(No Model.)

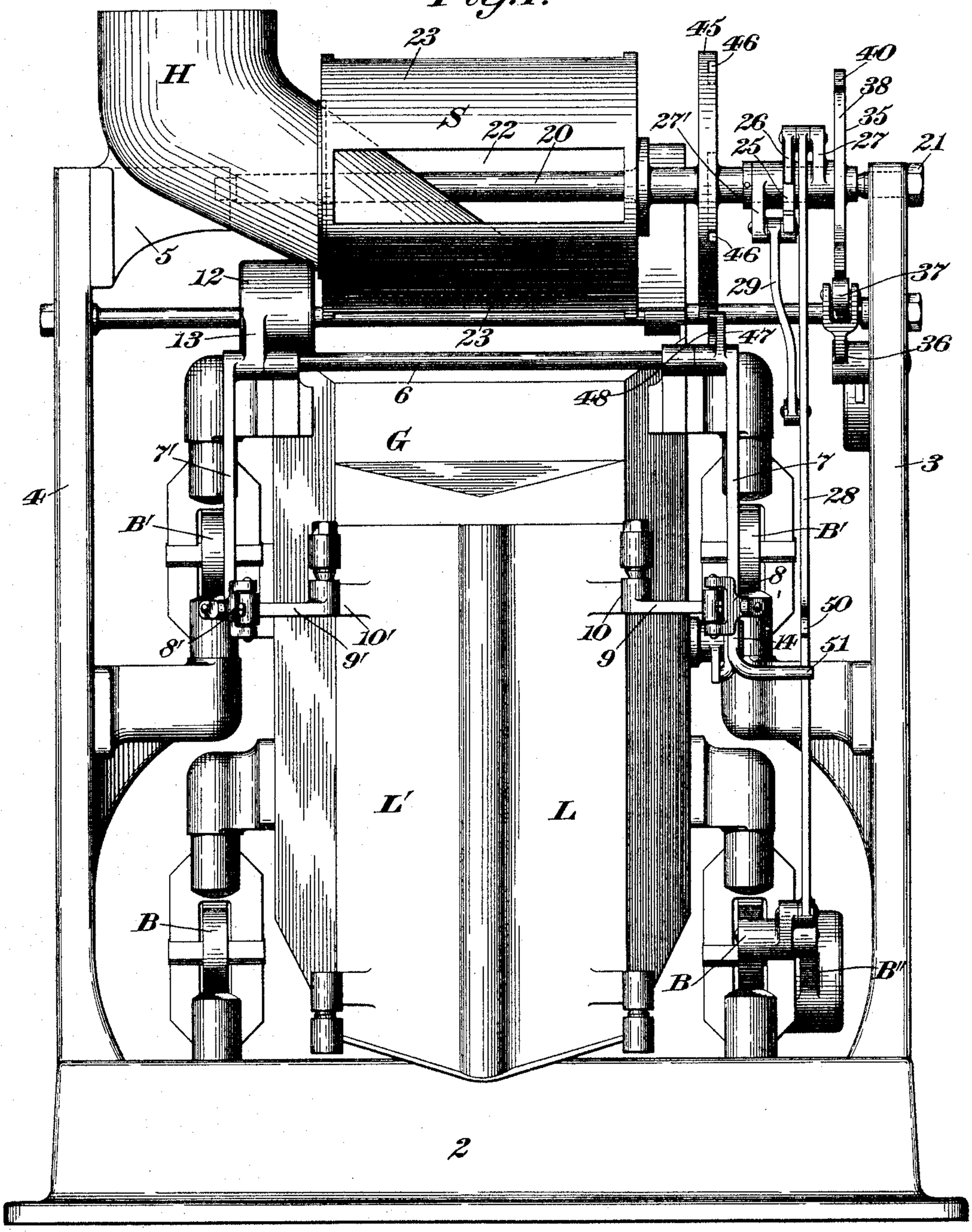
4 Sheets—Sheet 1.

F. H. RICHARDS.

WEIGHING MACHINE.

No. 585,980. Patented July 6, 1897.

Fig. 1.



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(No Model.)

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WEIGHING MACHINE.

No. 585,980. Patented July 6, 1897.

Fig. 2.

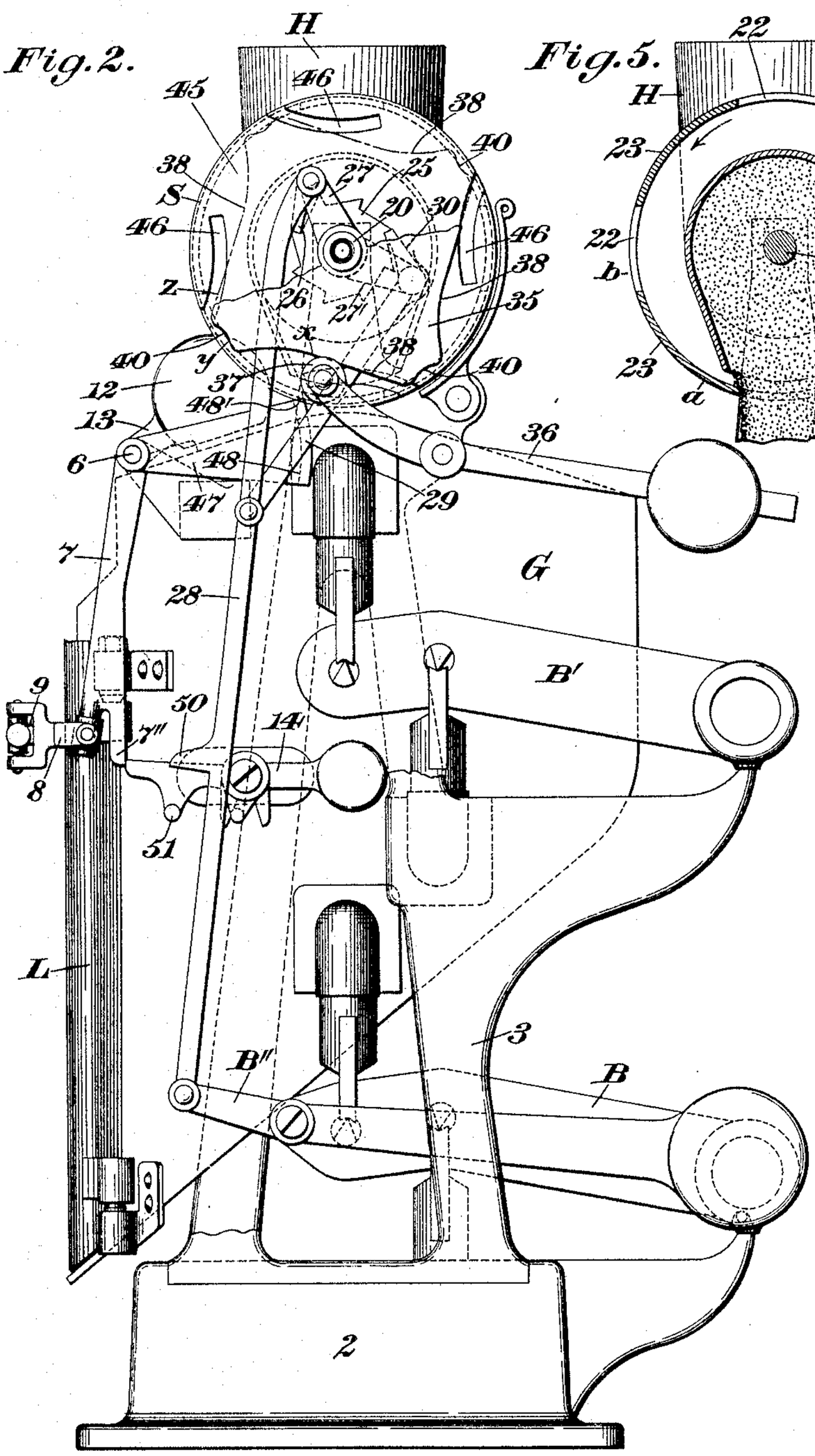

Fig. 5.

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(No Model.)

4 Sheets—Sheet 3.

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Fig. 6.

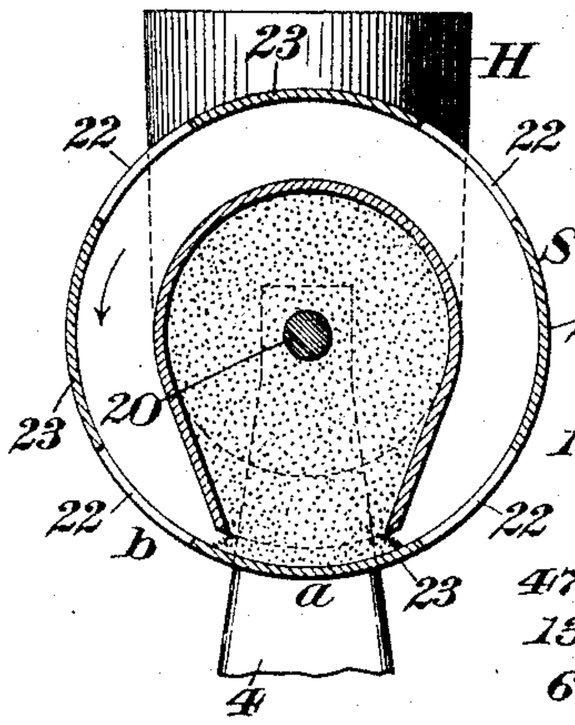

Fig. 3.

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(No Model.) 4 Sheets—Sheet 4.

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WEIGHING MACHINE.

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Fig. 4.

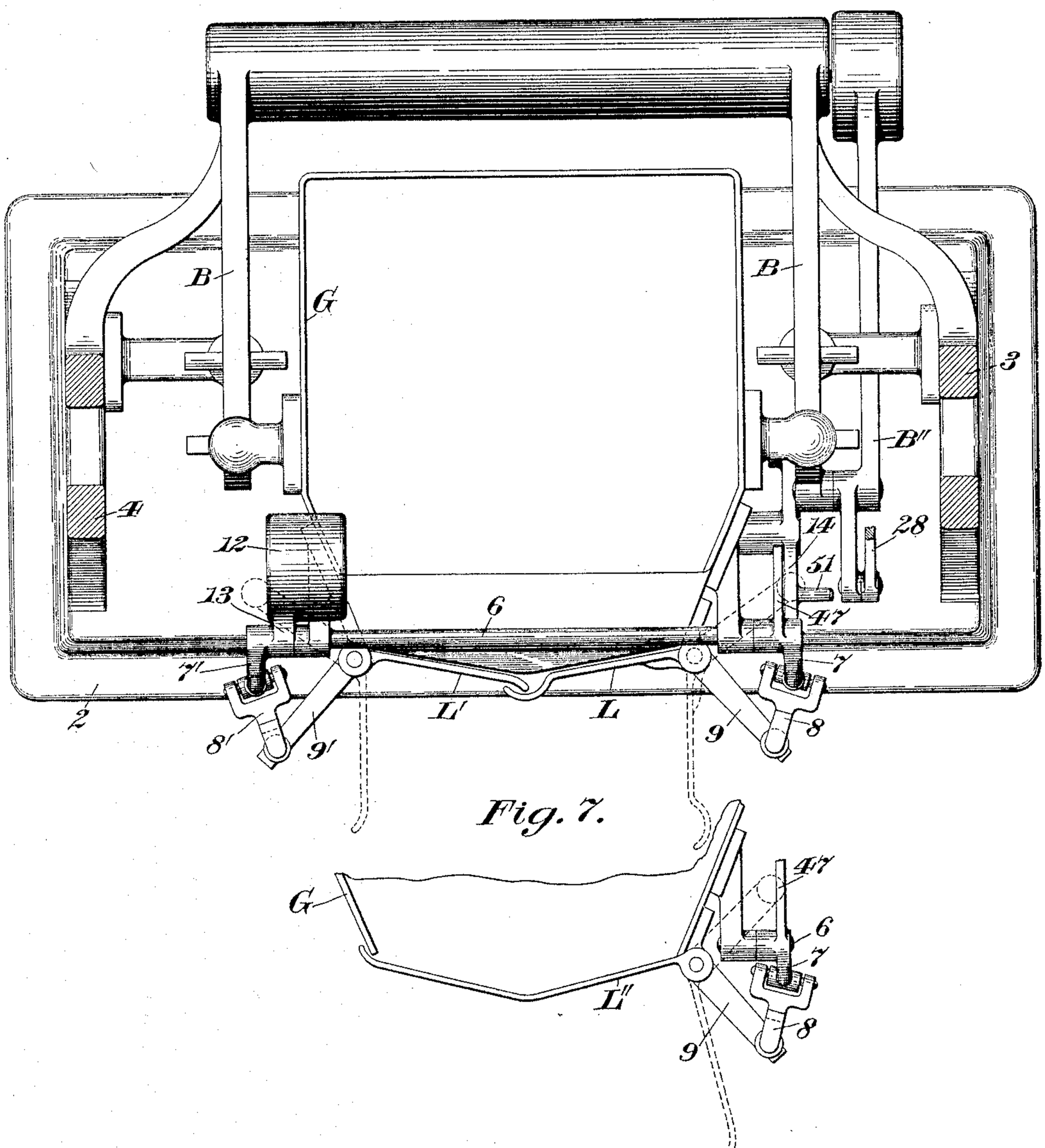
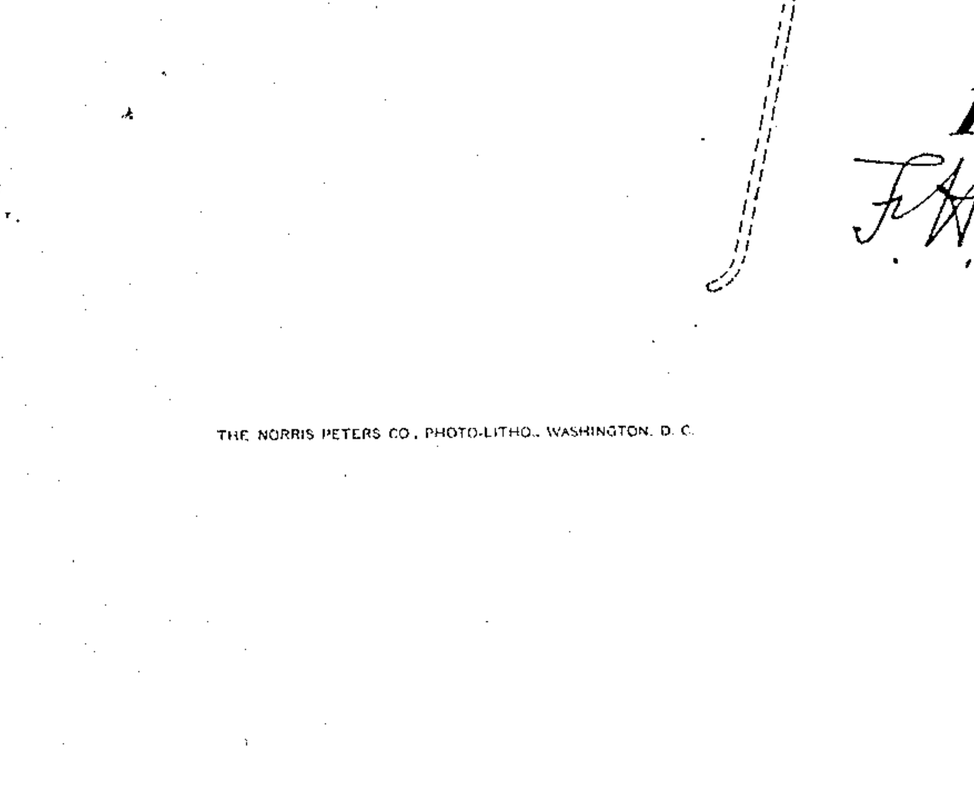


Fig. 7.



Witnesses:
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Inventor:
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UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT.

WEIGHING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 585,980, dated July 6, 1897.

Application filed December 3, 1896. Serial No. 614,318. (No model.)

To all whom it may concern:

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

This invention relates to weighing-machines for automatically weighing and delivering predetermined charges of granular and other free-flowing materials.

With respect to one of its features the invention comprehends the provision, in connection with a reciprocatory load-receiver and with stream-supplying means therefor, of a stream-controlling member supported to have an advancing movement to reduce the stream and to have a continued action in the direction of said advancing movement to permit the stream to pass into the load-receiver, the actuating mechanism for accomplishing this operation being preferably operative with and controlled by the weighing mechanism. In the construction illustrated I provide a rotary stream-controller having a series of stream-controlling or valve members or plates and mechanism for intermittently and partially rotating said stream-controller, whereby said valve members may be successively brought to a position to at first reduce and subsequently cut off the supply-stream.

Another object of the invention is to provide, in conjunction with the load-receiver or bucket having a discharge-outlet, a closer which is adapted, when in its primary or shut position, to confine a mass of material within said load-receiver and which has its mass-releasing movement about a vertical axis.

In the drawings accompanying and forming part of this specification, Figure 1 is a front elevation of a weighing-maching embodying my present improvements, and it illustrates the positions taken by the various parts at the commencement of operation. Fig. 2 is an end elevation as seen from the right in Fig. 1, the parts being in positions corresponding therewith. Fig. 3 is a view similar to Fig. 2, the supply of the bucket having been stopped, while the bucket-closers are represented wide open to permit the discharge of the bucket contents or load. Fig. 4 is a plan view with the supply apparatus removed and with the framing in transverse section, the closers being represented by full lines occupying their normal positions, their open positions being indicated by the dotted lines. Figs. 5 and 6 are detail views, partly in elevation and partly in section, of the supply mechanism in two different positions; and Fig. 7 is a detail view in elevation of a modification.

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

The framework for sustaining the various sets of mechanisms may be of any suitable structure, it consisting in the present case of the supporting base or bed 2 and the end frames or columns 3 and 4, which rise therefrom. The end frame 4 has connected thereto, at the top thereof, the bracket 5, carried by the spout or hopper H, said spout or hopper constituting a convenient means for delivering a stream of material to the load-receiver of the weighing mechanism.

The weighing mechanism includes a load-receiver and beam mechanism therefor. The load-receiver consists in the present instance of a vertically-reciprocatory single-chambered bucket G, and the beam mechanism is made up of a series of superposed counterweighted bucket-supporting beams, two of such beams being illustrated, and they being designated by B and B′, respectively, and being fulcrumed upon the framework in the ordinary manner, said framework being furnished with suitable supports upon which the weights of the respective beams are sustained when the machine is at rest. Said beams near the poising sides thereof will be furnished with supports for the bucket, which may be of the usual kind.

The load-receiver or bucket will have an inclined bottom, which is disposed at an angle somewhat in excess of the angle of repose of the material being weighed, to permit said material to freely pass from the bucket at the proper stage in the operation of the machine, said inclined bottom leading toward the discharge-outlet of the bucket, which is vertical.

I have illustrated a plurality of preferably-overlapping closers for the discharge-outlet of the bucket, such closers being designated by L and L′, respectively, and being adapted

when in their normal or shut positions to confine the mass of material being weighed within the bucket and having their mass-releasing movement about vertical axes.

The closers L and L′, the edge of the first mentioned of which is provided with a rounded portion overlapping the adjacent edge of the coöperating member to provide a close joint, will be shiftably connected, as by hinges, to the bucket, they being forced open or apart when freed by the action of the mass within the bucket, a suitable detent device being employed to maintain the two closers shut, and an actuator, such as a counterbalance-weight, being employed to return the two closers to their initial or shut positions on the discharge of a bucket-load.

The bucket G is illustrated carrying the rock-shaft 6 at its upper edge, which may be mounted in suitable brackets thereon and which has at one end the bifurcated or forked arm 7, the hub of which is fixed thereto in some convenient manner, one branch of said arm 7 being connected by a suitable slide-joint to the coupling member 8, the last-mentioned part being connected by a universal joint to the arm 9 of the hinge member 10 on the closer L. The opposite end of the shaft 6 is furnished with an arm 7′, operatively connected to the coupling member 8′, which in turn is connected to the arm 9′ of the hinge member 10′ by joints similar to those just described. The shaft 6 also carries the counterbalance 12 on the arm 13, which latter may be made integral with the closer-actuating arm 7′.

For maintaining the respective closers in their shut positions I have illustrated a counterweighted latch at 14, it being pivotally supported upon the bucket G on one end thereof and swinging upward to engage the branch 7″ of the closer-actuating arm 7, these parts being illustrated in engagement in Fig. 2. When the latch is depressed sufficiently far by suitable means to disengage it from the branch arm 7″, the respective closers L and L′ will be free to open, the last-specified operation being effected by the mass of material within the bucket acting against said closers to force them to the positions indicated by the dotted lines in Fig. 4, and in the act of opening they elevate the actuating-weight 12 by reason of the interposed operative connections. When the load is discharged by the bucket, the hinge-arm 9′ being in the dotted-line position illustrated in said figure, the weight 12 is free to drop, and in so doing will force said arm outward and simultaneously shut the closer L′, the closer L being shut in synchronism therewith by the rocking of the shaft 6, acting through the intermediate parts 7, 8, and 9.

The stream-controller is designated in a general way by S, and it consists in the present case of a drum or cylinder supported for rotation, and the spout H, to which I have hereinbefore referred, leads or extends into said stream-controller and forms a means for circumferentially supporting the latter, said spout being preferably circular in cross-section to permit the free passage of the supply-stream therethrough. The stream-controller or drum S is also carried by the shaft 20, said shaft being passed through the spout and having one of its ends journaled in a bearing in the bracket 5, the other ends of said shaft having a journal-opening which may receive the pivot-screw 21 on the end frame 3.

As just stated and as represented in the accompanying drawings, the drum S is circumferentially carried at one end by the spout H, the opposite end of said drum being sustained by the rotary shaft 20, so that by supporting the drum in this manner a strong structure is provided, the drum being prevented from wabbling, which would be the case if it were simply supported at one end.

The drum S will have a series of supply-openings through which the supply-stream may pass from the chute H and enter the load-receiver or bucket G, said supply-openings being designated by 22, and being preferably formed in the periphery or body of the drum, instrumentalities being employed for intermittently operating or imparting a step-by-step movement to the drum S to successively bring the supply-openings 22 opposite or into approximate registration with the discharge-orifice of the chute or hopper H, the advancing movement of the drum being indicated by arrows in Figs. 5 and 6.

The intervening plates 23 between the supply-openings 22 in the periphery of the drum constitute valve members, and they are operable to progressively reduce the volume of the supply-stream which flows toward the bucket and then to cut it off, and on the continued advance of the stream-controller the supply-stream may pass through a succeeding supply-opening.

In the sectional view, Fig. 5, the supply-stream, which is represented by the stippled surface, is shown passing through one of the supply-openings 22, and it will be evident that, motion being imparted to the drum S in the direction of the arrow in said figure, the plate *a* will be caused to pass through or cross the path of the supply-stream to progressively reduce its volume as the load-receiver G is descending.

In Fig. 6 the valve member or plate *a* is represented having stopped the passage of the supply from the spout H, the load having been completed.

When the bucket has reached the limit of its upstroke and is in a position to receive a load, the stream-controller or drum S will be again rotated until the supply-opening *b* is brought opposite the discharge-orifice of the spout H.

The actuating mechanism for imparting the necessary step-by-step movement to the stream-controller or drum S will be preferably operated and automatically controlled

by the weighing mechanism, and it includes in its organization pawl-and-ratchet mechanism, a pawl being employed to actuate the stream-controller S to effect a stoppage of the supply, and a second pawl being provided to impart the necessary movement to the stream-controller to again cause the supply-stream to enter the bucket.

The drum-supporting shaft 20 is illustrated carrying the ratchet 25, one of the actuating-pawls thereof being shown at 26, said pawl being connected to the short rocking lever 27, which is loose on the shaft 20.

A relatively long rod is illustrated at 28, pivoted, respectively, to the lever 27 and also to the auxiliary beam B″, which is shiftably supported upon the main beam B.

The auxiliary beam B″ is counterweighted, its weight being normally added to the weight of the main beam B. At a predetermined point in the operation of the machine the auxiliary beam B″ will be oscillated about its center, so that the force of its weight will be subtracted from the counterpoised portion of the weighing mechanism and will be added or transferred to the poising side of the weighing mechanism, which includes the bucket, and said auxiliary beam will be locked in such shifted position and against return movement with the main beam B by means hereinafter described. (See Fig. 3.)

As the auxiliary beam descends in unison with the main beam B during the loading period it will draw the rod 28 downward, so that the pawl 26, being in engagement with the ratchet 25, the shaft 20 and drum S will be partially rotated to bring one of the valve members opposite the discharge-orifice of the spout, the result being a reduction in the volume and subsequent cut-off of the supply-stream, and when this operation has been attained the load, which has been completed, will be promptly discharged from the bucket.

The reciprocatory thrust-rod 28 has pivoted thereto the link 29, which is similarly connected to the short rocking lever 27′, which is loosely carried by the shaft 20, said lever being furnished with a pawl 30, which on the effective action of the pawl 26 on the downstroke of the rod 28 will run idly over the teeth of the ratchet 25.

The supply-stream to the bucket having been stopped and the load having been discharged, the beam B″, which is in its shifted position, will be released, and in so doing will transmit an upward thrust to the rod 28, which is transferred to the link 29, lever 27′, and pawl 30, so that the latter being in engagement with a tooth of the pawl 25 will partially rotate the stream-controller or drum S to bring one of the supply-openings 22 opposite the discharge-orifice of the spout H, the pawl 26 during this action running idly over the teeth of the ratchet 25.

I provide instrumentalities for retarding or checking the advancing movement of the stream-controller S during the loading period, whereby the necessary reduction in volume of the supply-stream will be insured as the weighing progresses, and the means illustrated for accomplishing this end will now be described. The drum-carrying shaft 20 has affixed thereto near one end the multifaced cam 35, with which coöperates a retarding device, the latter consisting in the present case of a counterweighted lever 36, mounted upon the framework and having one of its arms equipped with an antifriction-roll, which is adapted to ride successively in contact with the working faces of the cam 35 as the stream-controller or drum S is intermittently rotated.

The working faces of the cam are designated by 38, and intermediate the same and equidistantly disposed are a series of concaved stop-faces 40, into which the roll 37 of the lever may lie when the bucket has reached the limit of its descending movement, so that as the cam is held at this time it in turn will act as an effective stop for the lever 36.

At the commencement of operation, as represented in Fig. 2, the roll 37 will be in contact with the curved working face *x* at about the middle thereof or at its deepest point, and it will be evident that as the thrust-rod is drawn downward by the action of the beam mechanism the drum S and hence the cam 35 will be rotated, so that the cam-face *x* will be caused to travel in contact with the roll 37 of the lever, whereby the latter will act as an effective device for checking the too rapid rotation of the drum S and will also prevent the ratchet 25 from being carried away from the point of the actuating-pawl 26, as will be understood.

At the completion of the load the cam-face *x* will have passed out of operative connection with the roll 37 and the latter will be thrust into the stop-recess *y*. On the upward thrusting of the rod 28 by the auxiliary beam B″ the drum, of course, will be rotated and the cam 35 moved therewith, so that the roll 37 will pass out of the stop-recess *y* and will travel in contact with the cam-face *z* to a point midway of its length, said cam being effective to cause the gradual lowering of the weighted arm of the lever until it reaches the middle of the cam-face *z*, when the operation just set forth will be repeated, and so on intermittently.

It is essential that the material should be prevented from entering the bucket during the load-discharge period, and for the purpose of preventing such a contingency I have furnished means to limit the advancing movement of the stream-controller while the contents of the bucket or load-receiver are being emptied therefrom, and to accomplish an equally important result I provide means for limiting or holding the load-discharge member or members against opening movement while any part of the supply is being delivered to the bucket, and the instrumentalities for accomplishing these results will now be described. The drum-carrying shaft 20 is

provided with a stop in the form of a wheel 45, which may be secured thereto in some suitable manner and which has a series of curved stop-recesses 46 extending inward from its periphery, the closer or closers being furnished with a coöperating and reciprocally-effective stop member in the form of a segmental stop or segment 47, the flange 48 of which extends inward, said stop or segment 47 being rigidly secured to the closer-actuating rock-shaft 6, and hence being operative in unison with the closers L and L'.

During the passage of the supply-stream to the bucket G through any one of the supply-openings 22 in the drum S the point 48' of the stop-flange 48 will be contiguous to the periphery or face of the stop-wheel 45, as represented in Fig. 2, so that should the latch 14 be tripped too quickly or fail to work the stop-wheel 45 will positively block the oscillation of the stop member 47, and hence will hold the closers L and L', respectively, in their shut positions until one of the stop-recesses 46 is brought opposite the flange 48 of the stop member 47, this operation taking place when the valve-blade 23 has wholly cut off the supply-stream, and these parts being in alinement, as just stated, it will be evident that when the latch 14 is tripped, or if it has already been tripped, the two closers L and L', respectively, will be forced open, which results, through the intermediate connections, in swinging the stop member 47 upward and introducing the stop-flange 48 into the coöperating recess 46, the walls of which at this stage are concentric to the axis of movement of the stop member 47, and it will be evident that so long as the stop-flange 48 is inserted in one of the stop-recesses 46 the advancing movement of the drum S will be limited and until the stop member 47 has been returned to its normal position by the shutting of the closers, its flange being thereby caused to intersect the periphery of the stop-wheel 46, thereby releasing said stop-wheel and consequently the drum S, whereby the latter may be advanced to permit the supply of material to be delivered to the bucket.

It will be evident that when the stop 47 is in a position to limit the action of the coöperating member or stop-wheel 45, the beam B being in its lowermost position, the action of the thrust-rod 28 and consequently the auxiliary beam B'' will also be blocked, and although the beam B when the load is being discharged is free to return to its normal position the auxiliary beam B'', which is carried thereby, cannot do so, nor until the two closers are shut and the stop-wheel 45 is released by the shutting and latching of the two closers.

When the two closers are shut and latched and the stop-wheel 45 is released, the auxiliary beam can return to its primary position, and as it does so it will elevate the rod 28 and through the actuating-pawl 30 and ratchet-wheel 25 will advance the drum S sufficiently to bring one of the peripheral supply-openings 22 opposite the discharge-outlet of the supply-spout H, it being understood that during the ascending movement of the bucket and the beam mechanism the effective action of the drum S is limited by the two interlocking stops 45 and 47, the last-mentioned of which is in its effective position, as represented in Fig. 3.

The tripper for the latch 14 is designated by 50, and it consists of a rigid projection on the reciprocatory thrust-rod 28, which is adapted to intermittently engage the projecting pin 51 on the latch 14 on the completion of a load and to depress said latch sufficiently far to disengage it from the branch 7'' of the closer-actuating arm, whereby the two closers L and L' will be released and can be forced open by the weight of the completed load within the bucket.

The operation of the hereinbefore-described machine, briefly, is as follows: Fig. 2 represents the positions occupied by the respective parts at the commencement of operation, the bucket G being empty and the closers L and L', respectively, being shut and held in such position by the latch 14, which is in engagement with the branch 7'' of the arm 7, and one of the supply-openings 22 being opposite the discharge-orifice of the spout H a stream of material from the latter can pass through said opening and will gravitate into the bucket G to build up the load therein. When a certain proportion of the load has been received by the bucket, it and the beam mechanism will descend, so that the auxiliary beam B'' will draw the rod 28, with which it is connected, downward, and the pawl 26, being in engagement with a tooth of the ratchet 25, will rotate said ratchet, and consequently the shaft 20, whereby the stream-controller or drum S will be properly advanced, so that one of the plates 23 thereof will be caused to bodily cross the path of the supply-stream, the result being a reduction in the volume thereof as the bucket descends. On the completion of the load the valve member 23 will have cut off the supply-stream, and the tripper 50 will have impinged against the pin 51 on the latch 14, so that said latch will be tripped and disengaged from the branch 7'' of the arm 7, thereby freeing the two closers L and L', following which the latter will be forced open by the weight of the load within the bucket to permit the discharge thereof. When the bucket has been emptied, the closers L and L' will be shut, and the stream-controller or drum S, when the bucket has reached its load-receiving position, will be advanced by the pawl 30 in conjunction with the ratchet 25 to bring one of the supply-openings 22 opposite the discharge-orifice of the spout H.

When the supply from the drum S is entering the bucket G, the stop 47 will be contiguous to the periphery of the stop 45, as represented in Fig. 2, whereby movement of the

stop 47 will be blocked by the stop 45 should the latch be tripped too suddenly, the opening of the closers L and L′ being thereby prevented.

When the supply to the bucket is stopped, one of the series of recesses 46 will be opposite the flange 48, so that when the latch is tripped and the closers are opened said flange will be thrust into said recess to prevent advancing or retracting movement of the stop 45 and consequently the rotation of the drum S. When the closers are shut, the stop 47 will release the stop 45 and hence the drum S, so that the latter can be further advanced in the manner hereinbefore described.

In Fig. 7 I have illustrated a modified form of invention in which but one closer (designated by L″) is illustrated, it being connected to the bucket and operated in a manner similar to the closers L and L′, represented in the other views.

Having described my invention, I claim—

1. The combination, with weighing mechanism including a load-receiver, of stream-supplying means for said load-receiver; a stream-controlling device; and means controlled by the weighing mechanism, for operating said stream-controlling device to advance the same, thereby to reduce the volume of the stream, and also to impart a continued action to said device in the direction of its advancing movement to permit the flow of the stream.

2. The combination, with weighing mechanism, of a reciprocatory load-receiver; stream-supplying means; a stream-controlling plate supported to have an advancing movement to reduce the volume of the stream and to have a continued action in the direction of its advancing movement, to permit the flow of the stream; and means controlled by the weighing mechanism, for actuating said plate.

3. The combination, with beam mechanism and with a bucket supported thereby for ascending and descending movements, of a spout for delivering a stream of material to the bucket; a stream-controlling plate supported to have an advancing movement to reduce the volume of the stream and to have a continued action in the direction of said advancing movement, to permit the flow of the stream; and means controlled by the beam mechanism, for actuating said plate.

4. The combination, with weighing mechanism including a load-receiver, of stream-supplying means; a stream-controller comprising a plurality of valve members; and means controlled by the weighing mechanism, for intermittently actuating said stream-controller to carry said valve members successively across the path of the supply-stream, thereby to reduce the volume thereof.

5. The combination, with weighing mechanism including a load-receiver, of stream-supplying means for said load-receiver; a rotary stream-controller comprising a plurality of valve members; and means controlled by the weighing mechanism, for intermittently actuating said stream-controller to carry said valve members successively across the path of the stream, thereby to reduce the volume thereof.

6. The combination, with weighing mechanism including a load-receiver, of stream-supplying means therefor; a rotary drum having a series of supply-openings; and means controlled by the weighing mechanism, for actuating said drum.

7. The combination, with weighing mechanism including a load-receiver, of stream-supplying means therefor; a rotary drum having a series of supply-openings in its periphery; and means controlled by the weighing mechanism, for actuating said drum.

8. The combination, with weighing mechanism including a load-receiver, of a supply-spout; a rotary drum within which the discharge end of said spout is located, said drum having a series of supply-openings; and means controlled by the weighing mechanism, for actuating said drum to bring the supply-openings thereof opposite the discharge-orifice of the spout.

9. The combination, with weighing mechanism including a load-receiver, of a spout located to deliver a stream of material to the load-receiver; a drum circumferentially supported by said spout for rotation and having a series of supply-openings; and means controlled by the weighing mechanism, for actuating said drum.

10. The combination, with weighing mechanism including a load-receiver, of a spout located to deliver a stream of material to the load-receiver; a drum having supply-openings and supported circumferentially at one end of said spout and at its other end carried by a shaft; and means controlled by the weighing mechanism, for rotating said shaft.

11. The combination, with weighing mechanism including a load-receiver, of stream-supplying means therefor; a drum having a series of supply-openings; a ratchet operative with said drum; a coöperative pawl for said ratchet; and an operative connection between said pawl and the weighing mechanism.

12. The combination, with weighing mechanism including a load-receiver, of stream-supplying means therefor; a drum having a series of supply-openings; a drum-supporting shaft having a lever loose thereon; a ratchet carried by said shaft; a pawl on said lever; and a connection between said lever and the weighing mechanism.

13. The combination, with weighing mechanism embodying a load-receiver and with stream-supplying means therefor, of a drum having a series of valve members; a ratchet operative with said drum; a pawl for coöperating with said ratchet, to advance the drum and to successively carry the valve members across the path of the stream; and a second

pawl for operating the ratchet, to impart to the drum a continued action in the direction of its advancing movement, to permit the stream to flow toward the load-receiver.

14. The combination, with weighing mechanism including a reciprocatory load-receiver, of stream-supplying means therefor; a stream-controller having a series of successively-effective valve members; means controlled by the weighing mechanism, for advancing said stream-controller to carry the valve members successively across the path of the stream; and independent means also controlled by the weighing mechanism, for imparting a continued action to said stream-controller in the direction of its advancing movement, to permit the stream to pass toward the load-receiver.

15. The combination, with weighing mechanism including a load-receiver, of stream-supplying means therefor; a stream-controller having a series of supply-openings; means for advancing said stream-controller; and instrumentalities coöperative with the weighing mechanism, for retarding the advancing movement of said stream-controller during the weighing of a load, to thereby regulate the volume of the stream supplied to the load-receiver, automatically.

16. The combination, with weighing mechanism including a load-receiver, of stream-supplying means therefor; a stream-controller having a series of successively-effective valve members; means for advancing said stream-controller; a cam operative with the stream-controller; and a stream-controller-retarding device located to coact with said cam.

17. The combination, with weighing mechanism including a load-receiver, of stream-supplying means therefor; a stream-controller having a series of successively-effective valve members; means for advancing said stream-controller; a cam operative with said stream-controller; and a counterweighted lever located to coact with said cam, to retard the advancing movement of said stream-controller.

18. The combination, with weighing mechanism including a load-receiver, of stream-supplying means therefor; a stream-controller having a series of successively-effective valve members; means for advancing said stream-controller; a multifaced cam operative with said stream-controller; and a stream-controller-retarding device located to coact with said cam.

19. The combination, with weighing mechanism including a load-receiver, of stream-supplying means therefor; a stream-controller having a series of successively-effective valve members; means for advancing said stream-controller; a multifaced cam having a series of stop-recesses between its working faces; and a stream-controller-retarding device located to coact with said cam and to have one arm thereof intermittently forced into said recesses.

20. The combination, with weighing mechanism including a shiftable load-discharge member, of stream-supplying means; a stream-controlling plate supported to have an advancing movement to reduce the volume of the stream and to have a continued action in the direction of said advancing movement, to permit the flow of the stream; a stop operative with said stream-controller; and a coacting stop operative with the shiftable load-discharge member.

21. The combination, with weighing mechanism including a load-receiver and a load-discharging device, of stream-supplying means; a stream-controlling plate supported to have an advancing movement to reduce the volume of the stream and to have a continued action in the direction of said advancing movement, to permit the flow of the supply-stream; and instrumentalities for blocking the advancing movement of the stream-controlling plate during the discharge of the load.

22. The combination, with weighing mechanism including a load-receiver supported for ascending and descending movements and with load-discharging means, of stream-supplying means; a stream-controlling plate supported to have an advancing movement to reduce the volume of the stream and to have a continued action in the direction of said advancing movement, to permit the flow of the stream; and instrumentalities for blocking the advancing movement of the stream-controller plate during the discharge of the load and the ascending movement of the load-receiver.

23. The combination, with weighing mechanism including a load-receiver having a load-discharging member and with load-discharging means, of stream-supplying means; a rotary drum having a series of supply-openings; a stop-wheel operative with said drum; and a stop coöperative with said stop-wheel and with the load-discharge member.

24. The combination, with weighing mechanism including a load-receiver having a load-discharging member and with load-discharging means, of stream-supplying means; a rotary drum having a series of supply-openings; a peripherally-recessed stop-wheel operative with said drum; and a stop operative with said stop-wheel and with the load-discharge member.

25. The combination, with a bucket having a discharge-outlet, of a closer for said outlet; a shaft having a bifurcated arm; a latch for engaging one of the branches of the bifurcation; and a member connected to the other branch of said arm by a slide-joint and also operatively connected with the closer.

26. The combination, with a bucket having a discharge-outlet, of a closer for said outlet; a counterbalanced shaft having a bifurcated arm; a latch for engaging one of the branches of the bifurcation; and a member connected to the other branch of the bifurcation by a slide-joint and operatively connected to the closer.

27. The combination, with a bucket having a discharge-outlet; of a closer for said outlet, hinged to the bucket; a shaft having a bifurcated arm; a latch for engaging one of the branches of the bifurcation; and a coupling device connected, respectively, to one of the branches of the bifurcation and to the hinge of the closer.

28. The combination, with a bucket having a discharge-outlet; of a closer for said outlet, hinged to the bucket; a counterbalanced rock-shaft having a bifurcated arm; a latch for engaging one of the branches of the bifurcation; and a coupling device connected to the other branch of the bifurcation by a slide-joint and connected to the hinge by a universal joint.

29. The combination, with a bucket having a discharge-outlet; of a closer for said outlet, hinged to the bucket; a counterbalanced shaft having a bifurcated arm; a latch for engaging one of the branches of the bifurcation; a device connected to the other branch of the bifurcation by a slide-joint and operatively connected to the closer; a stop on said shaft; and a stream-controller having a stop coöperative with the first-mentioned stop.

30. The combination, with weighing mechanism including a load-receiver, of stream-supplying means for the load-receiver; a stream-controller having a series of successively-effective valve members; and means controlled by the weighing mechanism for imparting a step-by-step movement to the stream-controller, whereby the valve members thereof will be brought into position, one after the other, to stop the supply of material to the load-receiver.

FRANCIS H. RICHARDS.

Witnesses:
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