No. 616.860. Patented Dec. 27, 1898.

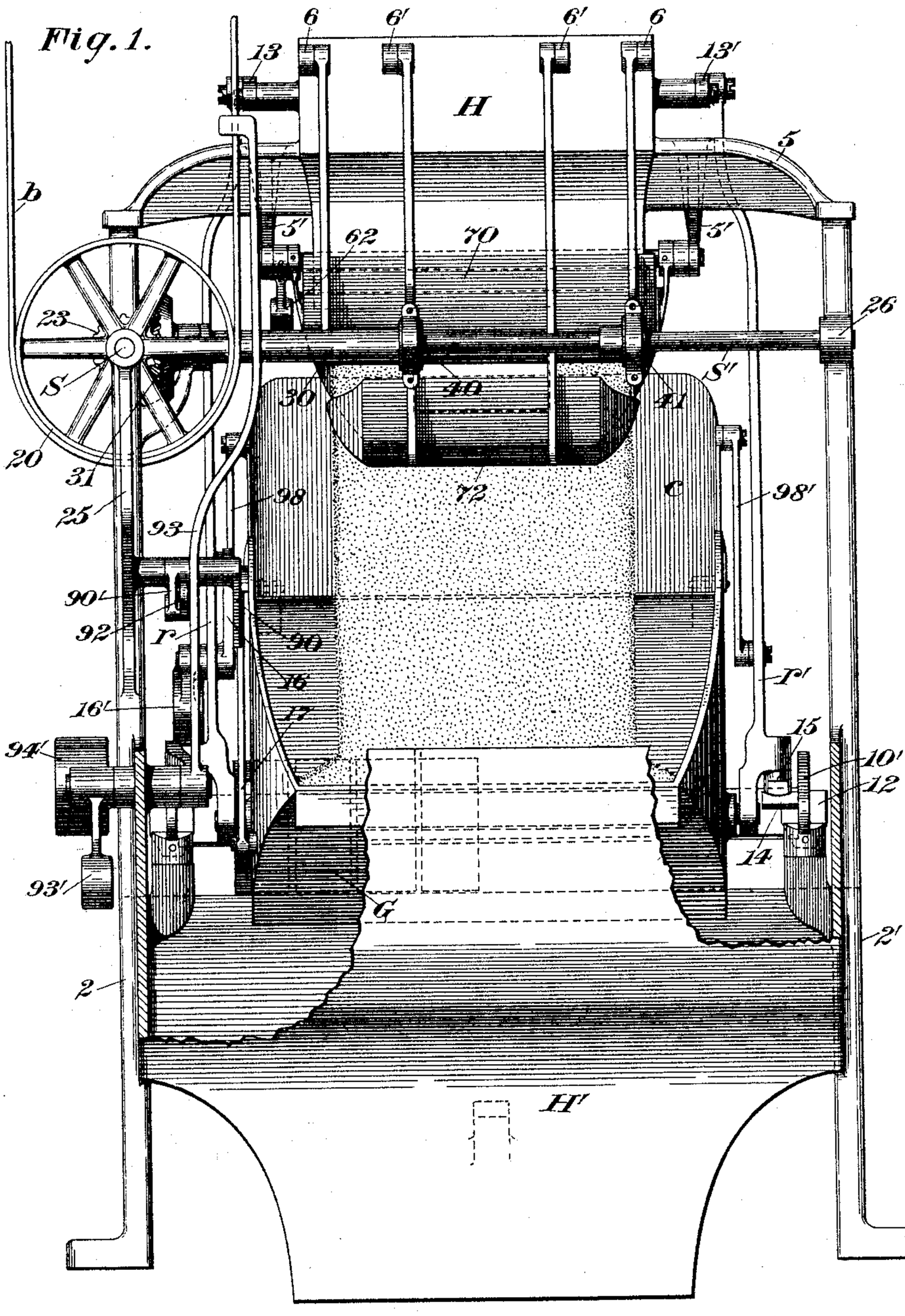
F. H. RICHARDS.

AUTOMATIC WEIGHING MACHINE.

(Application filed Mar. 5, 1898.)

(No Model.) 6 Sheets—Sheet 1.

Fig. 1.



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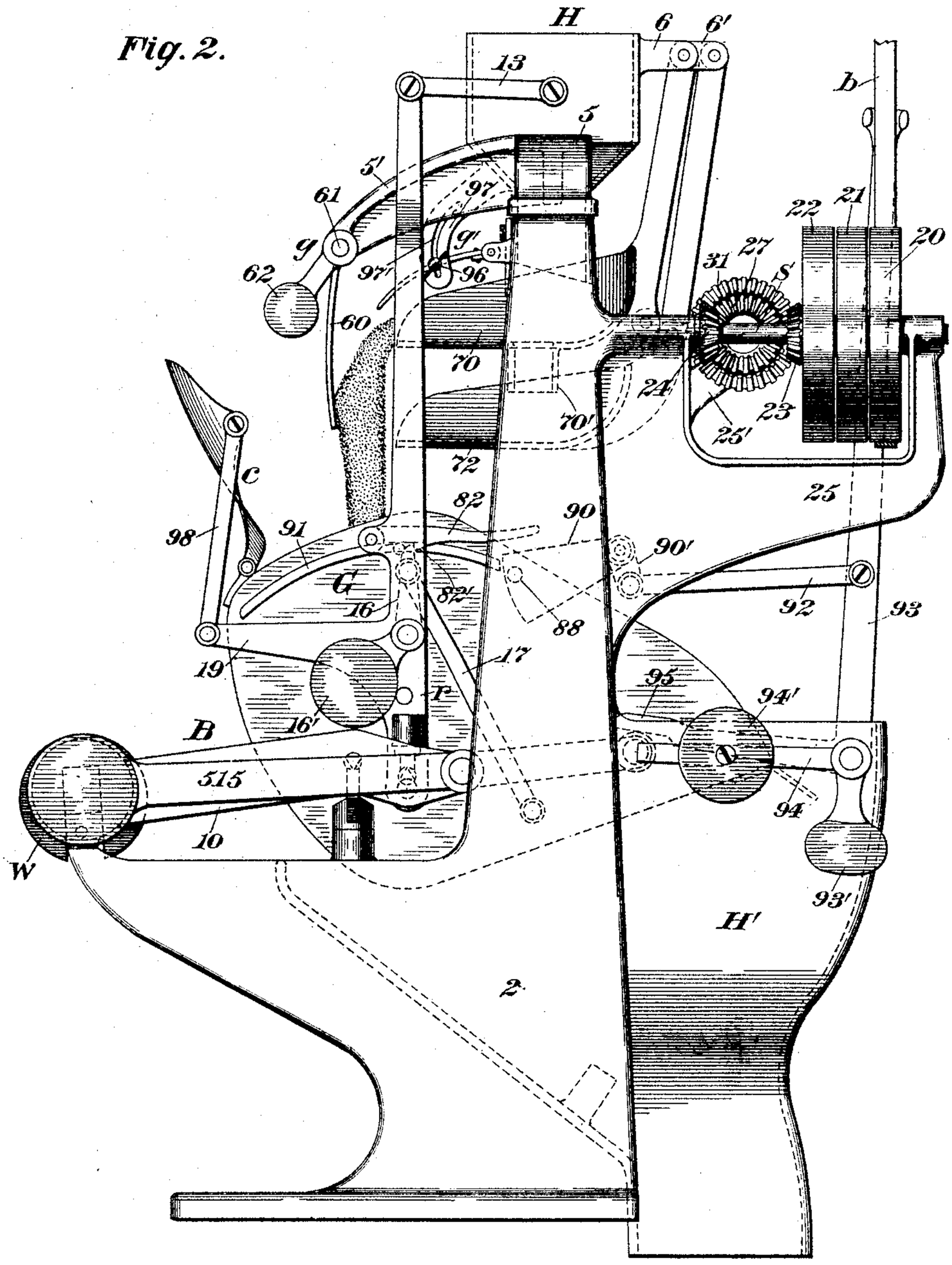
(No Model.) 6 Sheets—Sheet 2.

Fig. 2.



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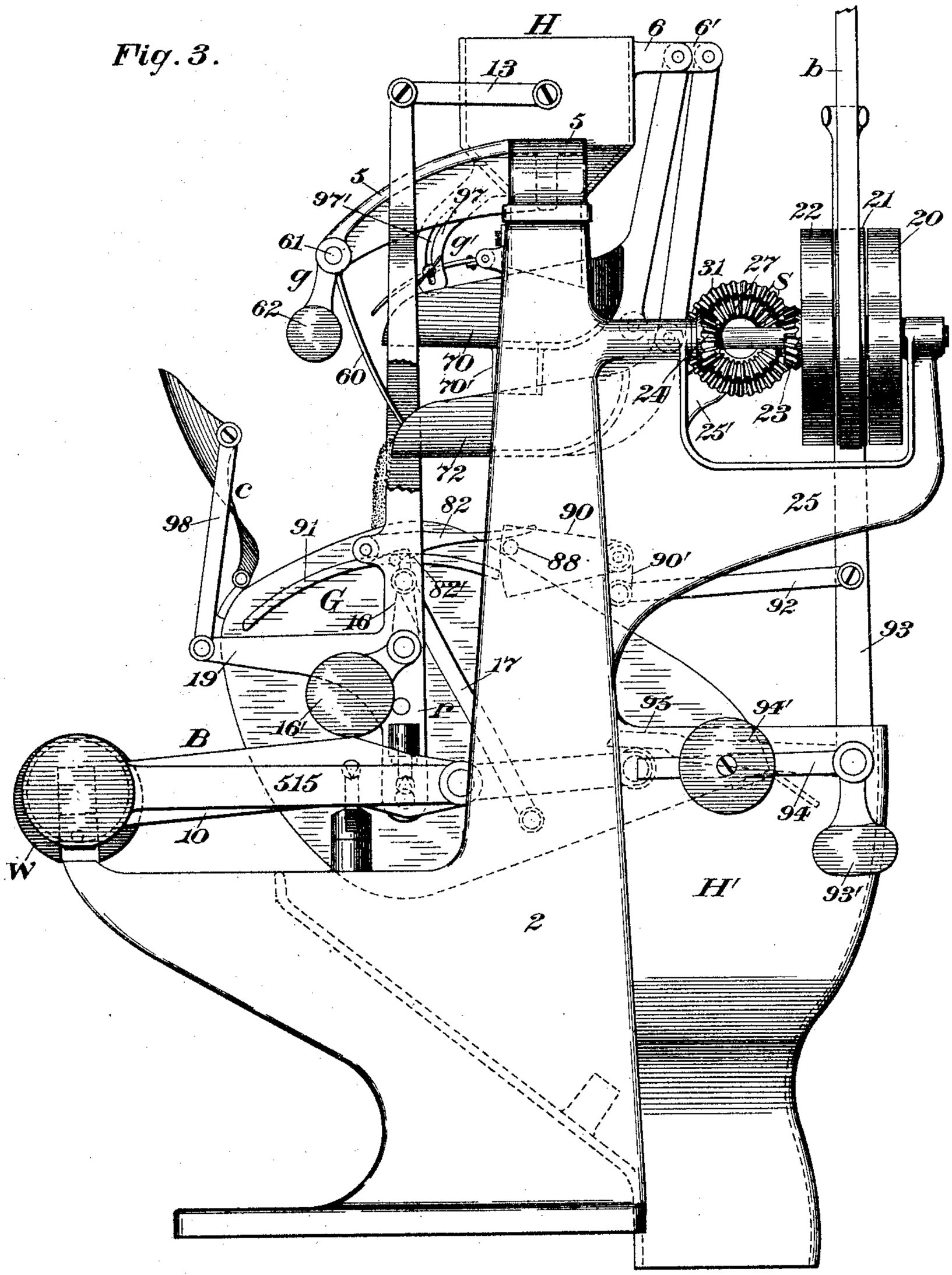
(No Model.) 6 Sheets—Sheet 3.

Fig. 3.



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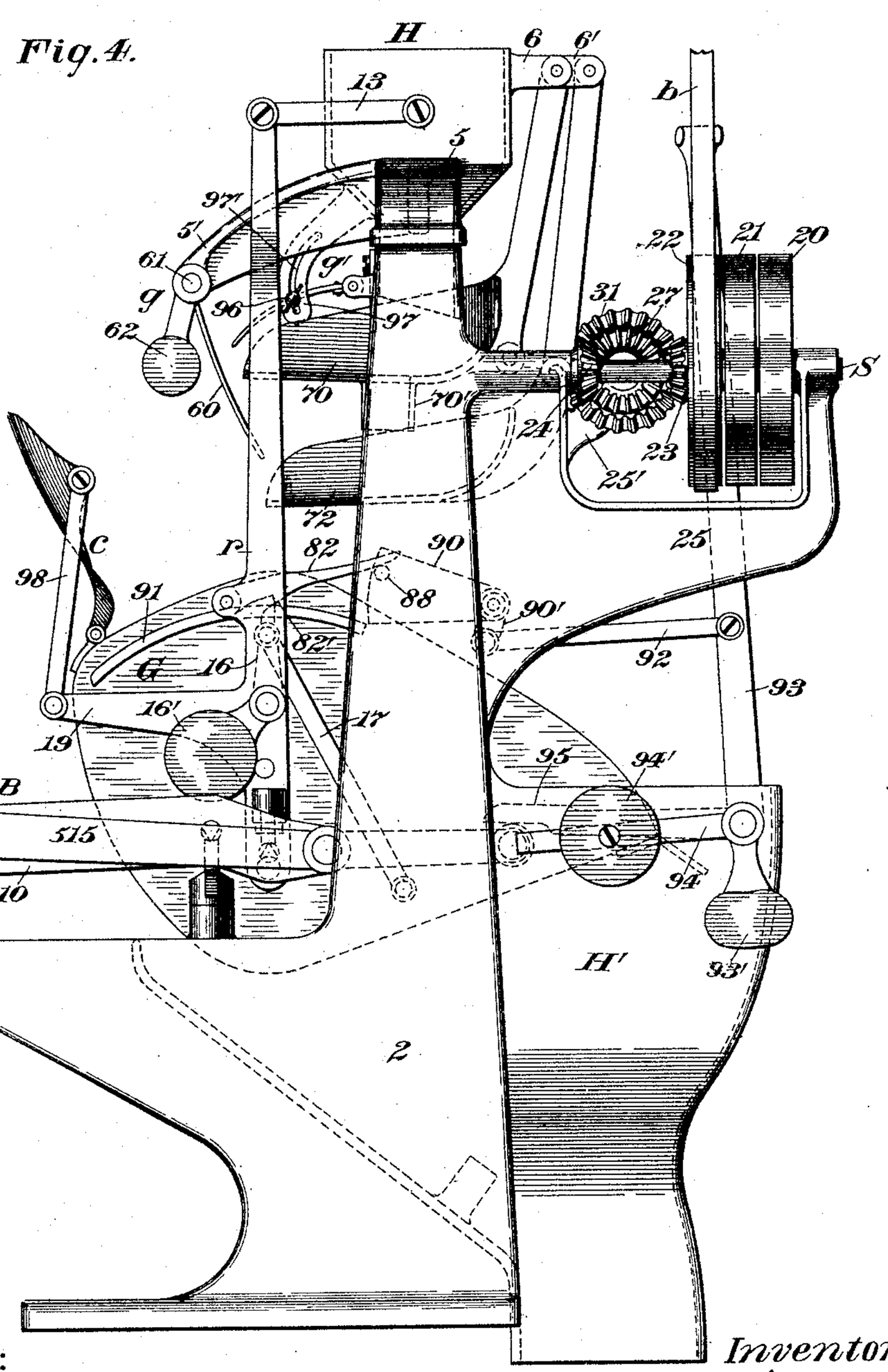
(No Model.) 6 Sheets—Sheet 4.

Fig. 4.



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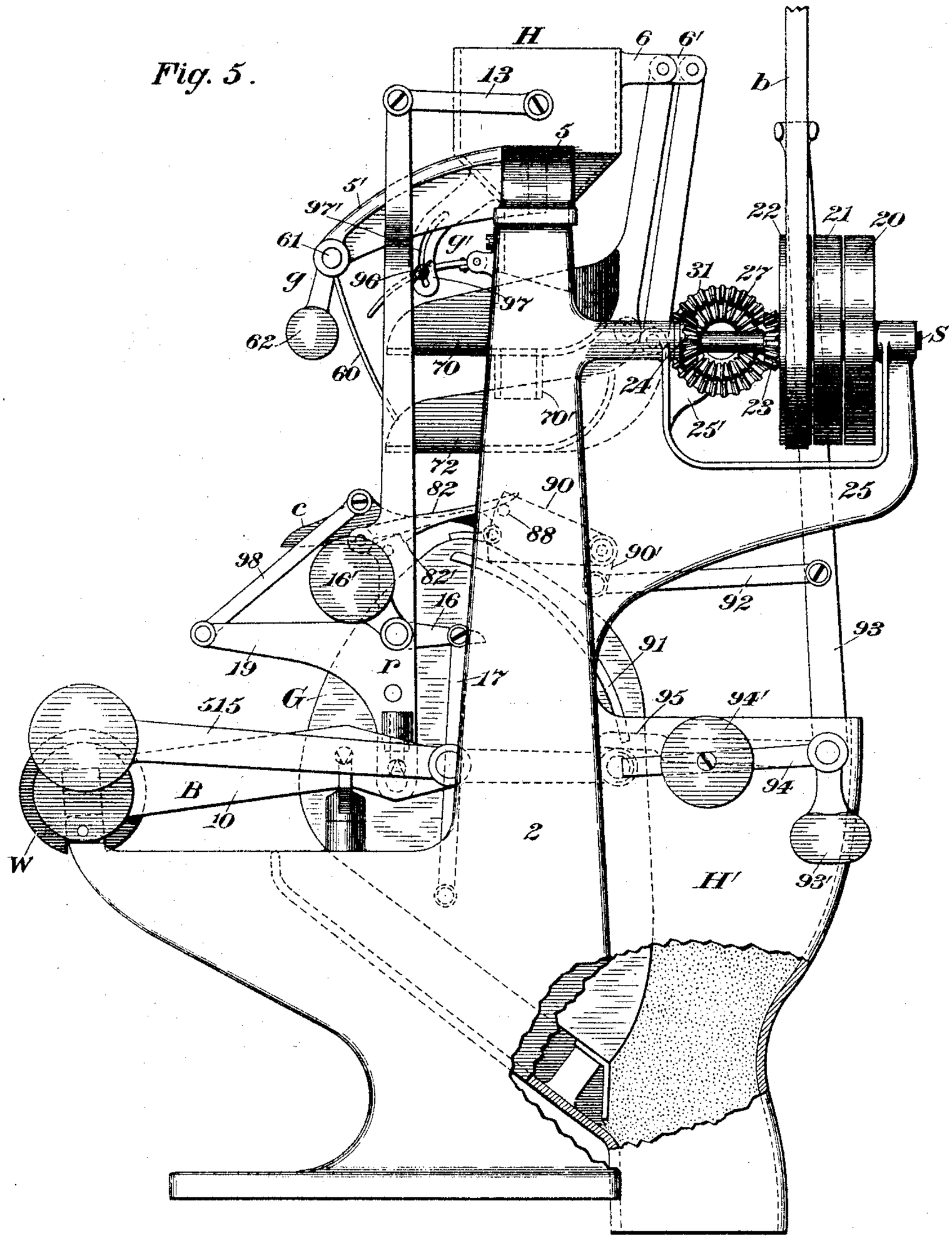
(No Model.) 6 Sheets—Sheet 5.

Fig. 5.



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(No Model.) 6 Sheets—Sheet 6.

Fig. 6.

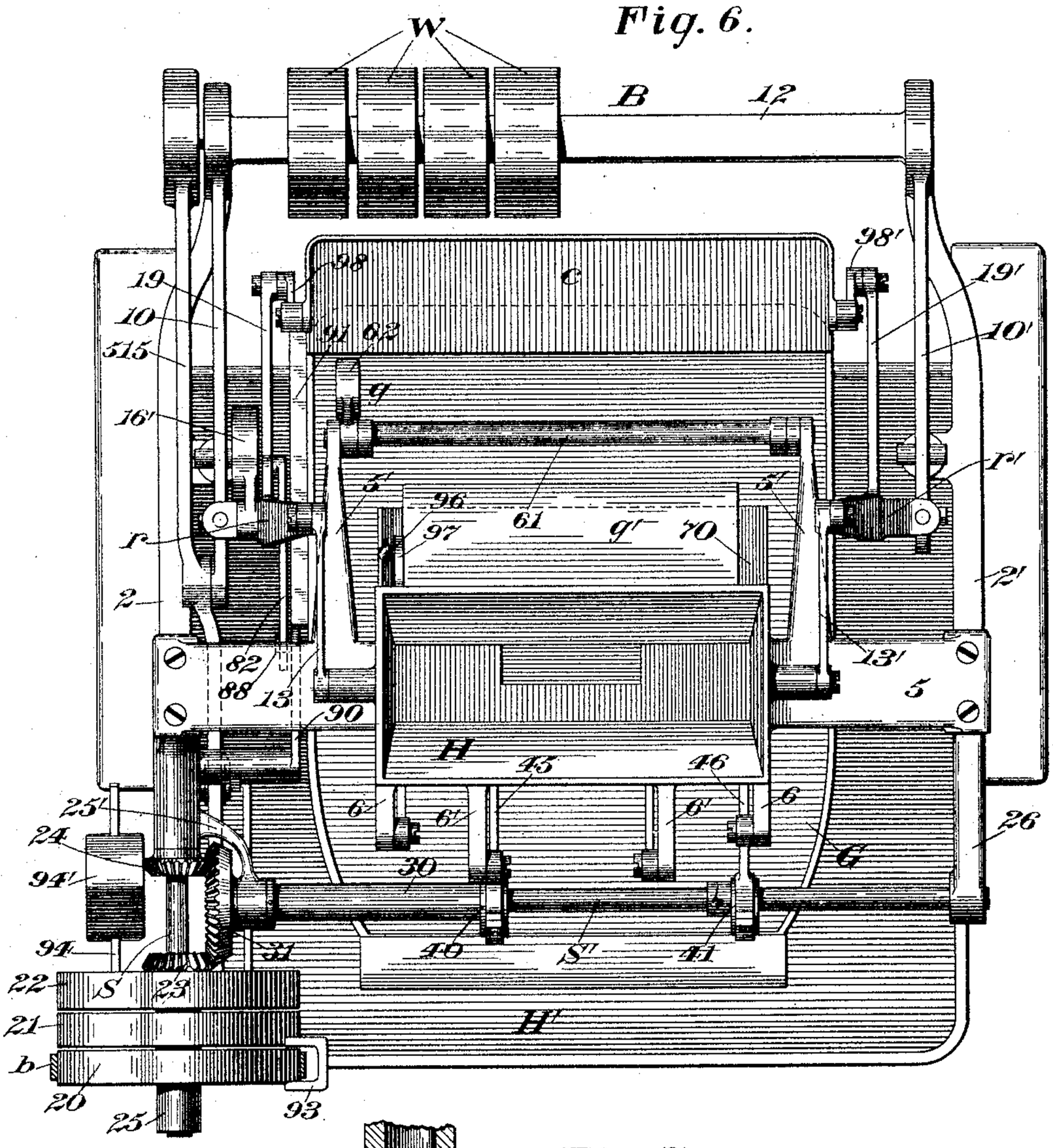


Fig. 7.

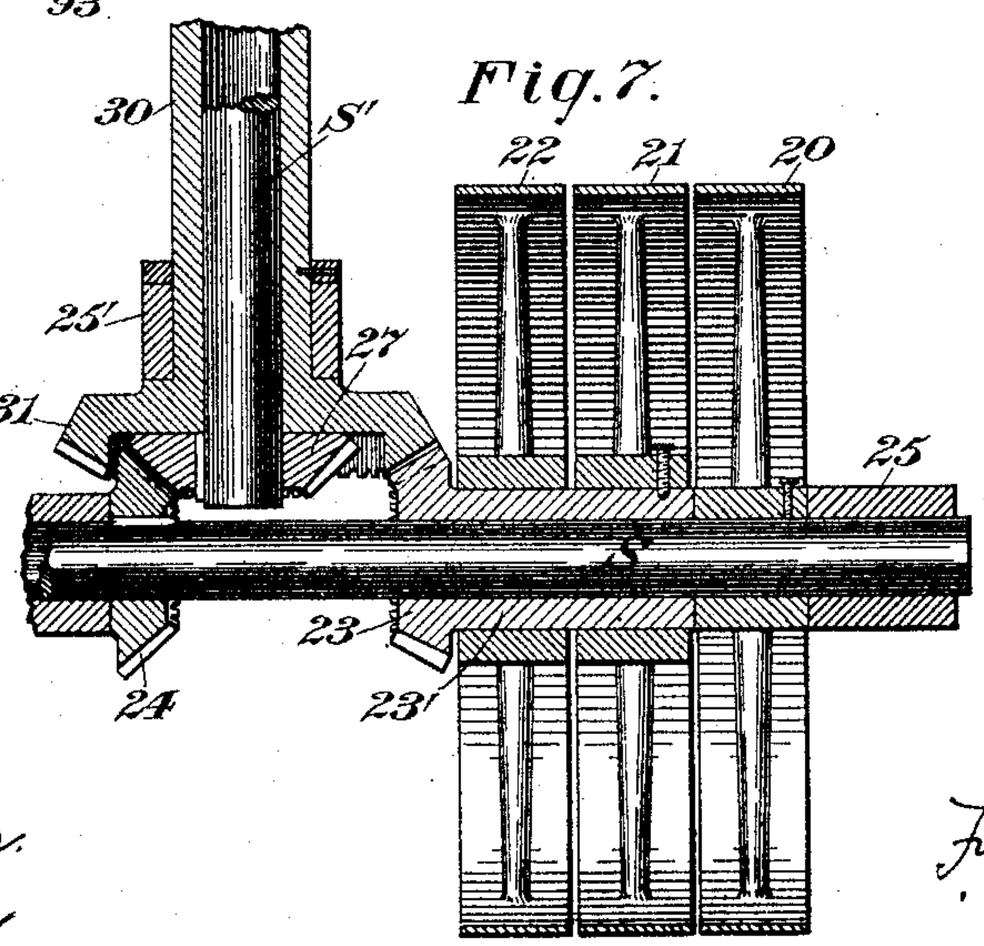


Fig. 8.

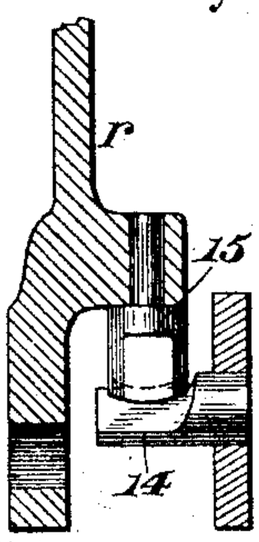
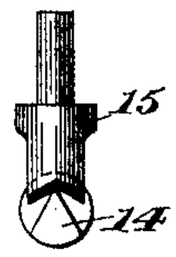


Fig. 9.



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UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT.

AUTOMATIC WEIGHING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 616,860, dated December 27, 1898.

Application filed March 5, 1898. Serial No. 672,726. (No model.)

To all whom it may concern:

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

This invention relates to weighing-machines; and it has for its main object the provision of an improved machine adapted for weighing automatically predetermined quantities of granular or similar material.

One of the main features of this invention is the provision, in a machine of this character, of improved stream-controlling mechanism for governing the supply of material to the load-receiver, one of the essential features of which mechanism is the employment of a pair of separately-operative superposed stream-controllers or valves, one of which governs the supply of the main stream, while the other controls the flow of the drip-stream and may receive its supply of material from a suitable opening or spout leading from the main-stream controller. In connection with these valves I may employ a guard that will prevent scattering of material of the main stream, while permitting the latter to flow unchecked, this guard being shiftable into position to control the volume of the drip-stream when the main stream is cut off.

The two stream-controllers or valves which I prefer to employ will be in the nature of force-feeders, preferably force-feeding pan-valves, supported below the supply-spout and one normally sustaining the column of material delivered from the lower end of such spout, both of these valves or feeders being oscillatory advantageously about an axis outside of the flow-stream and remote from the mouth of the supply-hopper. In connection with these two force-feeders I may make use of driving mechanism for operating the feeders successively, the feeder which supplies the drip-stream preferably having a somewhat shorter range of movement than that which feeds the main stream of material. Suitable differential driving mechanism may be employed for this purpose and controlled by the movements of the weighing mechanism of the machine.

Other features of this invention relate to the construction of the several parts of the weighing-mechanism and to the manner in which these coact with the stream-controlling devices and with the driving mechanism for the feeders, and all of these features will be described fully in detail hereinafter.

In the drawings accompanying and forming part of this specification, Figure 1 is a front elevation of an automatic weighing-machine embodying my present improvements, portions of the framework being broken away to illustrate the construction clearly. Fig. 2 is a side elevation of the machine as seen from the left in Fig. 1, the parts being in positions 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 illustrating the positions of the different devices at the moment of the cut off of the flow of material. Fig. 5 is a similar view showing the positions of the parts on the discharge of a load. Fig. 6 is a plan of the machine. Fig. 7 is an enlarged sectional detail illustrating the organization of the principal parts of the differential driving mechanism. Fig. 8 is an enlarged sectional detail illustrating an improved pivot-bearing for the machine, and Fig. 9 is an end view of said pivot-bearing detached.

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 as its essential elements a pair of side frames 2 and 2′, connected at their lower ends by a discharge-hopper H′ and at their upper ends by a top beam 5, supporting in the usual manner the supply-hopper H.

The stream-controlling means illustrated herein is, as before stated, of improved construction and embodies a pair of valves, such as 70 and 72, the former of which constitutes the main valve and controls the main stream supplied to the load-receiver, while the latter is the usual drip-valve and is intended to feed to said load-receiver the drip-stream for completing the load in the bucket. These two valves are preferably superposed and may be pan-valves, substantially of the usual type,

supported beneath the discharge-mouth of the hopper II and hung from arms, such as 6 and 6′, projecting from the hopper II. (See Figs. 1 and 6.) These valves are therefore supported to swing about axes remote from their working faces and will have a substantially horizontal movement back and forth under the discharge end of the hopper.

The main hopper II of course supplies material to the main valve 70, and the drip-valve 72 may be supplied in any suitable manner, but preferably from the main valve 70, which in this case has an opening in the bottom thereof, through which a portion of the material fed thereto will be delivered to the drip-valve to form the drip-stream. The spout of the main valve projects into the drip-valve from the bottom of the main valve and is indicated herein by 70′. In connection with these two valves I may make use of a guard for preventing scattering of the material of the main stream, and this guard may also serve as a means for controlling positively the volume of the drip-stream delivered during the last stages of the loading operation. This guard, which is designated herein by *g*, may be in the form of a plate, such as 60, secured to a shaft 61, journaled in bearings in the ends of a pair of brackets 5′, projecting rearwardly from the cross-beam 5. (See Fig. 6.) In order to carry the guard-plate into position to control the drip-stream, the guard is preferably counterweighted, as illustrated at 62, and may swing about its axis 61 from the position shown in Fig. 2 to that represented in Fig. 3. In the former position the weight and force of the main stream delivered from the valve 70 will be sufficient to prevent a reduction of the volume of the supply-stream.

It will be noticed that the two valves 70 and 72 are set substantially horizontally, and in this position of course material would not flow into the load-receiver, and hence I have illustrated herein mechanism for operating these pan-valves or feeders to force the material forward on the valves and into the bucket to be loaded. In this case the valves are intended to be vibrated back and forth by suitable driving mechanism. (Illustrated clearly in Figs. 1, 2, 5, 6, and 7.) This driving mechanism may be of any suitable type for imparting successive force-feeding movements to the valves 70 and 72; but I prefer to make use of the devices illustrated in these drawings.

S designates a main driving-shaft, to which is keyed a suitable band-wheel, such as 20, the shaft being journaled at its outer end in bearings in a bracket 25, projecting from the side frame 2, this shaft being somewhat short and having sleeved thereon a loose bevel-gear 23, to the hub 23′ of which is keyed a second band-wheel 21, this sleeve also supporting a loose pulley or band-wheel 22. Near the inner end thereof the shaft S has keyed thereto a bevel-gear 24, which meshes with a corresponding gear 27, secured to a shaft S′, supported at one end in bearings in a bracket 25′, projecting laterally from the main bracket 25, and at its other end in a bracket 26 at the opposite side of the machine. (See Fig. 6.) This shaft S′ is not, however, carried directly by the bracket 25′, but instead passes through a long sleeve 30, to the outer end of which is secured a large bevel-gear 31, which meshes with the bevel-gear 23, the sleeve being carried directly by the bearing in bracket 25.

It will be obvious that when the main shaft S is rotated by the band-wheel 20 the movements of said shaft will be imparted to the shaft S′, while the sleeve 30 will remain still.

When the band-wheel 21 is rotated, the gear-wheel 23 will communicate its rotation to the large bevel-gear 31 and hence to the sleeve 30, which will rotate at a slower rate of speed than will the shaft S′. All of the pulleys or band-wheels mentioned will of course be controlled by a single driving-belt.

The shaft S′ and the sleeve 30 constitute in this case means for operating the force-feeding pan-valves 70 and 72 and for imparting to them differential feed movements. Of course the main valve by which the main stream is controlled should be operated somewhat faster and will preferably have a greater range of movement than the drip-valve 72, and for this reason the main valve is operatively connected with the shaft S′ in this instance by means of an eccentric and a strap-rod, while the drip-valve 72 is connected in a corresponding manner with the sleeve 30.

The two eccentrics by means of which the movements of the driven shaft and the sleeve are transmitted to the main valve and the drip-valve, respectively, are indicated herein by 40 and 41, the former being secured to the sleeve 30, while the latter is fixed on the shaft S′. These two members will preferably be differential eccentrics, the former being so constructed as to impart a somewhat shorter vibratory movement to the drip-valve than the latter does to the main valve.

The connection between the valves and the eccentrics may be made in any suitable manner by means of strap-rods, such as 45 and 46, the former of which connects the eccentric 40 with the drip-valve, while the latter joins the eccentric 41 and the main valve.

The beam mechanism which I prefer to employ will preferably be of the "single-beam" type, such as is illustrated in a general way by B, and consists in this instance of a pair of beam-arms 10 and 10′, supported in the usual manner upon knife-edge pivots carried by the framework and connected at their rear ends by a cross-bar, such as 12, preferably rectangular in cross-section and carrying a set of slidable weights W of various sizes, which may be changed as desired to regulate the size of the load to be weighed.

The beam mechanism is intended to support a load-receiver, which may be substantially of the type illustrated herein at G; but this load-receiver or bucket, which in the con-

struction shown is of the "tilting" type, will not be carried directly by the framework in this instance, but by a member or members pivotally supported on the beam mechanism. In this case I have shown a pair of risers pivoted, respectively, on the arms 10 and 10′, preferably by means of knife-edge pivots, such as are illustrated in Fig. 8. Two of these risers are shown, and they are designated, respectively, by *r* and *r*′. Both may be guided at their upper ends in any suitable manner—as, for instance, by means of links 13 and 13′, connected with the supply-hopper H.

The pivot or knife-edge bearings between the beam and the risers are of novel construction and are clearly illustrated in detail in Fig. 9. As both sets of bearings are constructed in the same manner a description of one is sufficient for both.

The bearing member (indicated in a general way by 14) may be substantially of the usual V-shaped type, and the journal member, which is designated by 15, may be secured to the riser in any suitable manner and will preferably have a groove therein V-shaped in cross-section, the point or working face of this groove being convex from end to end thereof to permit a slight lateral rocking or rolling of the riser on the beam-pivot.

As before stated, the tilting load-receiver or bucket is not mounted directly on the beam mechanism, but is intended to be supported by the risers just described, and in this instance these risers have bearings therein, preferably below the knife-edge bearings just referred to, for the purpose of receiving in the usual manner trunnions projecting from the sides of the bucket. (See Fig. 1.) This load-receiver turns upon its trunnions to discharge its load and to regain its normal position, and hence is preferably counterweighted, but the counterweight is not in this case carried directly by the bucket for movement in unison therewith. Instead, the counterweight, which may be of the type indicated herein by 16′, is pivoted on one of the risers and is connected in some suitable manner with the load-receiver for operating the latter. Preferably the counterweight 16′ forms part of a lever 16, and that part of the lever which is on the side of the pivot opposite the counterweight may be connected by a link, such as 17, with a suitable point in the bucket.

The lever 16 is intended to be held by a suitable device or latch substantially in the usual manner, and hence when so held the bucket also will be retained in its normal load-receiving position. Preferably the extreme end of the lever has a stop or detent face which coacts with a latch, mounted in this case on the same riser as the lever 16. This latch is of the ordinary type and is designated by 82. It has the usual holding-face or latch-face 82′ and a long releasing-arm adapted to coact with a releasing device or latch-tripper—such, for example, as that shown at 88.

In the construction illustrated herein the latch-tripper 88 is in the form of a releasing face or pin carried by an interlocking segment 90, coöperative with the stream-controlling means, which means of course may embody both the valves and the power-feed mechanism therefor. The other interlocking stop, which coacts with the stop 90, is designated by 91 and is in the nature of a long stop-face on one side of the load-receiver, these two interlocking stops coöperating with each other in a well-known manner to prevent discharge of a load while the valves are operating and to prevent the feeding of material by the pan-valves while the load-receiver is discharging.

In the present case the interlocking stop 90 is supported on the framework, and a rock-arm 90′, moving therewith, is connected to a link 92, which in turn is operated by the usual belt-shipper 93, controlling the belt *b*, by which the feeding of the main stream and the drip-stream and the stopping of the feed are controlled. This belt-shipper has preferably a balance-weight 93′ below the pivot of the belt-shipping lever and an actuating-weight 94′ on an arm 94, projecting from the pivot of the belt-shipper, substantially at right angles to the body thereof. Another substantially right-angled arm 95 may coact with the usual valve-opening actuator 515 on the beam mechanism, by which actuator the belt will be shifted onto the pulley 20 on the return of the bucket to its normal position after discharging a load.

In addition to the devices hereinbefore described for preventing scattering of the material of the stream delivered to the load-receiver I may employ an adjustable guard, such as *g*′, supported just above the discharge end of the main valve 70 and adjustable by means of a clamp-screw 96, working in a slot 97′ in a bracket 97, projecting from the upper part of the framework, and I may also make use of a combined guard and catch-pan connected to the load-receiver. These last-mentioned devices will be supported, preferably, by a pair of links, such as 98, pivoted to rearwardly-projecting arms 19 and 19′, forming parts of the respective risers *r* and *r*′.

The catch-pan proper, which is designated in a general way by *c*, is pivoted between its ends and near the rear end thereof to the upper ends of the links 98, while the inner end of said catch-pan is hinged directly to the bucket. This catch-pan is so shaped that normally when the bucket is in its load-receiving position said pan forms a guard for preventing spattering of material falling into the bucket; but when the receiver is tilted and the catch-pan shifted the latter will pass under the discharge ends of the two valves into position to receive and hold any material which may be dislodged accidentally from the valves while the completed load is being delivered into the discharge-hopper H′. Of course when the bucket returns to its normal

position the catch-pan will deliver any such particles into the bucket to form part of the new load.

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 all of the parts are in their normal positions for making up a load, it will be seen that the belt *b* is on the band-wheel 20 and that through the connections from the driving-shafts S and S′ the valve 70 is being vibrated to feed the material positively into the receiver; that the guard G is pushed aside by the falling stream, (see Fig. 2;) that the catch-pan *c* is in its inclined position; that the interlocking stop 90 is in position to prevent tilting of the load-receiver to discharge a load, and that the drip-valve is not operating. As soon as the major part of the load is discharged into the bucket by the main stream the bucket begins to descend, and at the proper point in its downward movement the counterweight 94′ becomes effective to shift the belt-shipper 93 off from the pulley 20 and onto the pulley 21, whereupon the flow of the main stream is stopped and the guard-plate 60 swings into position to control positively the volume of the drip-stream to be delivered by the valve 72. As soon as the belt is shifted the connections from the sleeve 23′ and the sleeve 30 cause the drip-valve to be vibrated at a slower rate of speed than the main valve is operated and through a shorter distance, a drip-stream of suitable size being thus fed positively into the load-receiver. (See Fig. 3.) As soon as the load is completed the continued descent of the beam permits the counterweight 94′ to shift the belt-shipper off from the pulley 21 and onto the idle-pulley 22, whereupon of course the flow of material will be stopped. Substantially at the same time the latch-tripper 88, which moves with the interlocking segment 90, connected with the belt-shipper 93, lifts the latch 82, and the segment 90 now being clear of the segment 91 the load-receiver tilts and the material therein is discharged into the hopper H′. On the tilting of the bucket the counterweight 16′ and the catch-pan *c* are both shifted relatively to the load-receiver, and said pan-valve is brought into position to catch any material which may be discharged accidentally from either of the two valves 70 and 72. While the bucket is in its discharging position, of course, the interlock 91 prevents the shifting of the belt off from the loose pulley; but as soon as all of the material passes out from the receiver the counterweight 16′ becomes effective to return the bucket to its normal position, whereupon the catch-pan is shifted back to the inclined position shown in Fig. 2 and discharges its contents, if any, into the receiver, the latch reëngages the detent end of the lever 16, the interlock 91 is withdrawn from the interlock 90, and the actuator 515 becomes effective to shift the belt back onto the pulley 20 for the making up of a new load.

Having described my invention, I claim—

1. In a weighing-machine, the combination, with stream-supplying means, of a pair of pan-valves hinged at their rear ends to the framework for oscillation and supported one above the other; and means for vibrating said stream-controllers.

2. In a weighing-machine, the combination, with stream-supplying means, of a pair of pan-valves hinged at the rear ends thereof to the framework for oscillation, and said valves being located one above the other, and the upper valve having a depending spout for supplying material to the lower valve; and means for vibrating said valve.

3. In a weighing-machine, the combination, with stream-supplying means, of separately-operative superposed main and drip valves facing in the same direction; actuating means for said valves; and a reactive guard coacting with said valves and shiftable by the stream delivered from the main valve.

4. In a weighing-machine, the combination, with stream-supplying means, of separately-operative superposed main and drip valves facing in the same direction; actuating means for said valve; and a counterpoised swinging guard coacting with said valves and shiftable by the stream delivered from the main valve.

5. In a weighing-machine, the combination, with stream-supplying means, of independently-operative superposed main and drip-pan valves facing in the same direction; actuating means for said valves; and a counterweighted swinging guard-plate pivoted near its upper end and coacting with said valves and shiftable by the stream delivered from the main valve, and also shiftable by its counterweight into position to reduce the stream delivered from the drip-valve.

6. In a weighing-machine, the combination, with stream-supplying means, of a pair of force-feeders governing, respectively, the main stream and the drip-stream, and one of said force-feeders being vibratory, and actuating means for said force-feeders.

7. In a weighing-machine, the combination, with stream-supplying means, of a pair of vibratory force-feeders governing, respectively, the main stream and the drip-stream, and actuating means for said force-feeders.

8. In a weighing-machine, the combination, with stream-supplying means, of a pair of oscillatory combined valve and force feeders successively operative for delivering, respectively, the main stream and the drip-stream, and actuating means for said force-feeders.

9. In a weighing-machine, the combination, with stream-supplying means, of a pair of swinging force-feeders governing, respectively, the main stream and the drip-steam, and actuating means for said force-feeders.

10. In a weighing-machine, the combina-

tion, with stream-supplying means, of a pair of oscillatory force-feeding valves governing, respectively, the main stream and the drip-stream, and actuating means for successively vibrating said force-feeding valves.

11. In a weighing-machine, the combination, with stream-supplying means, of a pair of swinging vibratory force-feeding pan-valves governing, respectively, the main stream and the drip-stream, and actuating means for said force-feeding valves.

12. In a weighing-machine, the combination, with stream-supplying means, of a pair of swinging force-feeding valves governing, respectively, the main stream and the drip-stream and having their axes of oscillation remote from their working faces, and actuating means for said force-feeding valves.

13. In a weighing-machine, the combination, with stream-supplying means, of driving mechanism; a pair of eccentrics operative by the driving mechanism; and a pair of force-feeders operative by said eccentrics and governing, respectively, the main stream and the drip-stream.

14. In a weighing-machine, the combination, with stream-supplying means, of driving mechanism; a pair of separately-operative eccentrics operative by said driving mechanism and having a common axis of rotation; a pair of force-feeders; and strap-rods connecting said valves, respectively, with said eccentrics.

15. In a weighing-machine, the combination, with stream-supplying means, of driving mechanism; a pair of separately-operative eccentrics operative by said driving mechanism and having a common axis of rotation; a pair of vibratory force-feeding pan-valves; and strap-rods connecting said valves, respectively, with said eccentrics.

16. In a weighing-machine, the combination, with stream-supplying means, of separately-operative superposed main and drip valves, the former having a spout projecting therefrom into the latter for supplying material to the drip-valve; actuating means for said valves; and a swinging catch-pan normally inoperative; and means for shifting said catch-pan into its operative position on the discharge of the load.

17. In a weighing-machine, the combination, with stream-supplying means, of separately-operative superposed main and drip valves, the former having a spout projecting therefrom into the latter for supplying material to the drip-valve; actuating means for said valves; weighing mechanism including a tilting load-receiver; and a swinging catch-pan connected with the load-receiver and normally inoperative and shiftable into its operative position by the load-receiver on the discharge of a load.

18. In a weighing-machine, the combination, with stream-supplying means, of stream-controlling means; a weighing mechanism including a member shiftable for discharging the load; a latch for said shiftable member; a pair of interlocking stops operative, respectively, with the stream-controlling means and the shiftable member of the load-receiver; and a latch-tripper carried by the interlocking stop for said shiftable member of the load-receiver.

19. In a weighing-machine, the combination, with counterweighted beam mechanism, of a tilting load-receiver on said beam mechanism, and a counterweight supported independently of the load-receiver and connected therewith for normally holding the load-receiver in a predetermined position.

20. In a weighing-machine, the combination, with counterweighted beam mechanism, of a tilting load-receiver supported on said beam mechanism, and a counterweight supported on the beam mechanism independently of the load-receiver and connected with the latter for holding the load-receiver in a predetermined position.

21. In a weighing-machine, the combination, with framework, of counterweighted beam mechanism; a tilting load-receiver; a riser pivoted on the beam mechanism; a guide for said riser; and a counterweight supported on said riser and connected with the load-receiver for normally holding the latter in a predetermined position.

22. In a weighing-machine, the combination, with framework, of counterweighted beam mechanism; a pair of risers pivoted on the beam mechanism at opposite sides of the machine; means for guiding said risers; a tilting load-receiver pivotally supported by said risers; and a counterweight supported on one of said risers and connected with the load-receiver for normally holding the latter in a predetermined position.

23. In a weighing-machine, the combination, with framework, of beam mechanism; a load-receiver; a stop connected with the load-receiver and movable relatively thereto; holding means for engaging said stop to hold the load-receiver in a predetermined position; and releasing means for disengaging said holding means from the stop.

24. In a weighing-machine, the combination, with framework, of beam mechanism; a load-receiver; a stop supported independently of the load-receiver and connected with the latter and movable relatively thereto; a latch for said stop; and a latch-tripper.

25. In a weighing-machine, the combination, with framework, of beam mechanism; a load-receiver; a counterweighted stop supported independently of the load-receiver and connected with the latter and movable relatively thereto; a latch for said stop; and a latch-tripper.

26. In a weighing-machine, the combination, with framework, of weighing mechanism including counterweighted beam mechanism and a member shiftable for discharging a load; a riser pivoted on the beam mechanism; a guide for said riser; a stop on the riser and

connected with, and movable relatively to, the shiftable member of the load-receiver; a latch for said stop; and a latch-tripper.

27. In a weighing-machine, the combination, with framework, of weighing mechanism including counterweighted beam mechanism and a member shiftable for discharging a load; a riser pivoted on the beam mechanism; a guide for said riser; a stop on said riser and connected with, and movable relatively to, the shiftable member of the load-receiver; a latch supported on said riser and coacting with said stop; and a latch-tripper.

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