chute; a feeder therefor; driving mechanism for said feeder; and a speed-modifier embodying a fast and a movable member, and having the first-mentioned member coöperative with the feeder; of a fluid-pressure compartment having the pressure thereof capable of acting against said movable member, whereby said movable member will be held against movement, and will thereby be effective for transmitting movement to the fixed member.

10. In a weighing-machine, the combination with beam mechanism, and with a bucket supported thereon; of a supply-chute; a feeder therefor; driving mechanism for said feeder; and speed-reducing apparatus embodying communicating fluid-pressure and storage compartments, and fast and loose members operative therein, and having the pressure of the fluid in the pressure-compartment capable of acting against said loose member, whereby the latter will be held against movement, and whereby when so held it will be effective for transmitting movement to said fixed member, and having said pressure also capable of reduction by the flow of the fluid from the pressure to the communicating storage compartment.

11. In a weighing-machine, the combination with beam mechanism and with a bucket supported thereon; of a supply-chute; a feeder therefor; driving mechanism for said feeder; speed-reducing apparatus embodying communicating pressure and storage compartments, and fixed and movable members operative therein, whereby the pressure of the fluid in the pressure-compartment acting against said movable member will thereby hold it against movement, and whereby it will be effective for transmitting movement to the fixed member, and having the pressure in the pressure-compartment reducible by the flow of the fluid from the pressure to the communicating storage compartment; and a valve for controlling the flow of the fluid from the pressure to the storage compartment.

12. In a weighing-machine, the combination with beam mechanism, and with the bucket supported thereon; of a supply-chute; a feeder therefor; driving mechanism for said feeder; speed-reducing apparatus embodying communicating pressure and storage compartments and fast and loose members, whereby the pressure of the fluid in the pressure-compartment acting against said loose member will hold the latter against movement, and whereby when so held said member will be effective for transmitting movement to the fixed member, and whereby the pressure of fluid against said loose member will be reduced by the passage of the fluid from the pressure to the communicating storage compartment; a valve for controlling the flow of the fluid from the pressure to the storage compartment; and a movable part of the weighing mechanism operatively connected with, and for controlling, the movements of said valve.

13. In a weighing-machine, the combination with beam mechanism, and with the bucket supported thereon; of a supply-chute; a feeder; driving mechanism for said feeder; and speed-reducing means embodying communicating pressure and storage compartments, and fixed and movable members, whereby the pressure of the fluid in the pressure-compartment acting against said movable member will hold the same against movement, to thereby transmit movement to the fixed member, and whereby the pressure of fluid against said movable member will be reduced by the passage of the fluid from the pressure to the storage compartment; a valve-cylinder having ports communicating with said compartments; a valve operative in said cylinder for preventing or permitting the flow of the fluid from the pressure to the storage compartment; and actuating mechanism for said valve.

14. In a weighing-machine, the combination with beam mechanism, and with a bucket supported thereon; of a supply-chute; a feeder therefor; driving mechanism for said feeder; and speed-reducing apparatus embodying communicating pressure and storage compartments, and fast and movable members, whereby the pressure of fluid in the pressure-compartment acting against said movable member will hold the same against movement, and whereby when said member is so held it will be effective for transmitting motion to the fixed member, and whereby the pressure of the fluid in the pressure-compartment will be reduced by the passage of the fluid from the pressure to the storage compartment; a valve-cylinder having tapered ports communicating with each of said compartments; and a valve operative in said cylinder for closing and opening said ports, whereby as said valve is opened a stream of gradually-increasing volume will flow from the pressure to the storage compartment through said tapered ports; and actuating mechanism for said valve.

15. In a weighing-machine, the combination with beam mechanism, and with a bucket supported thereon; of a supply-chute; a feeder therefor; driving mechanism for said feeder; and speed-reducing means embody-

ing communicating pressure and storage compartments and fast and movable members, and having the pressure of the fluid in the pressure-compartment capable of acting against said loose member, whereby the same will be held against movement and will be effective for thereby transmitting movement to said fixed member; a valve for controlling the flow of fluid from the pressure to the storage compartment; valve-actuating means; and a second port communicating with the storage and with the pressure compartment, to thereby permit the return flow of the fluid from the storage to the pressure compartment.

16. In a weighing-machine, the combination with beam mechanism, and with a bucket supported thereon; of a supply-chute; a feeder therefor; driving mechanism for said feeder; and speed-reducing means embodying communicating pressure and storage compartments and fast and loose members, and having the pressure of the fluid in said pressure-compartment capable of acting against said loose member to thereby hold the same against movement, whereby it will be effective for transmitting movement to the fixed member; a valve having an opening movement to permit the flow of the fluid from the pressure to the storage compartment, to thereby reduce the pressure in the former; valve-actuating means; and means for holding said valve against opening movement at a predetermined point in the operation of the machine, and for also releasing said valve, to thereby permit a further decrease in pressure in the pressure-compartment.

17. In a weighing-machine, the combination with beam mechanism, and with a bucket supported thereon for ascending and descending movements; of a supply-chute; a feeder therefor; driving mechanism for said feeder, whereby when said feeder is in motion a stream of material will be fed from the supply-chute and into the bucket; a stream-controlling valve operative for cutting off a portion of said stream of material; valve-closing mechanism therefor; speed-reducing means operative for reducing the speed of the feeder, and embodying communicating pressure and storage compartments, the fluid in which flows from the pressure to the storage compartment; a fluid-controlling valve for controlling said flow; and means operatively connecting said fluid-controlling valve with the stream-controlling-valve-closing mechanism.

18. In a weighing-machine, the combination with beam mechanism, and with a bucket supported thereon for ascending and descending movements; of a supply-chute; a feeder therefor; driving mechanism for said feeder; and a speed-reducer embodying communicating pressure and storage compartments and a fixed and movable member, and having the pressure in said pressure-compartment capable of acting against said movable member, to thereby hold the same against movement, and having said fluid capable of flowing from the pressure to the storage compartment; a valve for controlling the flow of the fluid from the pressure to the storage compartment; a slidable member operatively connected with said valve; a support for said slidable member; and means operatively connecting said slidable member with an operative part of the machine, whereby when said part descends, said slidable member will be slid inwardly, thereby opening the valve to permit the flow of the fluid from the pressure to the storage compartment.

19. In a weighing-machine, the combination with a supply-chute, of a feeder therefor; driving mechanism for said feeder and a speed-reducing apparatus, embodying communicating pressure and storage compartments and fast and movable members, and having the pressure of the fluid in the pressure-compartment capable of acting against said movable member, to thereby hold the same against movement, said fluid being also capable of flowing from the pressure-compartment to the storage-compartment; and a fluid-cup communicating with said storage-compartment.

20. In a weighing-machine, the combination with a supply-chute, of a feeder therefor; driving mechanism for said feeder; a hollow, feeder-supporting shaft; and speed-reducing apparatus embodying communicating pressure and storage compartments and fast and movable members; and a fluid-cup communicating with the storage-compartment, and supplying fluid thereto through the hollow feeder-supporting shaft.

21. In a weighing-machine, the combination with a supply-chute, of a feeder therefor; a feeder-supporting shaft; and speed-reducing apparatus rotative about said shaft, and embodying fast and movable members, and having said fast member carried by said shaft; and means for holding said movable member against movement, whereby it will be effective for transmitting movement to the fixed member.

22. In a weighing-machine, the combination with a supply-chute, of a feeder therefor; a feeder-supporting shaft; and speed-reducing apparatus rotative about said shaft, and embodying a fixed pinion carried by said shaft, and a movable pinion meshing therewith; said speed-reducing apparatus also embodying communicating pressure and storage compartments, and having the pressure of the fluid capable of acting against the teeth of said loose pinion, whereby it will be held against movement and will thereby rotate said fixed pinion, and also reducible by the flow of the fluid from the pressure to the storage compartment.

23. In a weighing-machine, the combination with a supply-chute, of a feeder therefor; a feeder-supporting shaft; speed-reducing apparatus carried by said shaft, and embodying two compartments, separated by a bifurcated partition, and having the inner faces

of the partition curved; pinions, one of which constitutes a fixed pinion and is carried by the feeder-supporting shaft, and a movable pinion meshing therewith, said pinions having a rubbing contact with the curved faces of the branches of the bifurcated partition, and having the pressure of the fluid in the pressure-compartment capable of acting against the teeth of the movable pinion, whereby the same will be held against movement, and will be thereby effective for transmitting movement to the fixed pinion.

24. In a weighing-machine, the combination with beam mechanism, and with a bucket supported thereon for ascending and descending movements; of a supply-chute; a stream-feeder therefor, and operative for feeding a stream of material from the supply-chute and into the bucket; a stream-controlling valve operative for cutting off a portion of said stream of material; a valve-closing lever; speed-reducing means involving communicating pressure and storage compartments and fixed and movable members, and having the fluid in the pressure-compartment capable of acting against said movable member, whereby it will be held against movement and thereby effective for imparting movement to the fixed member; a valve for controlling the flow of the fluid from the pressure to the storage compartment; and means operatively connecting said fluid-controlling valve with the stream-controlling valve, and operable on the closure of the stream-controlling valve to open the fluid-controlling valve, to thereby permit the fluid to flow from the pressure to the storage compartment.

25. In a weighing-machine, the combination with beam mechanism, and with a bucket supported thereon; of a supply-chute; a feeder therefor and operative for feeding a stream of material from the supply-chute and into the bucket; a stream-controlling valve operative for cutting off a portion of said stream; a pivotally-supported valve-closing lever; speed-reducing apparatus embodying communicating pressure and storage compartments and fixed and movable members, and having the fluid in the pressure-compartment capable of acting against said loose member, whereby it will be held against movement, and will be thereby effective for imparting movement to the fixed member, and having said fluid capable also of flowing from the pressure to the storage compartment; a valve having an opening movement for permitting the flow of the fluid from the pressure-compartment to the storage-compartment; and a lever operatively connected by the stream-controlling-valve-closing lever with the fluid-controlling valve, and operative on the closing movement of the stream-controlling valve for opening the fluid-controlling valve.

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Witnesses:
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