

No. 616,634.

Patented Dec. 27, 1898.

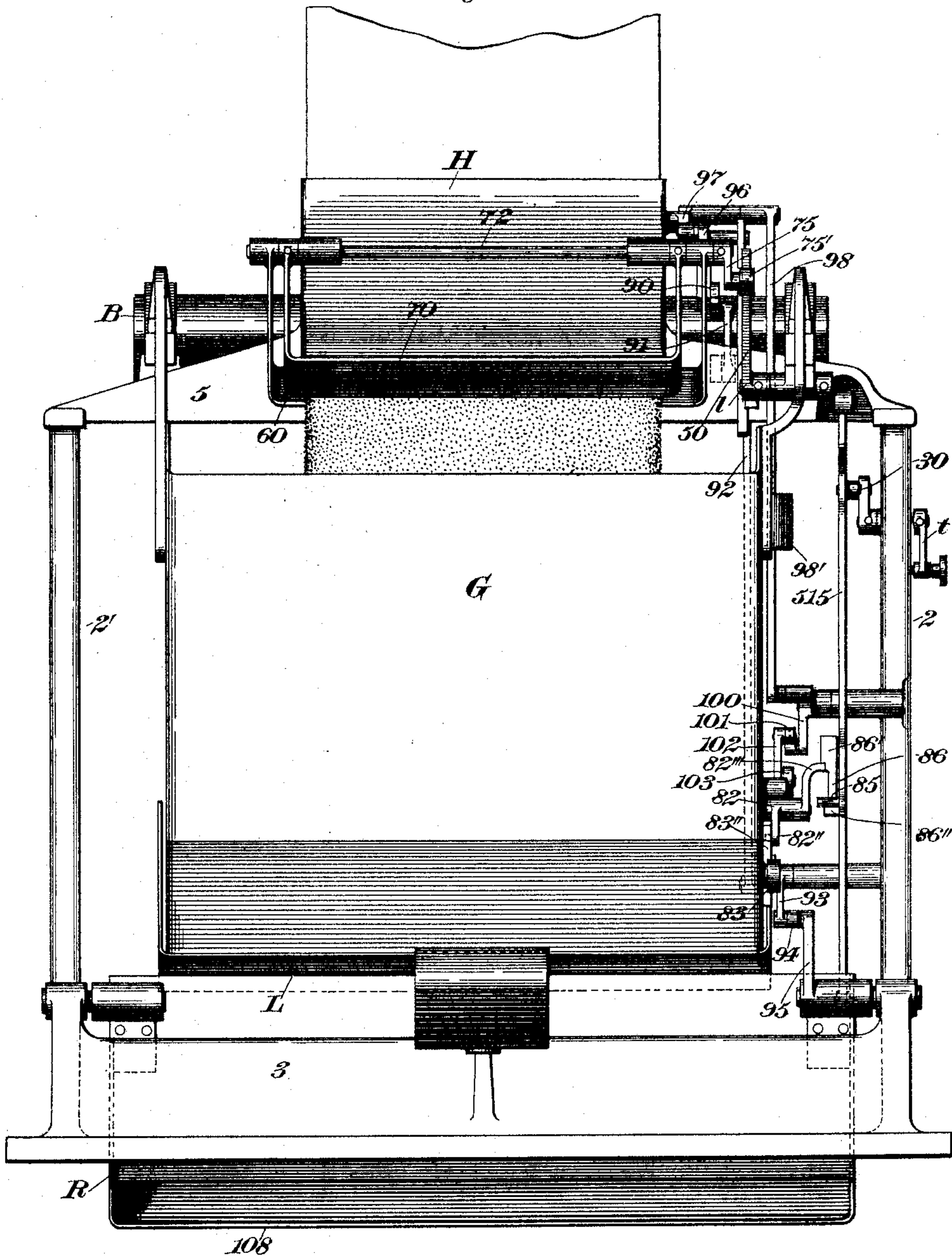
F. H. RICHARDS.
WEIGHING MACHINE.

(Application filed Feb. 11, 1898.)

(No Model.)

5 Sheets—Sheet 1.

Fig. 1.



Witnesses:

L. S. Hawkins.
Fred. J. Dole.

Inventor:

F. H. Richards.

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5 Sheets—Sheet 2.

Fig. 2.

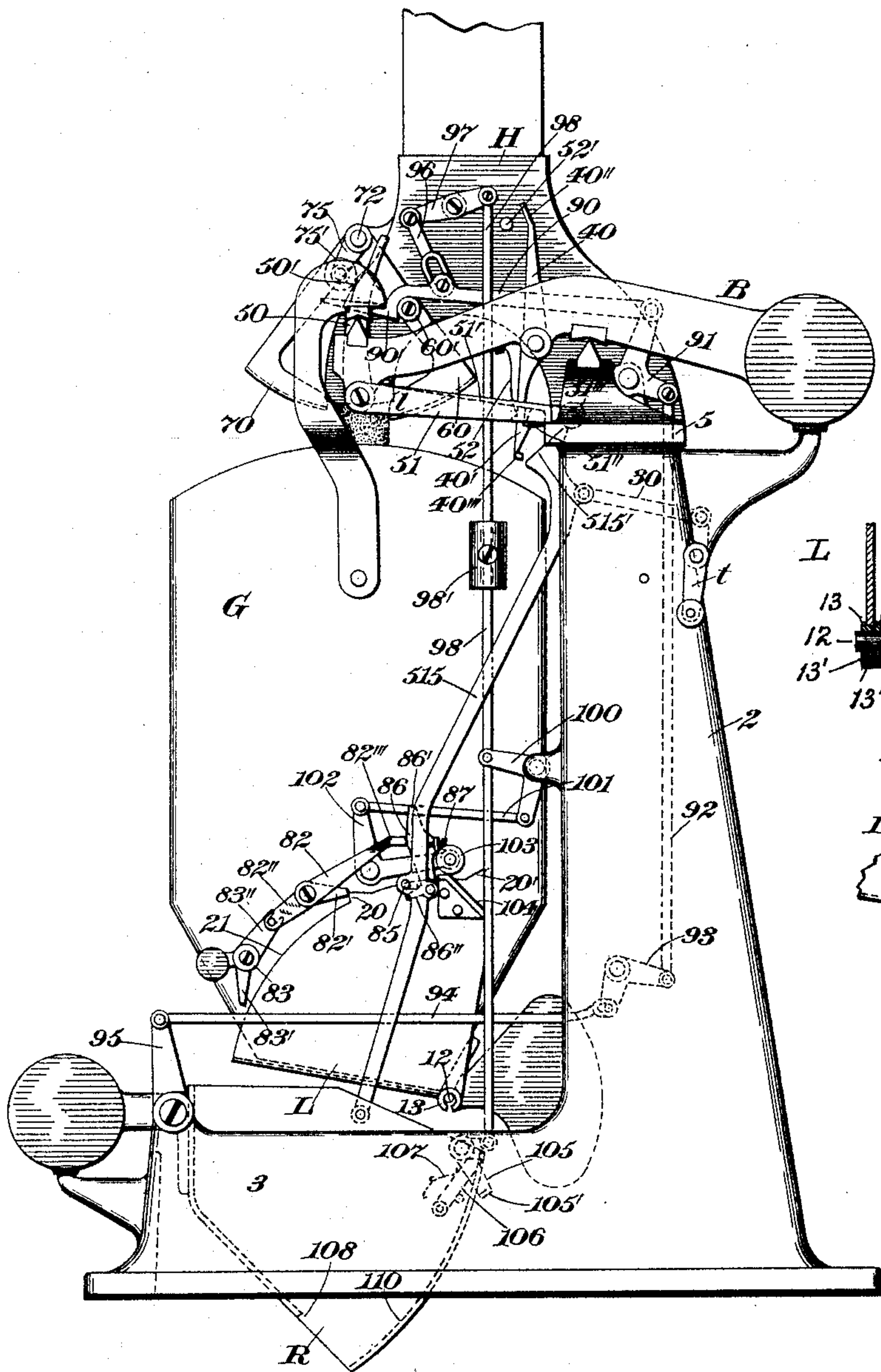


Fig. 6.

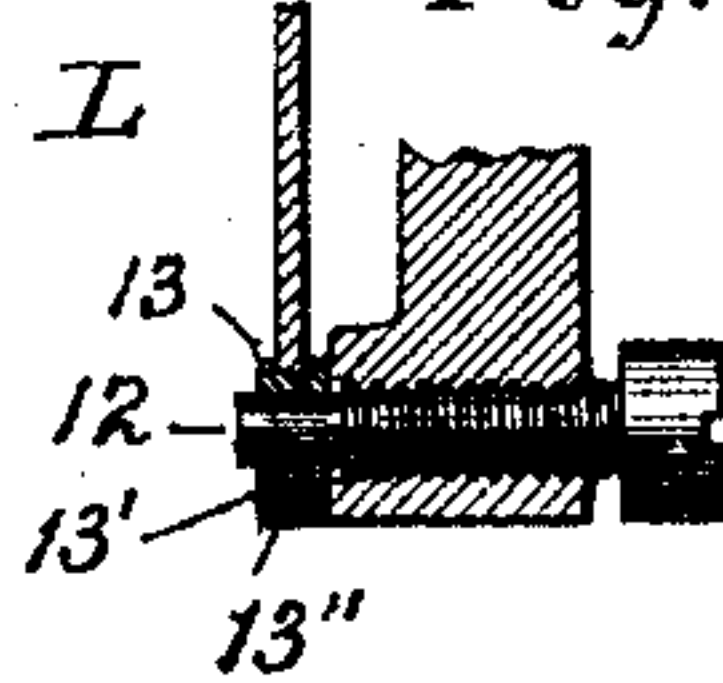
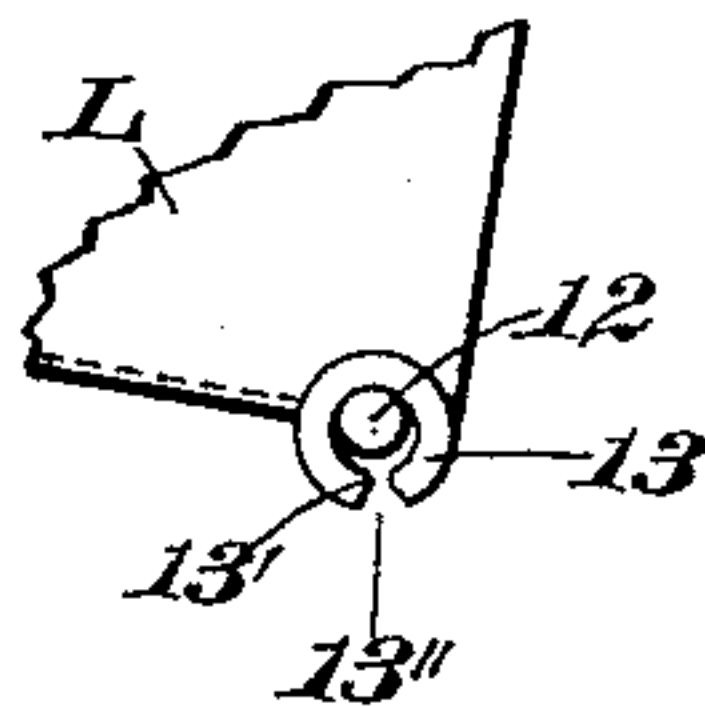


Fig. 7.



Witnesses:

W. S. Hawkins.
Fred. J. Dole.

Inventor:

F. H. Richards.

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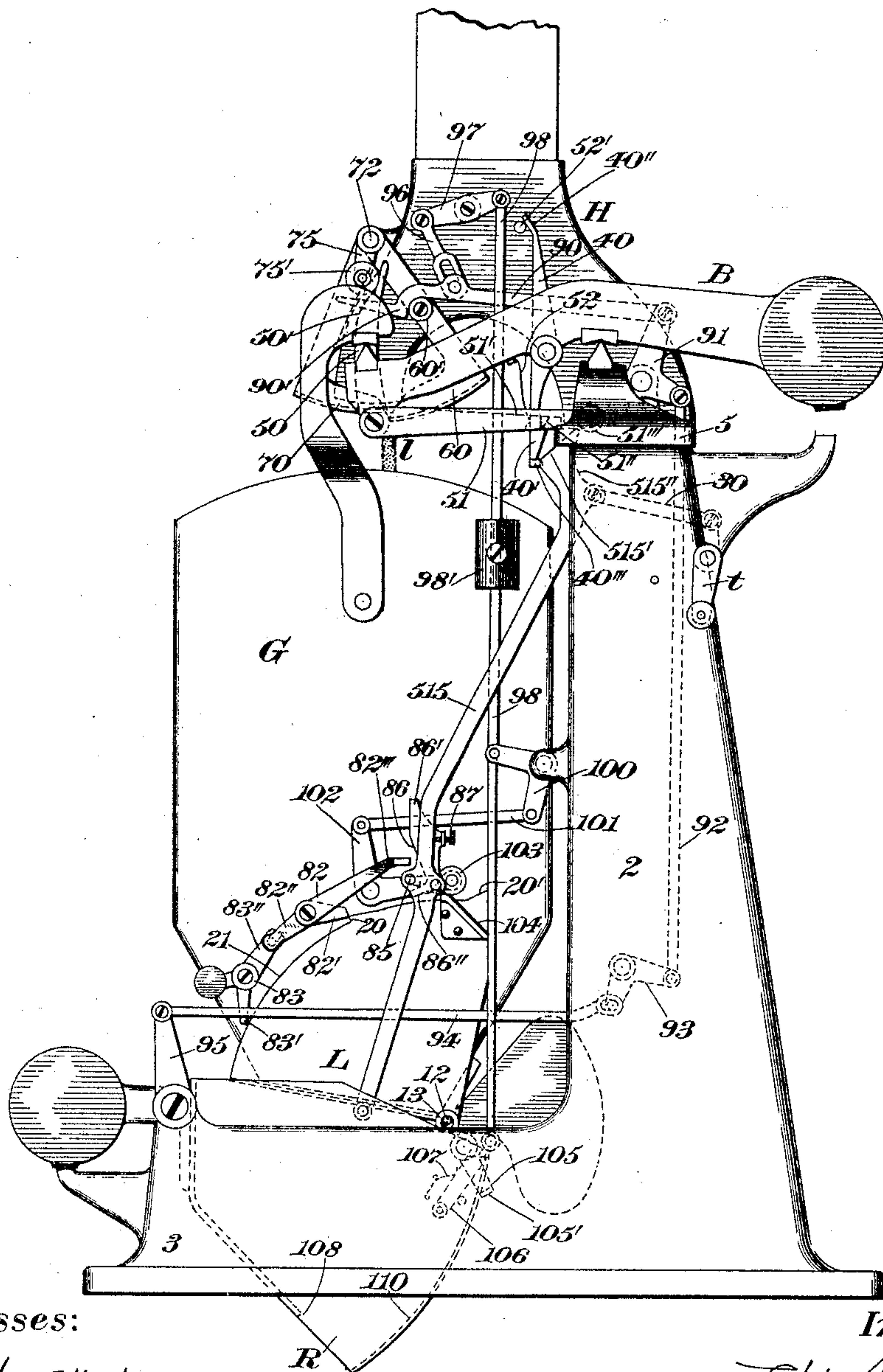
F. H. RICHARDS.
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(No Model.)

5 Sheets—Sheet 3.

Fig. 3.



Witnesses:

W. S. Hawkins.
Fred. J. Dole.

Inventor:

F. H. Richards.

No. 616,634.

Patented Dec. 27, 1898.

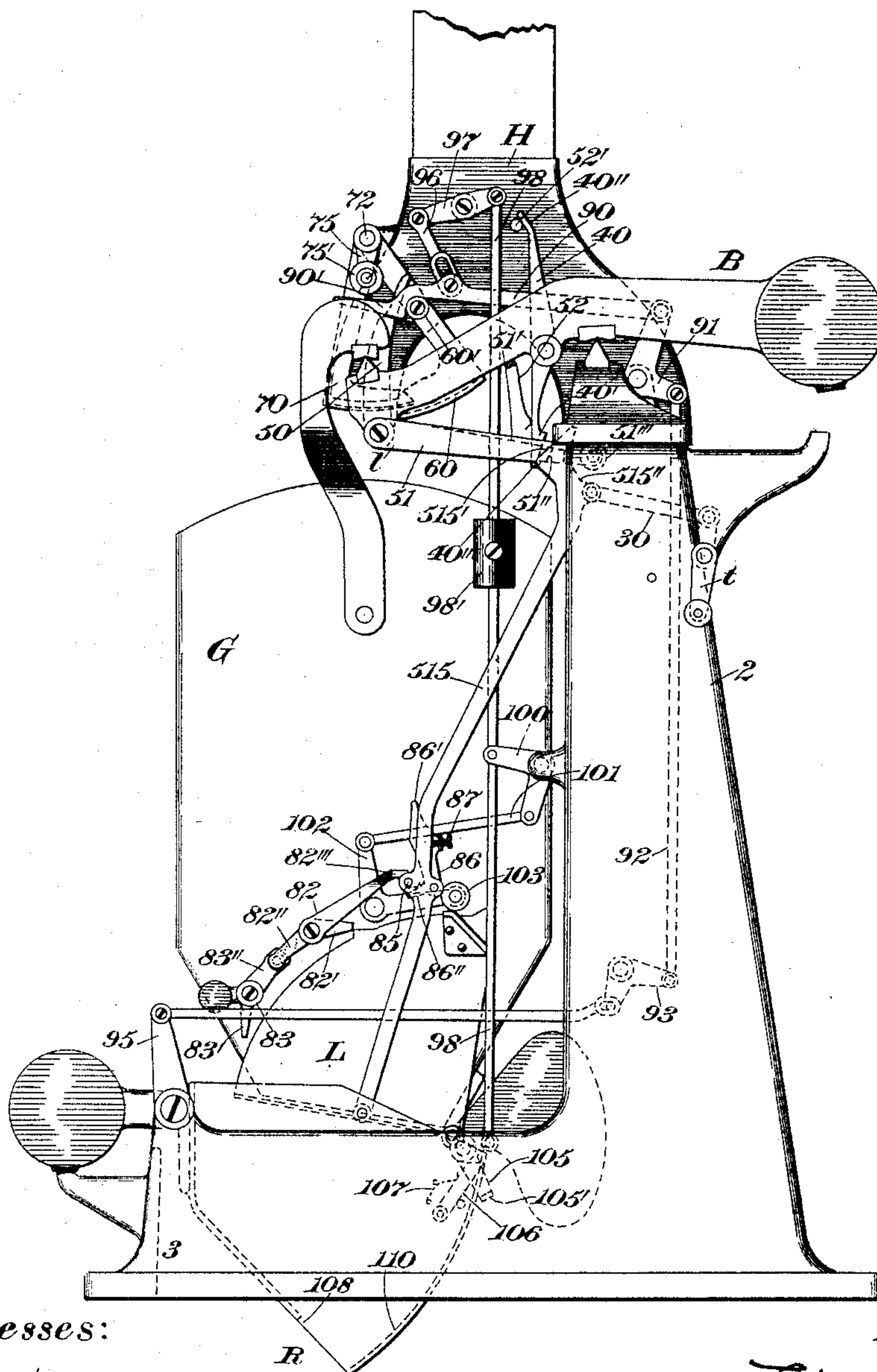
F. H. RICHARDS.
WEIGHING MACHINE.

(Application filed Feb. 11, 1898.)

(No Model.)

5 Sheets—Sheet 4.

Fig. 4.



Witnesses:

N. S. Hawkins
Fred. J. Gole.

Inventor:

F. H. Richards.

No. 616,634.

Patented Dec. 27, 1898.

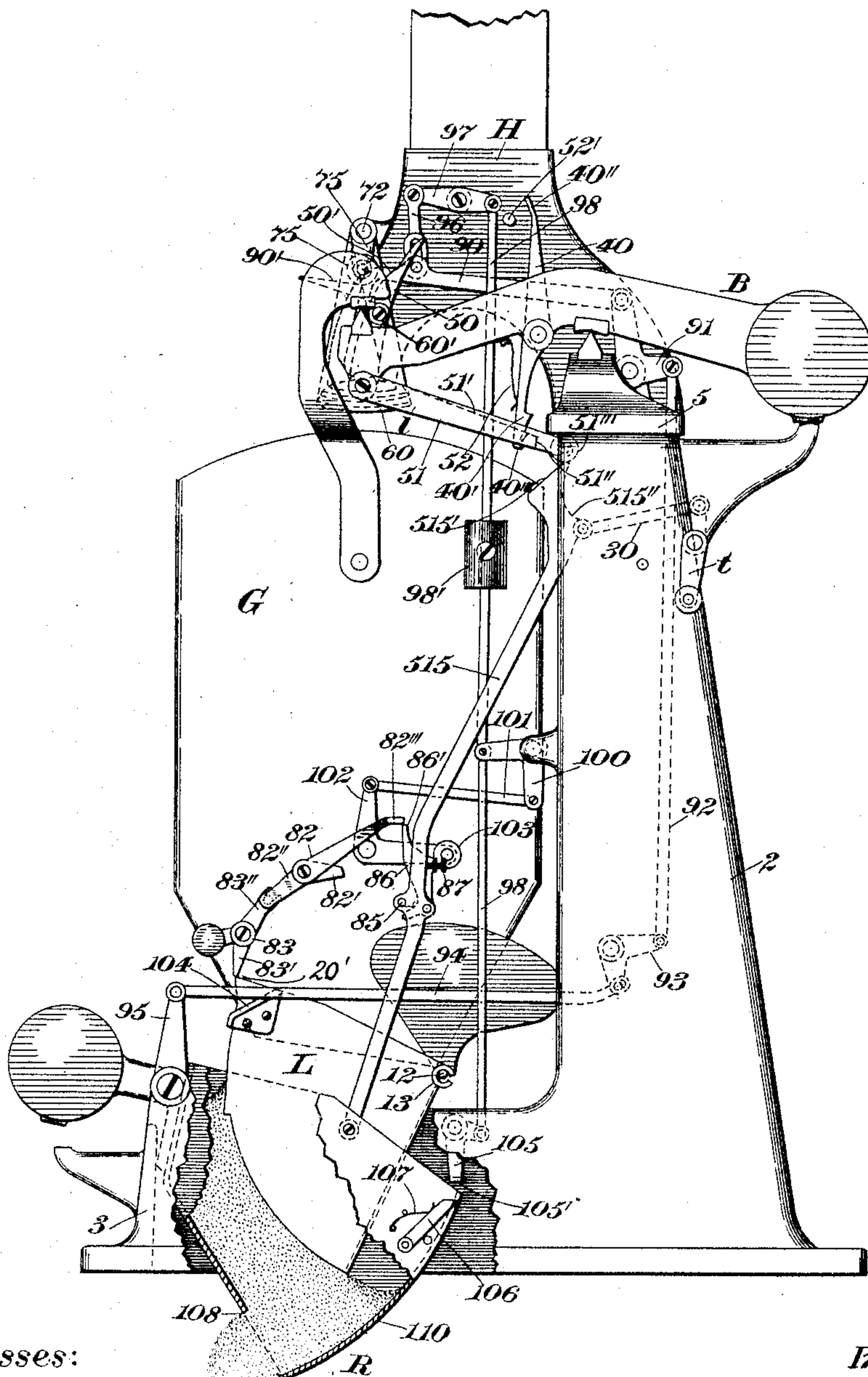
F. H. RICHARDS.
WEIGHING MACHINE.

(Application filed Feb. 11, 1898.)

(No Model.)

5 Sheets—Sheet 5.

Fig. 5.



Witnesses:

W.S. Hawkins
Fred. J. Gole

Inventor:

F. H. Richards.

UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT.

WEIGHING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 616,634, dated December 27, 1898.

Application filed February 11, 1898. Serial No. 669,933. (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 of that class adapted for automatically making up and discharging predetermined quantities of granular or other material.

One of the main objects of this invention is the provision of an improved machine of this type having a stream-controlling valve releasable at a determined point in the operation of the machine from a holding device carried by the usual beam mechanism, suitable means being employed of course for effecting the closing of the valve when so released. In the preferred construction the beam carries a swinging cam normally held against movement relatively to the beam by a latch or similar holding device, this latch being tripped at a determined point to permit the valve-closing actuator to become effective to shut the valve regardless of the further descent of the beam. This cam for closing the valve will also cooperate usually with the valve-actuator, which may be of any desired construction, provided it is capable of engaging the cam at the proper point in the operation of the mechanism and shifting such cam to return the valve to its wide-open position.

Another feature of this invention is the employment of a supplemental or safety valve in addition to the main valve just described and a let-off-actuating device controlling the opening and the closing of said valve. This let-off-actuating device is so constructed as to release the supplemental valve at the proper time after the load has been made up in the load-receiver, and it also serves to reopen the valve after all of the material has passed out from the machine, the closer is shut, and the other parts are in position to permit the making up of new load. Preferably the let-off device will be capable of reciprocation or oscillation in paths which are transverse relatively to each other, the movement of this let-off device in one of such paths being con-

trolled in this case by the shiftable member or load-discharger carried by the load-receiver for discharging a load, while the movement of said let-off device in another of such paths will preferably be governed by the return of the regulator to its normal position. In connection with the shiftable member of the load-receiver I employ a pair of separately-effective holding devices for securing such shiftable member or load-discharger in its open or shut positions, respectively, these let-off devices being preferably a pair of pivoted coacting latches suitably connected and controlled by a pair of latch-trippers, also operative at different points in the cycle of movements of the mechanism. One of these latches normally holds the load-discharger or closer shut and is released by one of the latch-trippers, while the other latch holds the closer open for a determined length of time and is then released by the other latch-tripper. Both of these latch-trippers will ordinarily be carried by the thrust-rod, which connects the valve-opening actuator (in this case the regulator) with the valve, and one of said trippers may be of the "by-pass" type.

Other features of this invention, relating more particularly to the details of construction and the organization of the various parts of the several principal mechanisms, will be described in detail hereinafter.

In the drawings accompanying and forming part of this specification, Figure 1 is a front elevation of an automatic weighing-machine constructed in accordance with my present improvements. Fig. 2 is a side elevation of the same, showing the parts in position for delivering a full stream to the load-receiver. Fig. 3 is a similar view showing the parts in the drip position. Fig. 4 is a similar view showing the positions of the parts when the load is completed and the flow of material stopped. Fig. 5 is a similar view, with parts broken away, showing the positions of the several devices when the closer is opened and the load discharged; and Figs. 6 and 7 are details illustrating the manner in which the closer is supported on the load-receiver.

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

Any suitable framework may be employed for supporting the several operative parts of

my improved weighing-machine. That illustrated herein comprises the usual base, such as 3, from which rise side frames 2 and 2', connected at their upper ends by a cross-beam 5 and carrying the usual supply-hopper H for delivering material to the receiver of the weighing mechanism.

The weighing mechanism embodies as its essential elements a load-receiver having a member shiftable for discharging the load and beam mechanism.

The beam mechanism may be substantially of the type shown at B, it comprising a pair of connected counterweighted beams supported by the usual knife-edge pivots on the cross-beam 5 and also having similar knife-edge bearings from which is suspended in a well-known manner a bucket or load-receiver, as G. The opening through which material is discharged from this receiver is controlled by a closer, such as L, which will be described more fully hereinafter.

The stream-controlling means by which the flow of material to the receiver G is governed is of novel type and embodies as its essential elements a main valve, which may be of the type shown at 70, and a supplemental or safety valve—such, for example, as that represented at 60. Both of these valves are preferably supported for oscillation about a common axis, such as 72, on the hopper H and are intended to close the discharge-mouth of the supply-spout by swinging under the latter, one overlapping the other. The main valve should close first and has in this instance a rock-arm 75, movable in unison therewith and carrying at its outer end an antifriction-roll 75', adapted to coact with a suitable controlling or actuating device. In the preferred construction this device will be in the nature of a member shiftable on the beam mechanism. When released, it will oppose no resistance to the closing movement of the valve, which, it should be understood, will be effected in any suitable manner—as, for example, by making the valve of such weight that it will be self-closing. Either a member on the valve or the shiftable member on the beam mechanism will have a cam-face, and in this instance the beam carries a shiftable cam, preferably in the form of a cam-lever, such as that designated by I, this cam-lever having an upwardly-extending cam-arm 50, the cam-face 50' of which coacts with the antifriction-roll 75' to determine the position of the main valve 70. The cam-face 50' is of such shape that when the beam is up, as shown in Fig. 2, the main valve will be held wide open, and the full stream will therefore then flow into the load-receiver, while when the beam descends the antifriction-roll 75' will ride over a cam-face of such shape that the main valve will close to the drip position and will remain there until the cam is released, when of course the valve should quickly shut. The cam-lever I is in this case in the form of an angle-lever, the arm 51 of

which coöperates with a holding device, which may also be carried by the beam. In this case the holding device is in the nature of a latch, such as 40, pivoted on the beam B in advance of the pivot of the latter and having at its lower end a latch-face 40', adapted to engage a detent or stop, which may be carried either on the arm 51 or an arm 51', movable in unison with the arm 51. This detent or stop is indicated at 51". The latch 40 will preferably be spring-pressed, it being held normally in engagement with the detent 51" by a light spring, such as 52.

For the purpose of releasing the holding device or latch 40' at the proper point in the operation of the machine, which point of course will be about at the end of the drip period, I may make use of any suitable tripping member—such, for example, as the latch-tripper or fixed pin 52' on the side of the hopper, this pin coöperating with the upper inclined end 40" of the latch 40 to release the detent 51" properly.

In order to limit the movement of the cam-lever I, I prefer to employ a stop carried on the latch 40, and hence the latter has at the lower end thereof a stop member 40''' in position to engage the detent 51" after the latch is released by the tripper 52.

For the purpose of returning the cam-lever to its normal position and at the same time opening the main valve 70 I may make use of any suitable valve-opening means; but in this case I prefer to employ a suitable regulator, such as R, as the valve-opening device and to connect to said regulator the usual valve-opening thrust-rod, such as 515, which may coact at its upper end with an antifriction-roller, such as 51'', at the extreme rear end of the arm 51 of the cam-lever. The upper end of said thrust-rod may have at 515' a cam-face, over which the roller 51'' is intended to ride to shift the valve to the wide-open position, while a cut-away portion or face 515'' at the upper rear side of the thrust-rod may be provided to form a space in which the roller may work on the release of the cam-lever from its latch on the descent of the weighted load-receiver.

In connection with the thrust-rod 515 I make use of testing shifting means of the ordinary type—such, for example, as the testing-lever t, connected by means of a link, as 30, with the thrust-rod 515 in such a manner as to shift the latter out of operative relation with the antifriction-roll 51'' when it is desired to determine whether the machine is operating properly.

The supplemental or safety cut-off valve 60, which has hereinbefore been referred to, will be released in this case and permitted to close only after the main valve 70 is shut, and for the purpose of effecting this closing movement of the supplemental valve I prefer to make use of a let-off device, by means of which said supplemental valve may also be actuated subsequently to return said valve

to its wide-open position. In the preferred construction the let-off device is normally in engagement with the valve 60 and holds the same wide open. This device will engage
 5 some member projecting from the valve—such, for example, as the pin or stud 60'. The let-off device proper is intended to co-operate with this pin and will be normally in engagement therewith, but will be capable
 10 of being shifted out of the path of said pin when the load in the receiver is completed. In order to provide for this last-mentioned movement, the let-off device in the construction illustrated herein is mounted so as to re-
 15 ciprocate or oscillate in paths transverse relatively to each other, one of these paths being substantially in a horizontal direction and the other in substantially a vertical direction.

The let-off device may be of the type indicated herein by 90, and in this instance is in the nature of a hooked bar or rod, the hooked forward end 90' of which normally en-
 20 engages the pin 60'; while the rear end of the bar may be pivotally connected to one end of an angle-lever, such as 91, supported on the framework, the other arm of this an-
 25 gle-lever being connected in some suitable manner with the valve-opening actuator or regulator, the connections illustrated for that purpose being in this case a connecting-rod
 30 92, an angle-lever 93, a connecting-rod 94, connected with the angle-lever 93 by a loose joint, and a rock-arm 95, connected to the
 35 rod 94 and movable in unison with the regulator. These connections may of course be varied at will.

Obviously the regulator, which ordinarily will be counterweighted in a well-known man-
 40 ner, will constitute the means for shifting the hooked let-off device back and forth in its substantially horizontal path, the construc-
 45 tion being such that when the regulator is in the position shown, for example, in Fig. 2 the supplemental valve 60 will be drawn to
 5 its extreme position to the right and will be held wide open, while when the regulator is down, as shown in Fig. 5, the let-off device
 60 will be in its extreme left-hand position and the supplemental valve will be shut. In con-
 65 nection with the regulator, however, I also employ coacting means for operating the let-off device, such means serving, when not held
 70 by any other part of the mechanism, to shift the let-off device in a substantially vertical direction to carry the same out of engage-
 75 ment with the pin 60'. In this case the hooked bar 90 is pivotally connected by means of a link 96, having an open eye, with a lever 97
 80 on the side of the hopper H, said lever being connected in turn to a long rod 98, disposed substantially in a vertical position and con-
 85 nected at the proper point with a device or devices governed by the movements of the closer. This rod 98 will usually have a weight,
 90 such as 98', which when the rod is not under restraint will tend to withdraw the let-off de-

vice from the pin 60' and shift it to its inop-
 95 erative position.

As the regulator has been described as the means for governing the horizontal recipro-
 100 cation of the let-off device or bar, so the closer L is intended to control the vertical recipro-
 105 cation of said member. In this case the con-
 110 nections from the rod 98 to the closer L include an angle-lever 100, pivoted on the framework
 115 and connected by a link or rod 101 to one end of another angle-lever 102, supported in
 120 this case on the side of the load-receiver and preferably having at its free end an anti-
 125 friction-roll 103. This antifriction-roll at the
 130 free end of said angle-lever is intended to coact with a suitable part of the closer L, (in this case a cam-face, such as 104.)

When the parts are in their normal posi-
 135 tions, (shown in Fig. 2,) the antifriction-roll
 140 will rest on the extreme point or top of the cam 104, and hence the closing movement of
 145 the load-discharger is effective for carrying the let-off device into its operative position in
 150 opposition to the force of the weight 98'; but
 155 when the closer opens and the weight 98' be-
 160 comes effective the antifriction-roll 103 will ride down the cam-face 104 and the let-off de-
 165 vice will be withdrawn to its inoperative posi-
 170 tion, (shown in Fig. 5,) out of engagement
 175 with the pin 60'.

As before stated, I prefer to employ in con-
 180 nection with the load-receiver and its load-
 185 discharger novel means for latching the load-
 190 discharger and in this case for holding it
 195 positively both when shut and when open. In the construction illustrated the closer has
 200 a pair of stop-faces or detents 20 and 20', pro-
 205 jecting from a face thereof concentric with the axis of oscillation of the closer, and these
 210 detents or stops are intended to coöperate with a pair of holding devices or latches pref-
 215 erably supported on the side of the load-receiver. In this case both of said latches
 220 will lie adjacent to the concentric face 21, just referred to, and will coact with each
 225 other, they being preferably pivotally sup-
 230 ported in the usual manner for oscillation and connected so as to move in unison. The
 235 two latches which are illustrated herein are
 240 designated, respectively, by 82 and 83, the former being the latch for coöperating with
 245 the stop 20 to hold the closer shut, while the latter is designed to engage the face 20' to
 250 latch the closer open. In this case the latch-
 255 arm of the first-mentioned latch is designated
 260 by 82', while the corresponding detent of the other is indicated by 83'. The latch 82 may
 265 be connected with the latch 83 by means of
 270 an arm, such as 82'', having a pin working
 275 in the forked end of a corresponding arm 83''
 280 of the other latch. Either one of these latches may be counterweighted in the usual manner,
 285 the latch 83 being the one so shown herein. The tripping of these latches may be effected
 290 by suitable tripping means coöperating with a releasing-pin 82''' on the latch 82. The means

which I prefer to employ for this purpose are a pair of latch-trippers or releasing members separately effective at different points in the operation of the machine, and both of these
 5 closer-latch trippers may be carried advantageously by the valve-opening thrust-rod 515. In the construction shown one of the latch-trippers (that indicated by 85) may be a fixed pin on said thrust-rod, while the other
 10 will be in the nature of a by-pass device, such as that indicated at 86. This by-pass device may be pivotally supported on the rod 515 and may be adjusted to a proper working position by an adjusting-screw, such as 87.
 15 It will have the usual tripping-arm, such as 86', and a stop-arm 86'', coacting with the fixed stop 85 to limit the movement of such latch-tripper.

The latch-tripper 85, coacting with the arm 82'', serves to release the latch-arm 82' from the stop 20 when the load has been discharged, and on the descent of the regulator, with the thrust-rod 515, the latch-arm 83' will engage the stop 20', the release of this latch-arm being effected by the first partial rising movement of the regulator and the engagement of the tripper-arm 86' with the releasing-arm 83'' of the latch 83.

For the purpose of preventing the return of
 30 the regulator to its normal position prematurely I prefer to employ in connection with the let-off device interlocking members, one of which will coact with the let-off bar and the other with the regulator. In the construction shown an angle-lever, such as 105, is supported on the base 3, adjacent to the regulator, and is connected to the lower extended end of the rod 98. This angle-lever has an interlocking stop-face, such as 105', adapted
 40 to coact with the corresponding end of a by-pass, such as 106, supported on the regulator R and preferably spring-pressed, as indicated at 107. When the regulator is in its lowermost position, (indicated in Fig. 5,) the stop 106 is somewhat below the stop-face 105'; but
 45 when the regulator rises slightly to trip the latch-arm 83' its continued ascent will be prevented by the engagement of the end of the stop 106 against the face 105' of the angle-lever 105.

The regulator which I prefer to employ is substantially of the usual counterweighted type, (indicated at R;) but the discharge-opening therein (shown herein at 108) will preferably be somewhat smaller than usual and will
 55 be wholly in the bottom thereof adjacent to that side wall of the regulator which is most remote from the counterweight, and this side wall 110 will completely fill that side of the
 60 regulator, and hence cause the banking up of the material in the regulator for the proper length of time necessary to permit certain of the members of the weighing mechanism to return to their normal positions.

65 In Figs. 6 and 7 I have illustrated, on an enlarged scale, a detail of construction used in connection with the closer or load-receiver.

This feature of the invention appertains to the journal-bearing between the closer and the part by which the latter is supported and
 70 is intended as an improvement upon the connections now in use. 12 designates in a general way a journal member formed in this case at the outer end of a stud, screw, or other part and having a substantially cylindrical
 75 journal-surface for supporting a corresponding bearing member on the load-discharger or closer. This bearing member is designated in a general way by 13 and has a bearing the internal diameter of which is considerably
 80 greater than the external diameter of the journal member 12. Moreover, one side of the bearing member is open to permit cleansing of the engaging surfaces of the two parts, the opening preferably extending from end to end
 85 of the bearing member 13 and flaring somewhat, as indicated at 13'', from the inner end or neck 13' of the opening. By reason of this construction the parts 12 and 13 have a loose
 90 fit on each other and provision is made for permitting the escape of dust or dirt, which might otherwise accumulate in the bearing and form into a solid mass, which would interfere with the perfect operation of the mechanism. The opening in the bearing member
 95 is widened out, as shown, for the purpose of enabling the attendant to get at and brush out readily the accumulation of dust within the space between the bearing and journal surfaces.

The operation of a machine constructed in accordance with my present improvements, as illustrated in the drawings of this application, is as follows: It being understood that the parts are in their normal positions, as
 100 shown in Fig. 2, and that both the main valve and the supplemental valve are wide open and discharging the full stream into the load-receiver, it will be seen that the hook of the let-off device is in engagement with the pin
 105 60' of the supplemental valve, that the cam-lever *l* is latched by the member 40, that the regulator is up, and that the closer is latched shut by the engagement of the latch of the arm 82' with the stop-face 20. As soon as the
 110 major portion of the load is made up in the receiver the beam mechanism and the bucket will descend, and thereupon the antifriction-roll 75' will ride over the cam-face 50' of the cam-lever *l* as said cam-lever falls with the
 115 beam, and the main valve 70 will be shifted by its own weight to the drip position. (Illustrated in Fig. 3.) During this period of movement the valve-latch 40 will swing with the beam, but will not move relatively to it, and
 120 the upper end of said latch will move toward the latch-tripper 52' and will come into engagement with it, but will not be released thereby until the load is nearly completed, when the farther descent of the beam will
 125 cause the inclined face 40'' of the valve-latch to ride down over the stop 52' and release the detent 40' from the stop 51'', whereupon the weight of the valve will cause the latter to

swing to its shut position, (illustrated in Fig. 4,) the weight of the horizontal arm of the cam-lever being sufficient, of course, to shift the cam-arm thereof quickly out of the way of the antifriction-roller 75'. At the end of this movement of the cam-lever the main valve 70 is fully closed and the antifriction-roller 51''' is behind the cut-away face 51'' of the thrust-rod. (See Fig. 4.) On the tripping of the latch 82 by the pin 85 the weight of the load forces the load-discharger open in the usual manner, and thereupon the contents of the load-receiver are discharged into the regulator R. At the end of its opening movement the latch 83 engages the stop-face 20' of the closer, as shown in Fig. 5, and latches the closer in its wide-open position. Immediately thereafter the weight of material discharged into the regulator carries the thrust-rod down to the position shown in Fig. 5, with the by-pass latch-tripper beneath the releasing-arm 82''' of the latch 82. The opening of the closer and the descent of the regulator also cause the operation of the let-off device, the cam-face 104 permitting the antifriction-roller 103 to descend, and hence permitting the weight 98' to become effective to lift the hook 90' from the pin 60' of the valve 60 and release the latter, whereupon, of course, the supplemental valve closes also. The descent of the regulator also causes the shifting of the hooked let-off bar to the left, as seen in Fig. 5, through the connections hereinbefore described, the hooked member being left in position to engage the pin 90' again when the bar 90 is lowered. By the descent of the weight 98' the angle-lever 105 is shifted to bring its stop-arm to the vertical or dead-center position, as seen in Fig. 5, and the by-pass arm 106 passes by the stop-face 105' on the descent of the regulator and goes considerably beyond it, as illustrated. Said stop remains in this position until the regulator rises, owing to the discharge of a portion of the load through the opening 108, and when said regulator rises through this initial portion of its return movement the latch-tripping arm 86' raises the releasing-arm 82''' and causes the disengagement of the latch-arm 83' from the stop 20', whereupon, of course, the closer will shut again; but it should be understood that the regulator does not rise until the major portion of its contents has been discharged. As soon as the stop 106 comes into engagement with the stop 105 the regulator will remain in that position and will be locked against return movement until the closer reaches the end of its return movement and the antifriction-roller 103 rides up the cam-face 104 again, whereupon, of course, the weight 98' and connected parts will be elevated and the let-off bar 90 lowered into engagement with the stop-pin 90', the rising rod 98 of course withdrawing the stop-face 105' from the stop 106 and permitting the regulator to close. On the rising of the regulator the latch-tripping arm 86' will be swung slightly to the

right, clear of the arm 82''' . On the rising of the thrust-rod 515 the cam-face 515' thereof will engage the antifriction-roller 51''' of the cam-lever 4, which, it should be noted, was previously engaged with the stop 40''' on the rising of the beam mechanism, and the main valve will be forced wide open again. At the same time the connections with the regulator from the rock-arm 95 will also swing the let-off-actuating device 90 to the right and draw the supplemental valve 60 wide open also, whereupon all of the parts will be in their normal positions for making up a new load.

Having described my invention, I claim—

1. In a weighing-machine, the combination, with a valve and with means for closing the same, of beam mechanism; a pair of coacting members carried, respectively, by the valve and the beam mechanism and controlling the closing of the former, one of said members constituting a cam and one of said members being shiftable on the beam mechanism; a device for positively holding said shiftable member; and means for releasing said holding member approximately at the time the load is completed.

2. In a weighing-machine, the combination, with a valve and with means for closing the same, of beam mechanism; a pair of coacting members carried, respectively, by the valve and the beam mechanism and controlling the closing of the former, one of said members constituting a cam and one of said members being shiftable on the beam mechanism; a beam-supported latch for said shiftable member; and a latch-tripper.

3. In a weighing-machine, the combination, with a valve and with means for closing the same, of beam mechanism; a cam shiftable on the beam mechanism and coacting with and controlling the closing of the valve; a latch for said cam; and a latch-tripper operative at a determined point in the descent of the beam.

4. In a weighing-machine, the combination, with a valve and with means for closing the same, of beam mechanism; a cam-lever shiftable on the beam mechanism and coacting with and controlling the closing of the valve; a beam-supported latch for said cam-lever; and a latch-tripper operative at a determined point in the descent of the beam.

5. In a weighing-machine, the combination, with a valve and with means for closing the same, of beam mechanism; a cam-lever shiftable on the beam mechanism and coacting with and controlling the closing of the valve; a beam-supported spring-pressed latch for said cam-lever; and a latch-tripper operative at a determined point in the descent of the beam.

6. In a weighing-machine, the combination, with a valve and with means for closing the same, of beam mechanism; a cam shiftable on the beam mechanism and coacting with and controlling the closing of the valve; a

latch for said cam; a latch-tripper operative at a determined point in the descent of the beam; and a valve-opening actuator coöperative with said cam.

5 7. In a weighing-machine, the combination, with a valve and with means for closing the same, of beam mechanism; a cam shiftable on the beam mechanism and coacting with and controlling the closing of the valve; a
10 latch for said cam; a latch-tripper operative at a determined point in the descent of the beam; a load-receiver having a member shiftable for discharging a load; a regulator; and
15 a valve-opening-actuating member controlled by said regulator and coacting with said cam.

8. In a weighing-machine, the combination, with a valve and with means for closing the same, of beam mechanism; a cam shiftable on the beam mechanism and coacting with
20 and controlling the closing of the valve; a latch for said cam; a latch-tripper operative at a determined point in the descent of the beam; a load-receiver having a member shiftable for discharging a load; a regulator; and
25 a valve-opening thrust-rod connected with said regulator and having a cam-face coöperative with the cam on the beam mechanism.

9. In a weighing-machine, the combination, with a valve and with means for closing the
30 same, of beam mechanism; a cam shiftable on the beam mechanism and coacting with and controlling the closing of the valve; a latch for said cam; a latch-tripper operative at a determined point in the descent of the
35 beam; a load-receiver having a member shiftable for discharging a load; a regulator; a valve-opening thrust-rod connected with said regulator and having a cam-face coöperative with the cam on the beam mechanism;
40 and shifting testing means for shifting said rod out of operative relation with said cam.

10. In a weighing-machine, the combination, with a valve and with means for closing the same, of beam mechanism; a load-receiver
45 having a closer shiftable for discharging the load; a regulator supported to be shifted by the load; a valve-opening thrust-rod controlled by the regulator; a latch for locking said closer open; and a tripper on
50 the valve-opening thrust-rod adapted to engage said latch on the return movement of the regulator thereby to release the closer.

11. In a weighing-machine, the combination, with weighing mechanism including a
55 load-receiver having a closer, of main and supplemental valves supported independently of the weighing mechanism; actuating means for said valves; means for positively locking the supplemental valve against advancing movement during the advancing
60 movement of the main valve; and an automatic let-off device controlled by said closer and operable to effect the release of the supplemental valve on the opening of the closer.

65 12. In a weighing-machine, the combination, with a valve and with means for closing the same, of beam mechanism; a load-receiver

having a closer shiftable for discharging a load; a regulator supported to be shifted by the load; a valve-opening thrust-rod controlled by the regulator; a latch for locking
70 said closer open; a tripper on the valve-opening thrust-rod, adapted to engage and trip said latch on the return movement of the regulator, thereby to release the closer; means for
75 positively locking the valve against advancing movement; and means for automatically effecting the release of said valve on the opening of the closer.

13. In a weighing-machine, the combination, with a main valve, a supplemental valve, and actuating means for said valves, of weighing mechanism, and an automatic let-off device reciprocatory in paths transverse relatively to each other and controlled in its move-
80 ments by different members of the weighing mechanism.

14. In a weighing-machine, the combination, with a main valve, a supplemental valve, and actuating means for said valves, of weighing mechanism, and an automatic let-off device oscillatory in paths transverse relatively to each other and controlled in its movements by different members of the weighing mechanism.

15. In a weighing-machine, the combination, with a main valve, a supplemental valve, and actuating means for said valves, of weighing mechanism, and a hooked let-off device normally in engagement with the supplemental valve for opening the latter and reciprocatory in paths transverse relatively to each other into and out of operative relation with said valve and controlled in its movements by different members of the weighing mechanism.

16. In a weighing-machine, the combination, with a main valve, a supplemental valve, and actuating means for said valves, of weighing mechanism embodying a load-receiver
110 and a load-discharger; a regulator; an automatic let-off device normally in engagement with the supplemental valve for opening the latter and reciprocatory in paths transverse relatively to each other into and out of operative relation with said valve; connecting means between the load-discharger and the let-off device for controlling one of the reciprocatory movements of the latter; and connecting means between the regulator and the
115 let-off device for controlling the other reciprocatory movement of the latter.

17. In a weighing-machine, the combination, with stream-supplying means and with stream-controlling means, of weighing mechanism embodying a load-receiver and a load-discharger, and a pair of coacting latches carried by the load-receiver and separately effective for holding the load-discharger in its open and shut positions, respectively.

18. In a weighing-machine, the combination, with stream-supplying means and with stream-controlling means, of weighing mechanism embodying a load-receiver and a load-

discharger, and a pair of connected pivoted latches carried by the load-receiver and separately effective for holding the load-discharger in its open and shut positions, respectively.

19. In a weighing-machine, the combination, with stream-supplying means and with stream-controlling means, of weighing mechanism embodying a load-receiver and a load-discharger; a pair of coacting latches carried by the load-receiver and separately effective for holding the load-discharger in its open and shut positions, respectively; and a pair of latch-trippers coöperative, respectively, with said latches.

20. In a weighing-machine, the combination, with stream-supplying means, of a stream-controlling valve; weighing mechanism embodying a load-receiver having a member shiftable for discharging a load; a pair of latches separately effective for holding the shiftable member of the load-receiver in different positions; a valve-opening actuator; a valve-opening thrust-rod; and a pair of separately-effective latch-trippers carried by said thrust-rod and coöperative, respectively, with said latches.

21. In a weighing-machine, the combination, with stream-supplying means, of a stream-controlling valve; weighing mechanism embodying a load-receiver having a member shiftable for discharging a load; a pair of latches carried by the weighing mechanism and separately effective for holding the shiftable member of the load-receiver in different positions; a valve-opening actuator; a valve-opening thrust-rod; and a pair of separately-effective latch-trippers carried by said thrust-rod and coöperative, respectively, with said latches and disposed at different points in the length of the thrust-rod.

22. In a weighing-machine, the combination, with stream-supplying means, of a stream-controlling valve; weighing mechanism embodying a load-receiver having a member shiftable for discharging a load; a pair of latches carried by the weighing mechanism and separately effective for holding the shiftable member of the load-receiver in different positions; a valve-opening actuator; a valve-opening thrust-rod; and a pair of separately-effective latch-trippers carried by said thrust-rod and coöperative, respectively, with said latches, one of said trippers constituting a by-pass latch-tripper.

23. In a weighing-machine, the combination, with a main valve, a supplemental valve, and actuating means for said valves, of weighing mechanism embodying a load-receiver and a load-discharger; a regulator; an automatic let-off device controlled by the load-discharger and operative for releasing the supplemental valve at a determined point in the operation of the machine; and interlocking stops between the let-off device and the regulator.

24. In a weighing-machine, the combination, with a main valve, a supplemental valve, and actuating means for said valves, of weighing mechanism embodying a load-receiver and a load-discharger; a regulator; an automatic let-off device controlled by the load-discharger and operative for releasing the supplemental valve at a determined point in the operation of the machine; a by-pass stop on the regulator; and a stop coacting with said by-pass stop and controlled by the let-off device.

FRANCIS H. RICHARDS.

Witnesses;

F. N. CHASE,

JOHN O. SEIFERT.