No. 616,862. Patented Dec. 27, 1898.

F. H. RICHARDS.

WEIGHING MACHINE.

(Application filed Dec. 13, 1897.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

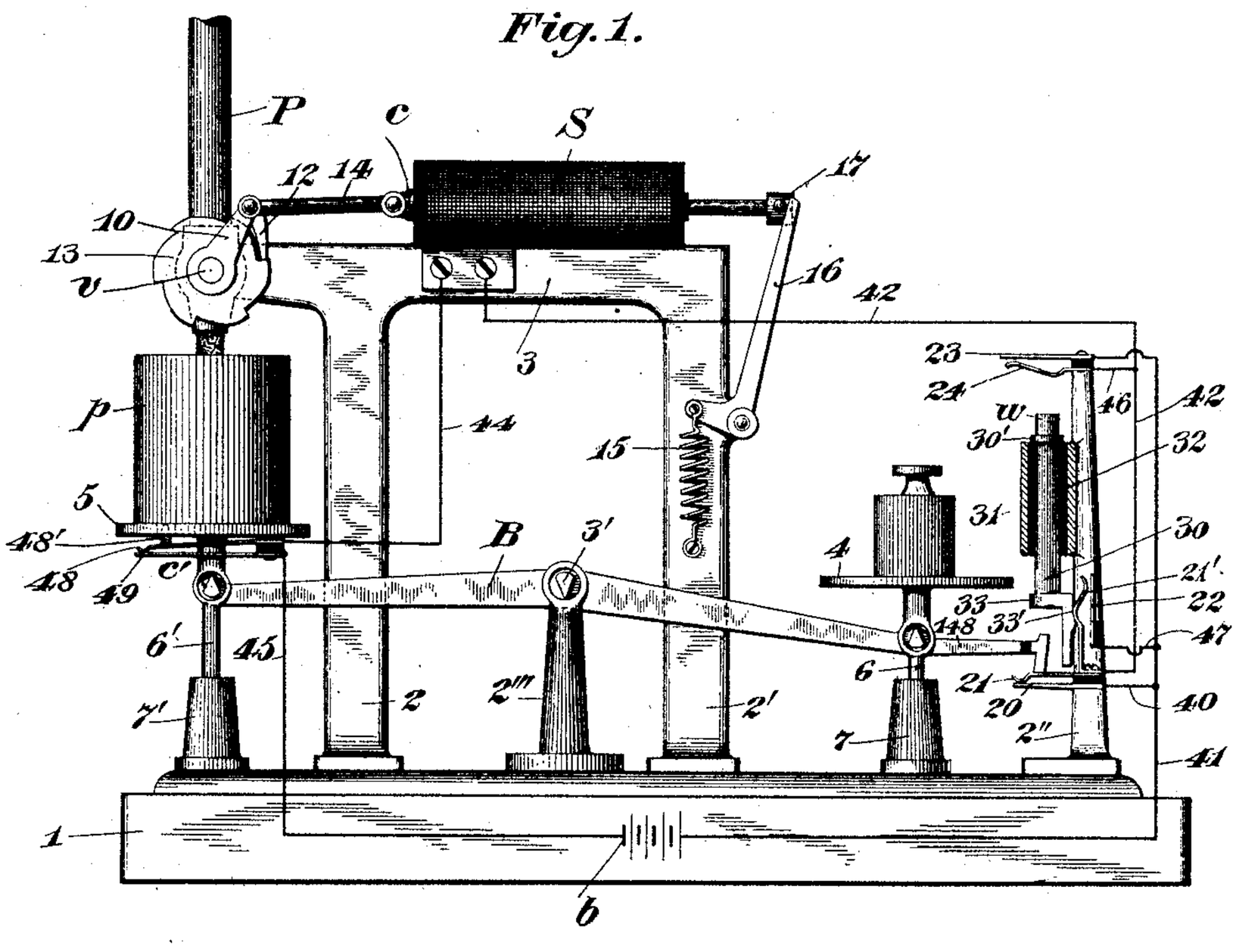
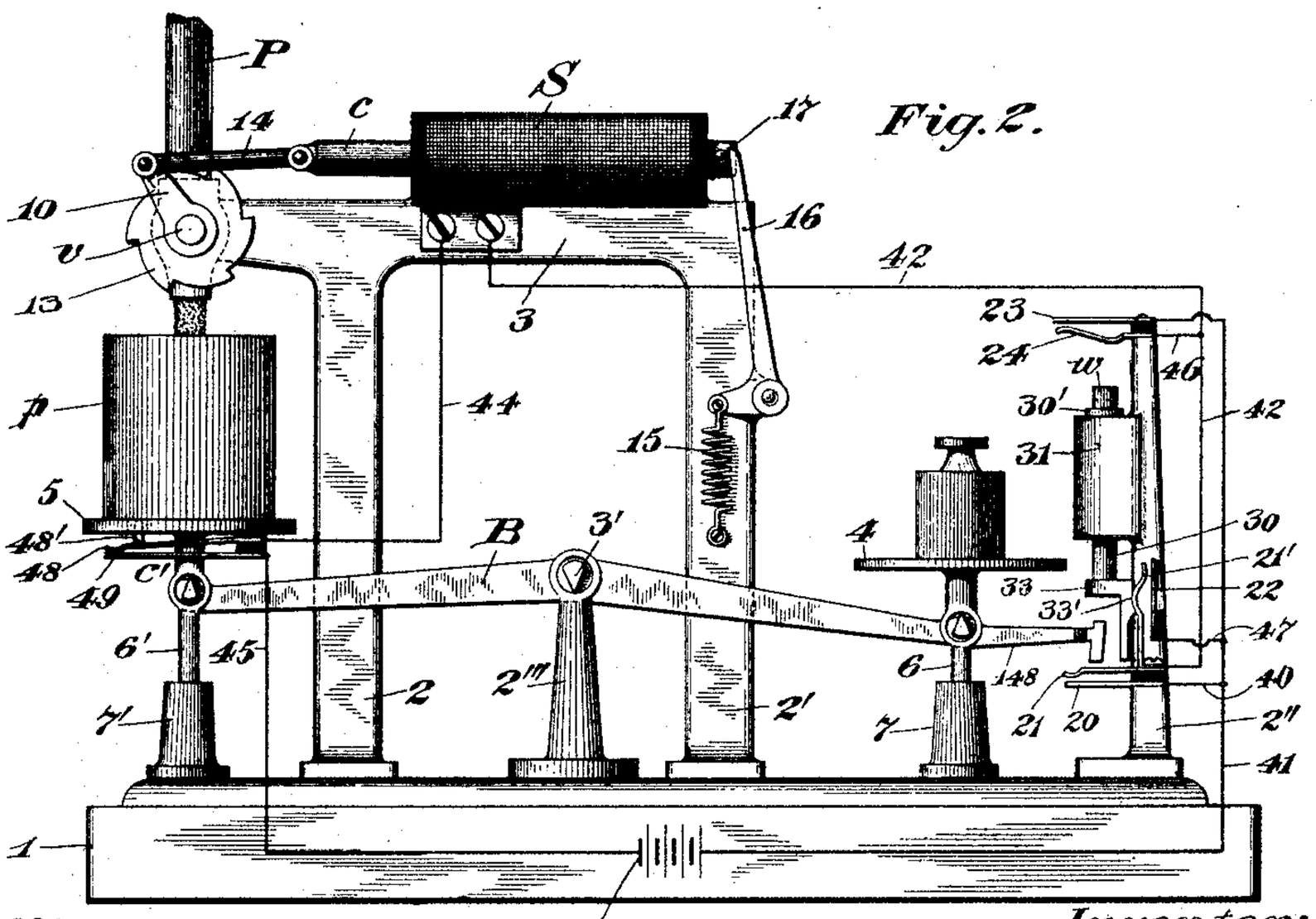


Fig. 2.



Witnesses:
F. G. Hewitt
Fred. J. Dole.

Inventor:
F. H. Richards.

No. 616,862. Patented Dec. 27, 1898.

F. H. RICHARDS.

WEIGHING MACHINE.

(Application filed Dec. 13, 1897.)

(No Model.) 3 Sheets—Sheet 2.

Fig. 3.

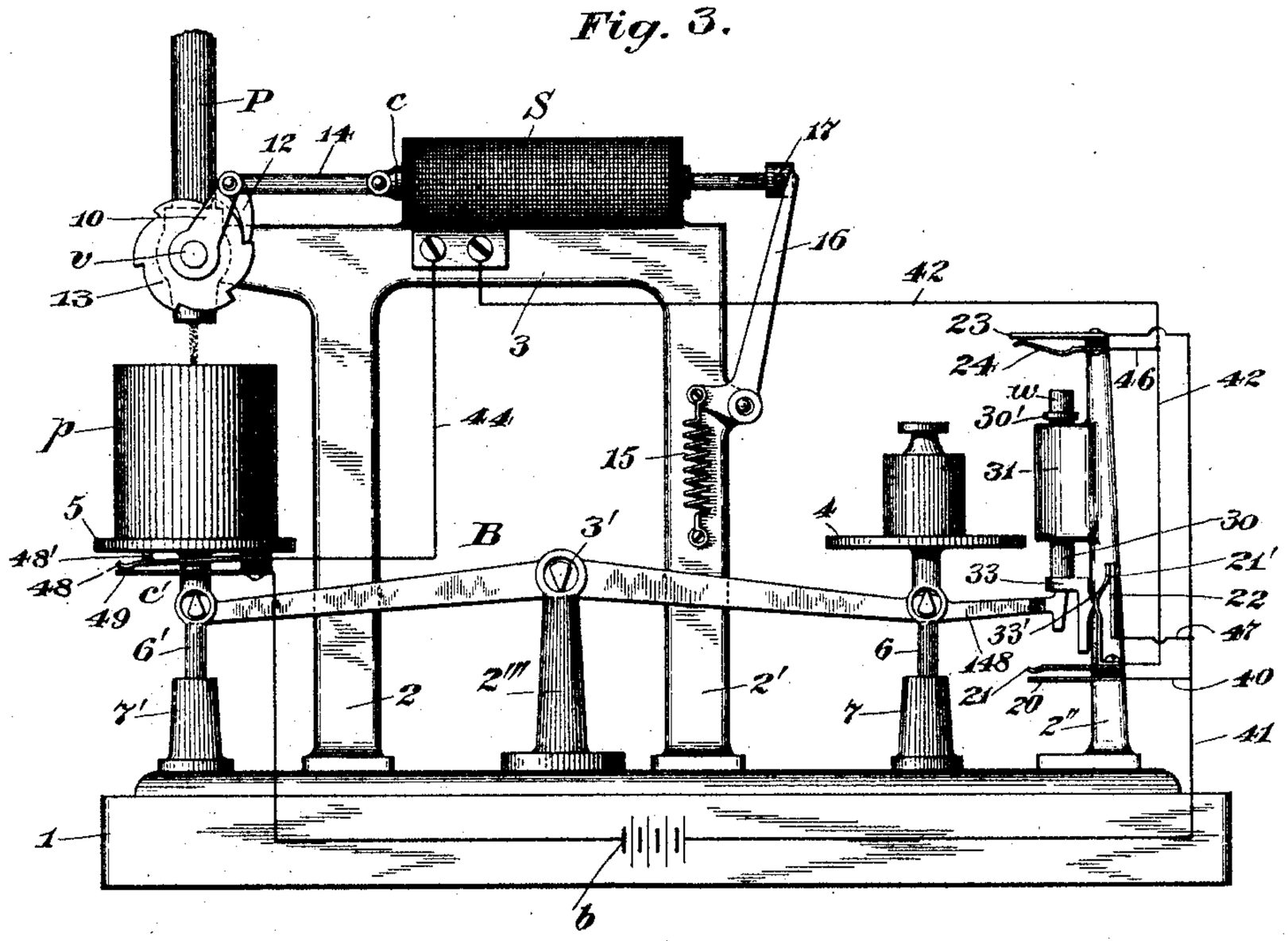
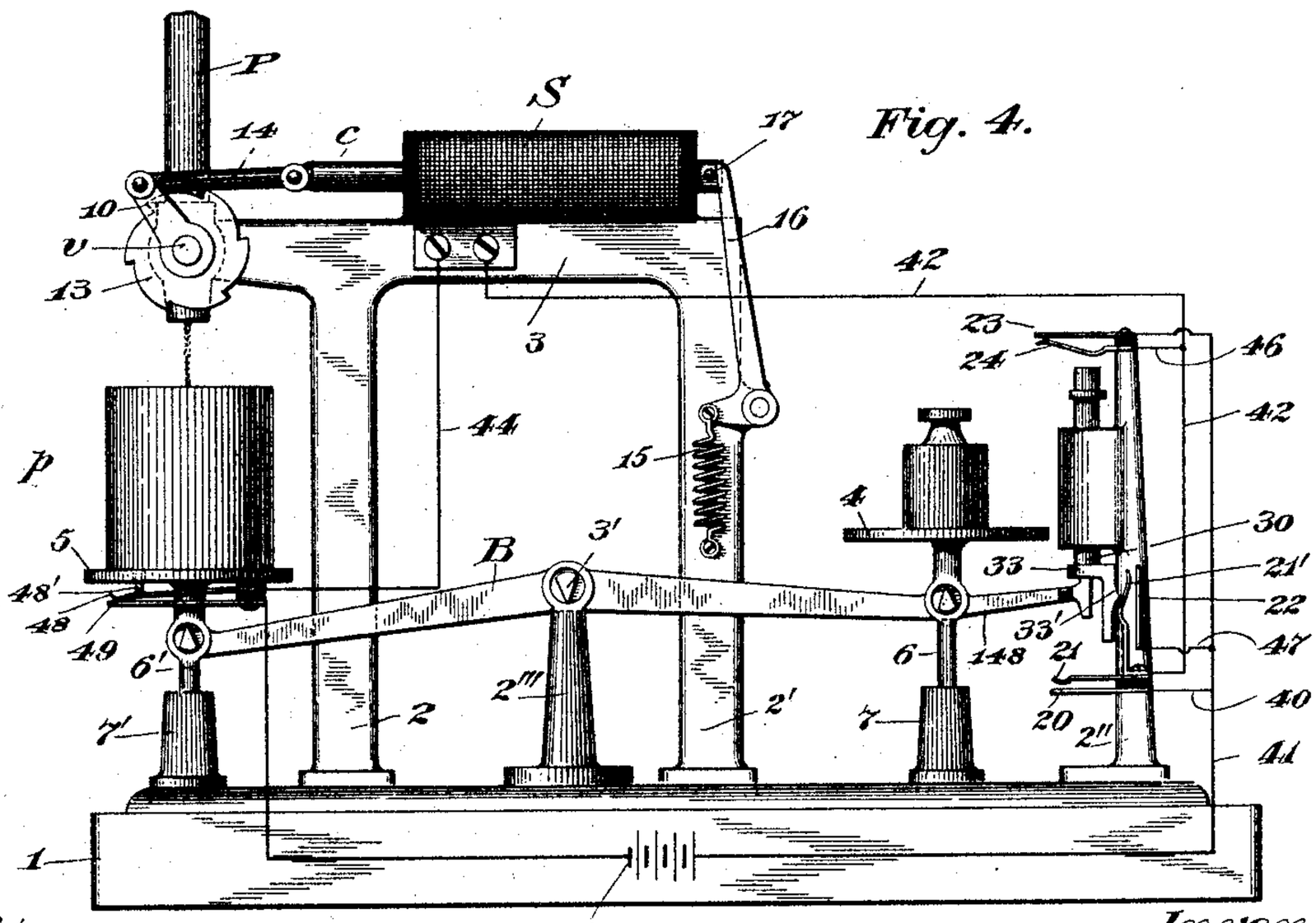


Fig. 4.



Witnesses:
P. G. Hewitt
Fred. J. Dole.

Inventor:
F. H. Richards.

No. 616,862. Patented Dec. 27, 1898.

F. H. RICHARDS.

WEIGHING MACHINE.

(Application filed Dec. 13, 1897.)

(No Model.) 3 Sheets—Sheet 3.

Fig. 5.

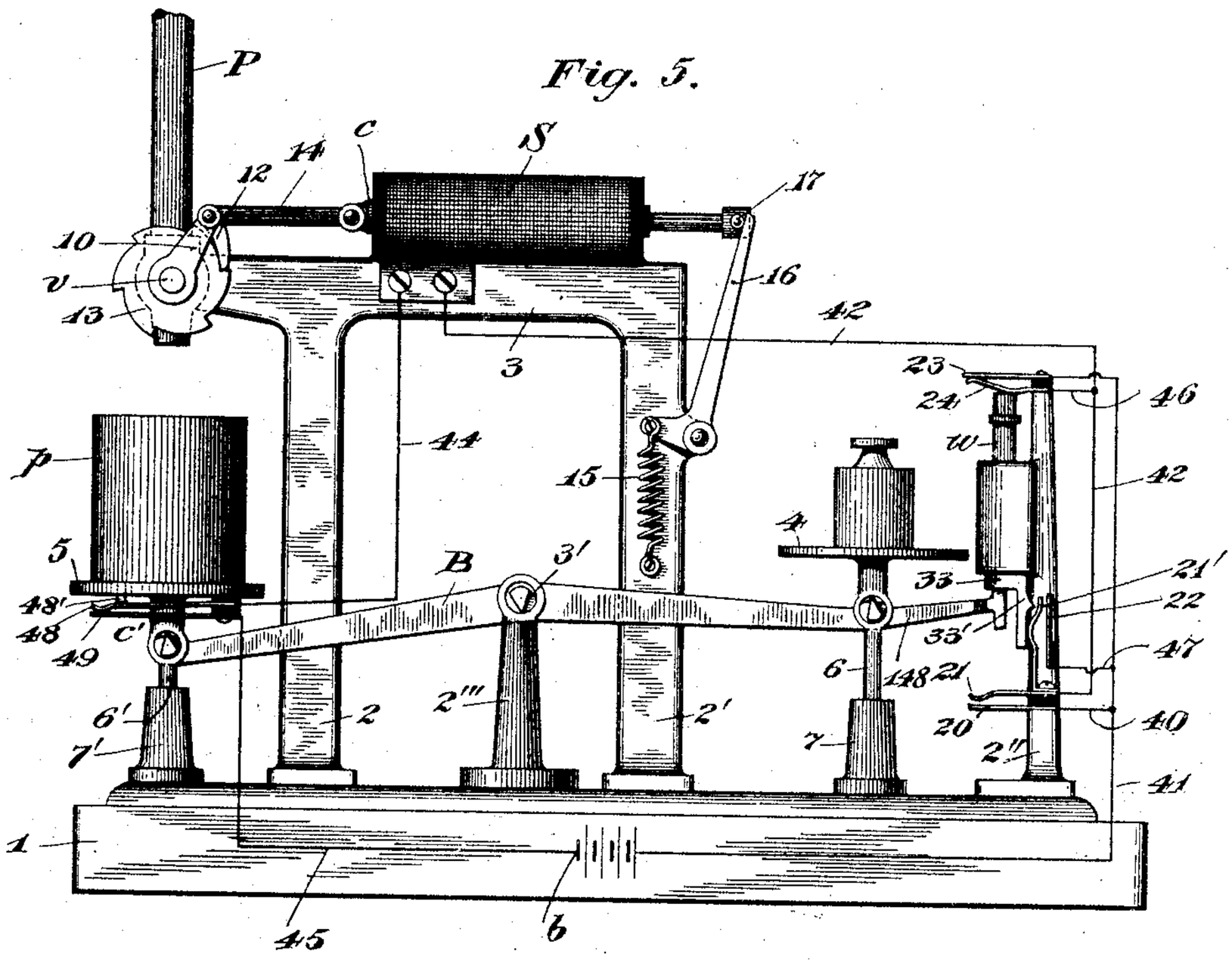


Fig. 6.

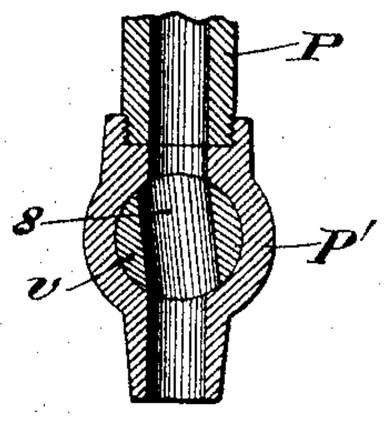


Fig. 7.

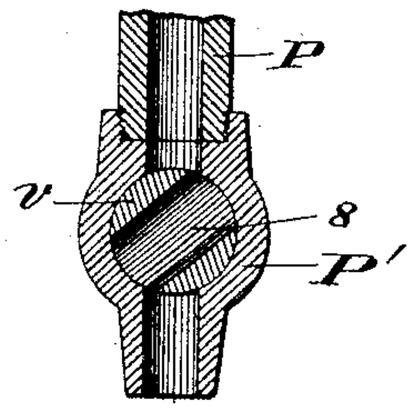
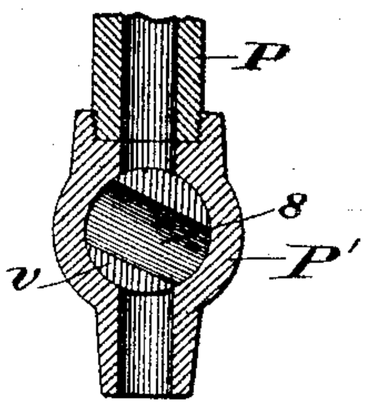


Fig. 8.



Witnesses:
F. G. Hewitt.
Fred. J. Dole.

Inventor:
F. H. Richards.

UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT.

WEIGHING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 616,862, dated December 27, 1898.

Application filed December 13, 1897. Serial No. 661,619. (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, and especially to automatic electrically-controlled weighing-scales adapted for weighing predetermined quantities of material; and it has for its main object the provision of an improved scale of this type in which no force will be applied to a stream-controlling valve for opening the same while the valve-closing force is being exerted thereon, and vice versa.

My present invention is in the nature of an improvement upon that shown and described in my application, Serial No. 661,411, filed December 10, 1897, in which is embodied a valve operated in the manner above stated; and it is also an improvement upon the invention described in my application, Serial No. 661,528, filed December 11, 1897, in which I have shown and claimed a construction embodying an intermittently-rotative valve in which the valve-actuating forces never oppose one another. In this case also I have retained the generic features of construction illustrated in the drawings of such other applications; but the principal feature of this invention as distinguished from those embodied in said other applications is the employment of an intermittently-rotative valve and a reciprocatory valve-actuator therefor operative for applying to the valve intermittently independent valve-actuating forces, one or more of which may be a valve-closing force or forces, while another may be a valve-opening force.

In the preferred construction I make use of an intermittently-rotative plug-valve and an oscillatory actuator having alternate working and idle strokes, the working strokes of which will be transmitted to the valve for exerting thereon successive independent opening and closing forces, while the idle strokes of the actuator will have no effect upon the valve to change the position thereof.

As before stated, the machine illustrated herein is intended to be electrically controlled, and hence for the purpose of operating the reciprocatory actuating member just referred to I prefer to make use of an electromagnet or solenoid the armature or core of which may be connected directly to such actuator, while the circuit to the solenoid will be controlled by the weighing mechanism substantially in the manner described and illustrated in the applications to which I have hereinbefore referred. This solenoid will usually operate when energized to impart a working stroke to the reciprocatory valve-actuator, and when deënergized a suitable spring may return the core to its normal position and impart an idle stroke to said actuator. These working and idle strokes may be transmitted to the stem of the plug-valve by means of a pawl-and-ratchet-wheel connection operating in the usual manner.

The circuit-controlling means governed by the weighing mechanism proper should be operative in such manner as to make and break a circuit to the solenoid a plurality of times during each cycle of operations of the weighing-machine, these makes and breaks corresponding to the several valve-opening and valve-closing movements, the manner in which these parts are controlled being substantially similar to that described in said other applications.

As the machine forming the subject-matter of this invention and illustrated herein is intended particularly as a means for weighing predetermined quantities of material in small lots into receptacles or packages removable from the weighing-machine and forming no part of the permanent mechanism thereof and as in such a machine if no other circuit-controlling means were employed than that governed by the beam mechanism proper the valve might be opened and material delivered therefrom with no package in position to receive the stream flowing from the supply-spout, I have illustrated herein, as in said other cases, circuit-controlling means governed by the proper placing of a receptacle or package in position on a suitable scale-pan or package-carrier, which circuit-controlling means will maintain an open circuit to the solenoid at all times except when a can is in place.

In connection with the circuit-controlling

means governed by the weighing mechanism proper I employ a slidable poise-weight, which is suitably mounted on the framework and forms part of such circuit-controlling means. Normally this poise-weight will be supported on the framework and will not exert its force on the beam mechanism until the poising side of the latter shall have been carried down to a predetermined point by the weight of the partial charge made up in the package carried on the scale-pan, and this poise-weight may control both the circuit for energizing the solenoid to shift the valve to its drip position and that for energizing said solenoid to cut off the flow of material entirely.

In the drawings accompanying and forming part of this specification, Figure 1 is a side elevation of an automatic electrically-controlled weighing-machine constructed in accordance with my present improvements and illustrates the parts in the positions which they assume when the full supply flows into the load-receiver at the beginning of the making up of a new load. Fig. 2 is a similar view showing the positions of the parts when the beam begins to descend and the circuit to the solenoid is broken to permit the idle stroke of the core and of the actuator controlling the valve. Fig. 3 is a similar view showing the positions of the parts when the beam mechanism descends to a point where the circuit to the solenoid will be reëstablished and the valve shifted to the drip position shown in Fig. 7. Fig. 4 is a similar view illustrating the next idle stroke of the core and the valve-actuator when the last-mentioned circuit is broken by the continued descent of the beam during the drip period. Fig. 5 is a similar view showing the positions of the parts when the valve is closed and the stream cut off entirely on the reënergization of the solenoid due to the making of the circuit on the shifting of the poise-weight by the weighing mechanism proper. Figs. 6, 7, and 8 are enlarged sectional details illustrating the different positions of the valve.

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 embodies a base or bedplate 1, from which rise three standards 2, 2′, and 2″, the former of which may be connected at their upper ends by a member, (indicated at 3,) which may form therewith a single or unitary casting on which the solenoid and the valve mechanism may be mounted.

Any usual form of weighing mechanism may be employed; but I prefer to make use of beam mechanism of the "single-beam" type, (indicated herein by B,) which beam may be supported in the usual manner by knife-edge pivots, such as 3′, on a short post, such as 2‴, rising from the base 1. Near the opposite ends thereof this beam may have pivotally supported thereon a pair of substantially flat pans, one of which is indicated by 4 and will constitute the weight-pan and the other of which is designated by 5 and forms a scale-pan or package-carrier on which the receptacles or packages into which the material is to be delivered may be supported. These two pans may be guided in their movements and maintained in their horizontal positions in any suitable manner, as by means of a pair of rods or hangers 6 and 6′, depending below the beam and working at their lower ends in suitable openings in bosses 7 and 7′, rising from the base 1.

The stream-controlling means or valve mechanism may be of any suitable type so long as the essential feature of an intermittently-rotative stream-controller is retained; but I prefer to employ a stream-supplying pipe or conduit, such as P, the flow of material through which will be regulated by a small rotary plug-valve *v*, journaled in the usual valve-body, which may be screwed onto the end of the pipe P, as shown at P′. This valve *v* may have a transverse opening 8 extending therethrough and of sufficient size to permit the material in the pipe to flow out unimpeded when the valve is wide open.

In the construction illustrated the valve will accomplish two complete operations during each single rotation thereof, it moving through three successive stages in substantially equal arcs during each half-rotation, these three stages or steps of movement corresponding, respectively, to the two movements of the valve for reducing and cutting off the flow-stream and the single movement for shifting the valve to its wide-open position.

The valve-actuating mechanism will, as before stated, embody as its essential feature a reciprocatory actuator, which will preferably be in the form of an oscillating arm 10, mounted loosely on the stem of the valve *v*. This arm may also carry at its free end a pawl 12, which will coöperate with a ratchet-wheel 13, secured to the valve-stem and having six long teeth, corresponding to the six movements of the valve during the two cycles of operation in a single rotation of the ratchet-wheel. The arm 10 is also pivoted to a connecting-link 14, which may be operated by any suitable electrically-controlled actuating member—such, for example, as the solenoid S, to one end of the core *c* of which the link 14 is pivoted.

When the coils of the solenoid are not energized, the core may be expelled by means of a spring 15, connected to an angle-lever 16, both carried on the framework, the long arm of the lever coacting with a suitable stop or pin, such as 17, on the core *c*, this stop being preferably adjustable.

The circuit-controlling means governed by the weighing mechanism is of novel construction and embodies in this case three sets of circuit-controlling members at corresponding breaks in the circuit to the solenoid. These circuit-controlling members are indicated

herein by 20 21, 21′ 22, and 23 24. The first set controls the opening of the valve, the second the first closing movement of the valve to the drip position, and the third the movement of said valve to cut off the stream completely. The members 20 21 are controlled solely and directly by the beam mechanism proper, which carries a contact-making arm 148. When the beam mechanism is counterpoised and is in its normal position, this arm will close the break at 20 21, but will open said break when the beam mechanism begins to descend toward the poising-line. The other two breaks are controlled by the contact member *w*, which in this case is in the form of a sliding bolt 30, mounted for reciprocation in a vertical direction in the bore of a member 31, projecting from the upright 2″. The poise-weight is insulated from the member 31, as indicated at 32, and it has a stop-flange 30′ for limiting the downward movement thereof. At the lower end of the bolt 30 there is an angle piece or arm 33, one member of which forms a stop for limiting the upward movement of the poise-weight, while the other arm has a cam-face 33′, so shaped as to operate as an actuator for closing the circuit between the contacts 21′ and 22 at the proper point in the movement of the poise-weight. As will be obvious, the upper end of the bolt 30 serves in a similar manner to close the break between the contacts 23 and 24 when the stream is entirely cut off by the valve.

The contact-arm 20 is connected by a conductor 40 with the return-conductor 41, leading to a source of energy or battery *b*, while the contact-arm 21 is connected by a conductor 42 to one terminal of the solenoid S, the other terminal of which is connected in turn, by means of a conductor 44, with the package-controlled contact-making means, while the other conductor 45, connected with said package-controlled contact-maker, connects with the opposite side of the battery *b* from that with which conductor 41 is connected.

Contact 23 is connected directly to the return-conductor 41, and contact 24 is connected, by means of a short conductor 46, to the wire 42. In substantially the same manner contact 22 is connected by a conductor 47 to the return-wire 41, while contact-arm 21 connects with the conductor 42.

The package-controlled circuit-closer, by means of which all of the circuits to the solenoid are maintained open unless there is a can in position on the package-carrier, is designated in a general way by *c*′. It may be of any suitable construction; but in this case I have shown a pair of coöperative contact-arms 48 and 49, the upper one of which has an upwardly-projecting member or pin 48′, which projects through an opening in the package-carrier 5 and will be pressed down to make the contact when there is a can in place.

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 position for delivering the full stream to a can or package *p*, supported on the package-carrier 5, it will be seen that a circuit is closed at the contacts 20 and 21, which will keep the solenoid energized until the charge in the can is sufficient to cause the beam to descend, whereupon the contact-arm 48 will rise from the arm 21 and break the circuit at that point. On the de-energization of the solenoid the spring 15 will expel the core *c* and impart an idle movement to the oscillatory actuating-arm 10, carrying the pawl 12 back into position to engage another tooth, as will be clear by referring to Fig. 2. As soon as the beam mechanism descends far enough the arm 148 in rising will engage the angle-arm 33 on the poise-weight *w* and raise the latter until the cam-face 33′ closes the contact at 21′ and 22, thus completing the circuit to the solenoid through conductor 45, contact-arms 49 and 48, conductor 44, solenoid S, conductor 42, contact-arms 22 and 21′, conductor 47, and return-wire 41. On the passage of the current through this circuit the solenoid will be energized and the valve will be shifted from the position shown in Figs. 1, 2, and 6 to that illustrated in Figs. 3 and 7, whereupon the stream will be reduced to a drip, and the remainder of the charge will be supplied in the usual manner by the drip material. As the beam continues to descend the arm 148 will also continue to raise the poise-weight, the force of which will of course be exerted on the beam mechanism in opposition to the weight of the charge and its receiver. At the proper point in the operation of the poise-weight the cam-face 33′ will release the contact 22 and break the contact at 21′ and 22, whereupon the core and the actuator will be returned to the position shown in Fig. 4. When the beam mechanism reaches the limit of its downward movement, the upper end of the poise-weight will raise the contact-arm 24 and make the circuit at 23 24, the course of this circuit being through conductor 45, contact-arms 49 48, conductor 44, solenoid S, conductor 42, conductor 46, contact-arms 24 and 23, and return-conductor 41 back to the battery. On the making of this circuit the valve will be shifted to the position shown in Fig. 8 to cut off the supply. This circuit will be broken when the filled can is removed from the package-carrier, and contact will also be broken at 48 and 49. The beam mechanism will return at once to its normal counterpoised position, break the contact at 23 24, leave the poise-weight suspended on the framework, and make contact again at 20 21; but the circuit to the solenoid will be broken until an empty can is placed in position, whereupon the current will flow through conductor 45, contact-arms 49 and 48, conductor 44, solenoid S, conductor 42, contact-arms 21 and 20, and return-con-

ductors 40 and 41 back to the battery, energizing the solenoid and operating the actuator to reopen the valve and restore the parts to their normal positions for a new cycle of operations.

Having described my invention, I claim—

1. In a weighing-machine, the combination, with stream-supplying means and with a stream-controlling valve intermittently operative in the same direction; of an electrically-operated reciprocatory valve-actuator having alternate working and idle strokes, said actuator being adapted on successive working strokes to impart to said valve independent valve-actuating movements; an electric circuit; and electric-circuit-controlling means.

2. In a weighing-machine, the combination, with stream-supplying means and with an intermittently-rotative stream-controlling valve, of a valve-actuating solenoid; a pawl-and-ratchet-wheel connection between the valve and the core of the solenoid, for applying to said valve successive and independent valve-actuating forces; an electric circuit including said solenoid; and electrical circuit-controlling means.

3. In a weighing-machine, the combination, with stream-supplying means and with an intermittently-rotative stream-controlling valve, of an electrically-operated reciprocatory valve-actuator operative for applying to said valve successive and independent valve-actuating forces; weighing mechanism; and circuit-controlling means governed by the weighing mechanism and operative for making and breaking the circuit to the solenoid a plurality of times at successive points in the movement of the weighing mechanism.

4. In a weighing-machine, the combination, with stream-supplying means and with an intermittently-rotative stream-controlling valve, of an electrically-operated reciprocatory valve-actuator operative for applying to said valve successive and independent valve-actuating forces; weighing mechanism embodying a package-carrier; an electric circuit controlling the operation of the valve-actuator; and a pair of circuit-controllers governed, respectively, by the weighing mechanism proper and by the placing of a package in position on the package-carrier.

5. In a weighing-machine, the combination, with stream-supplying means and with a stream-controlling valve, of framework; weighing mechanism; a slidable poise-weight on the framework; an electric circuit controlling the operation of a movable part of the weighing-machine; and an electrical circuit-controller governed by the poise-weight.

6. In a weighing-machine, the combination, with stream-supplying means and with a stream-controlling valve, of framework; weighing mechanism; a slidable poise-weight on the framework; an electric circuit controlling the operation of a movable part of the weighing-machine; and a plurality of electrical circuit-controllers operative successively by the poise-weight.

7. In a weighing-machine, the combination, with stream-supplying means and with a stream-controlling valve, of framework; weighing mechanism; a slidable poise-weight on the framework and normally out of operative relation with the weighing mechanism and in position to be engaged by the latter at a determined point in the movement thereof; an electric circuit controlling the operation of a movable part of the weighing-machine; and an electrical circuit-controller governed by the poise-weight.

8. In a weighing-machine, the combination, with stream-supplying means and with a stream-controlling valve, of framework; weighing mechanism; a slidable poise-weight on the framework; an electric circuit controlling the operation of a movable part of the weighing-machine; and a plurality of electrical circuit-controllers operative successively by the weighing mechanism proper and the poise-weight.

9. In a weighing-machine, the combination, with stream-supplying means and with a stream-controlling valve, of framework; weighing mechanism; a vertically-reciprocatory poise-weight on the framework; an electric circuit controlling the operation of a movable part of the weighing-machine; and a pair of electrical circuit-controllers governed by the poise-weight and adjacent to the opposite ends thereof.

10. In a weighing-machine, the combination, with stream-supplying means and with a stream-controlling valve, of a valve-actuating solenoid; an electric circuit including said solenoid; framework; weighing mechanism; a slidable poise-weight on the framework; and a pair of electrical circuit-controllers in said circuit and governed, respectively, by the weighing mechanism and the poise-weight.

11. In a weighing-machine, the combination, with stream-supplying means and with an intermittently-rotative stream-controlling valve, of a valve-actuating solenoid controlling the opening and the closing movements of said valve; an electric circuit including said solenoid; framework; weighing mechanism embodying a package-carrier; a slidable poise-weight on the framework; and a plurality of electrical circuit-controllers in said circuit and governed, respectively, by the weighing mechanism proper, the poise-weight, and the placing of a package in position on the package-carrier.

FRANCIS H. RICHARDS.

Witnesses:
F. N. CHASE,
JOHN O. SEIFERT.