No. 616,861. Patented Dec. 27, 1898.

F. H. RICHARDS.

AUTOMATIC WEIGHING MACHINE.

(Application filed Dec. 10, 1897.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

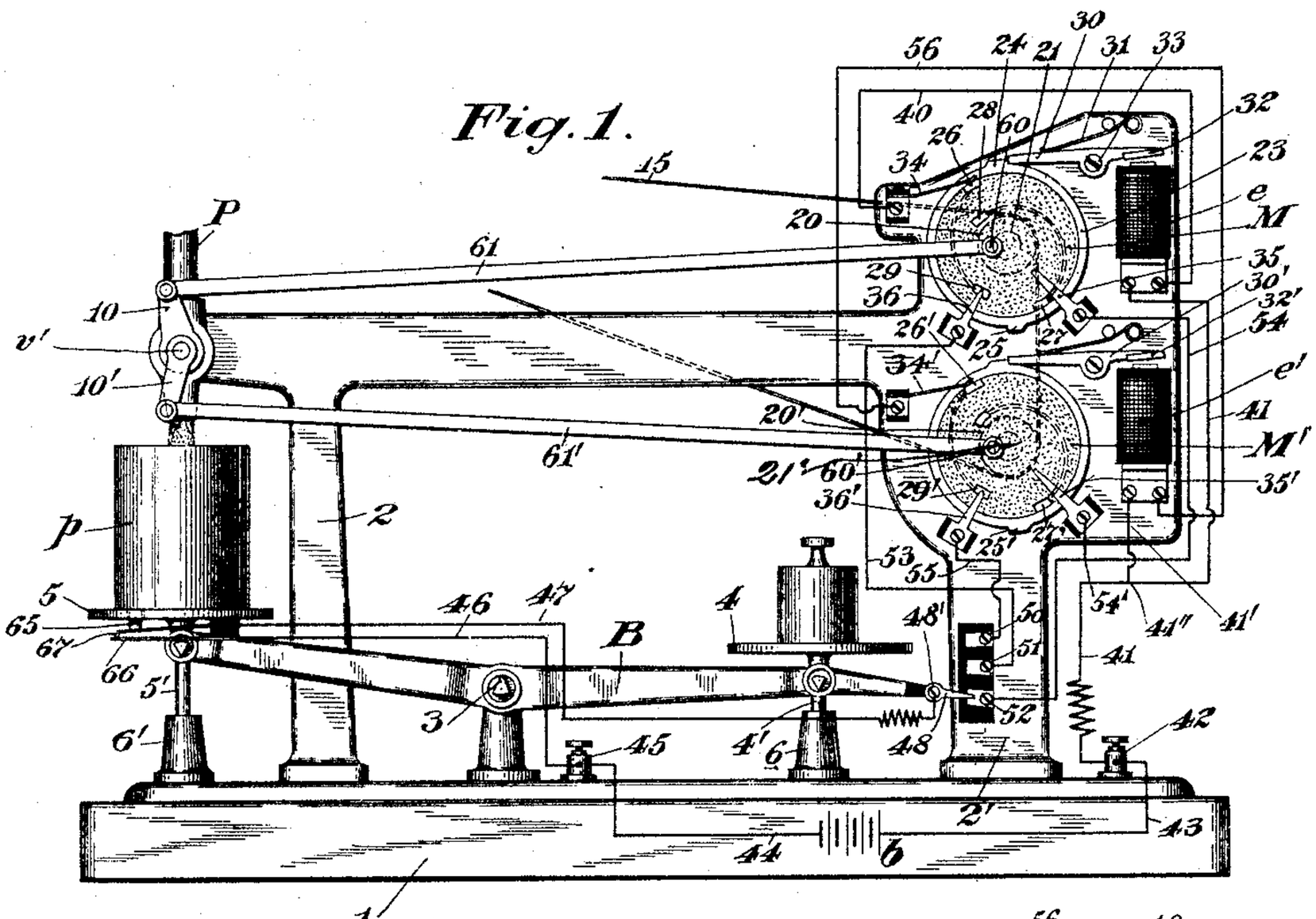
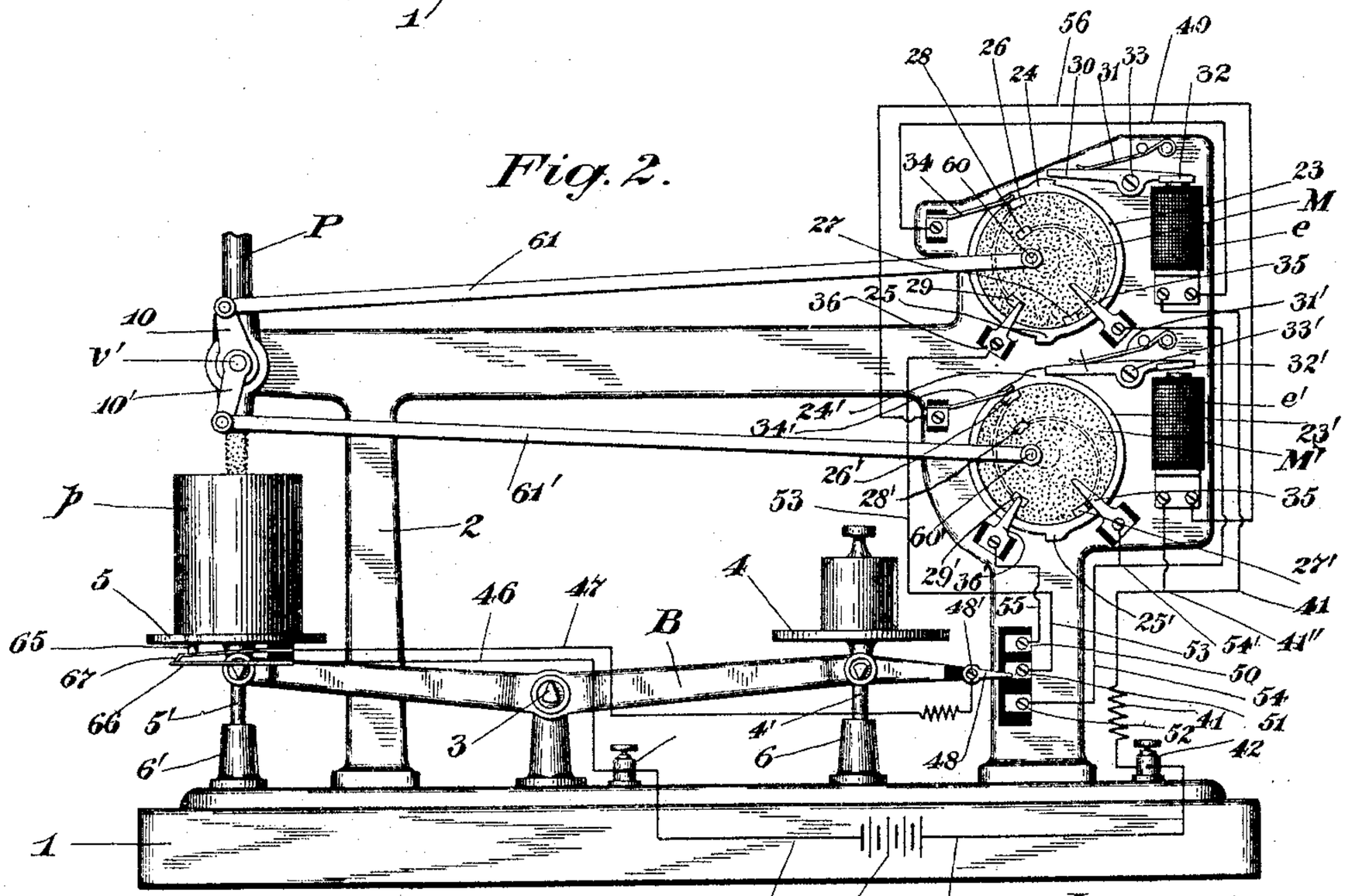


Fig. 2.



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3 Sheets—Sheet 2.

Fig. 3.

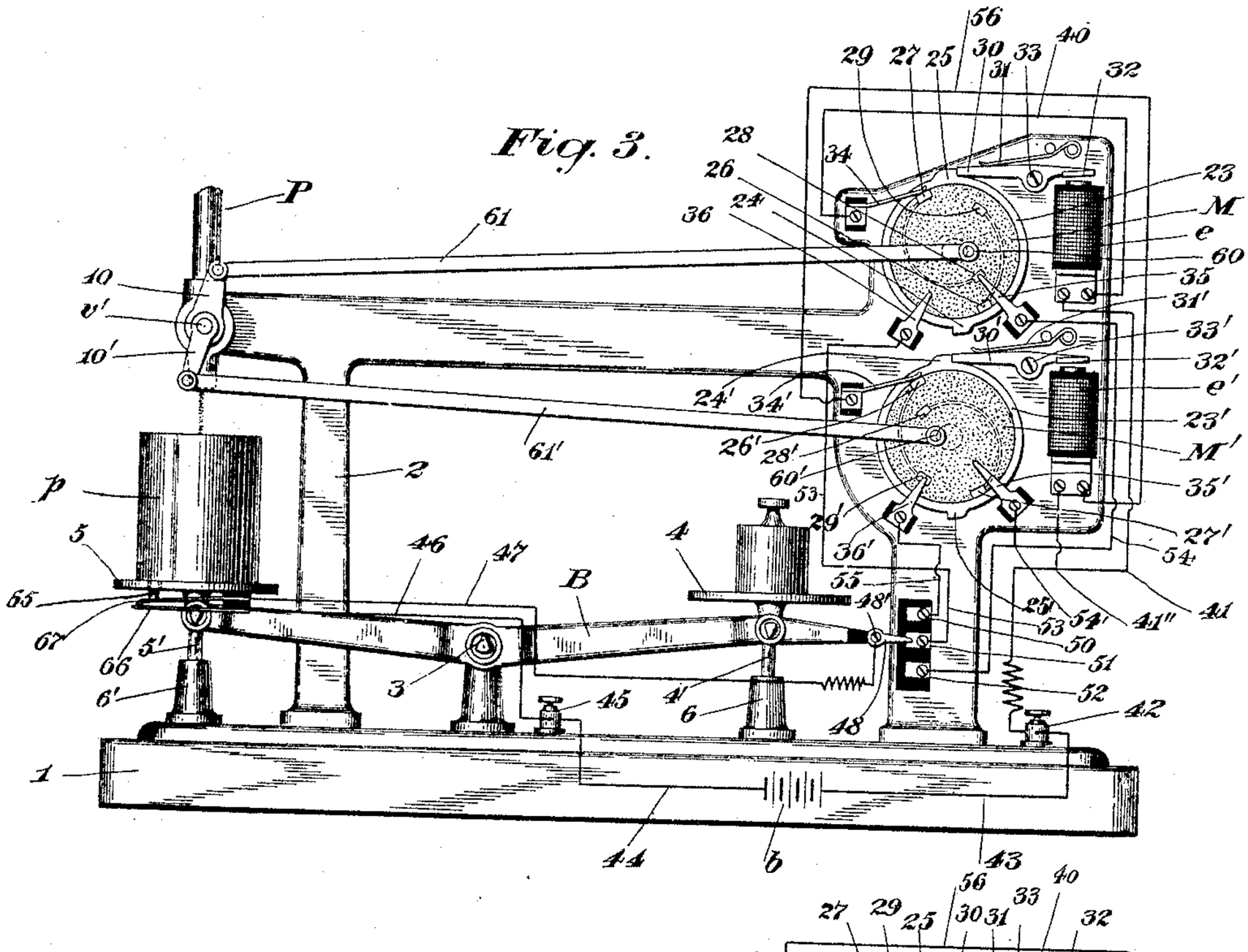

Fig. 4.

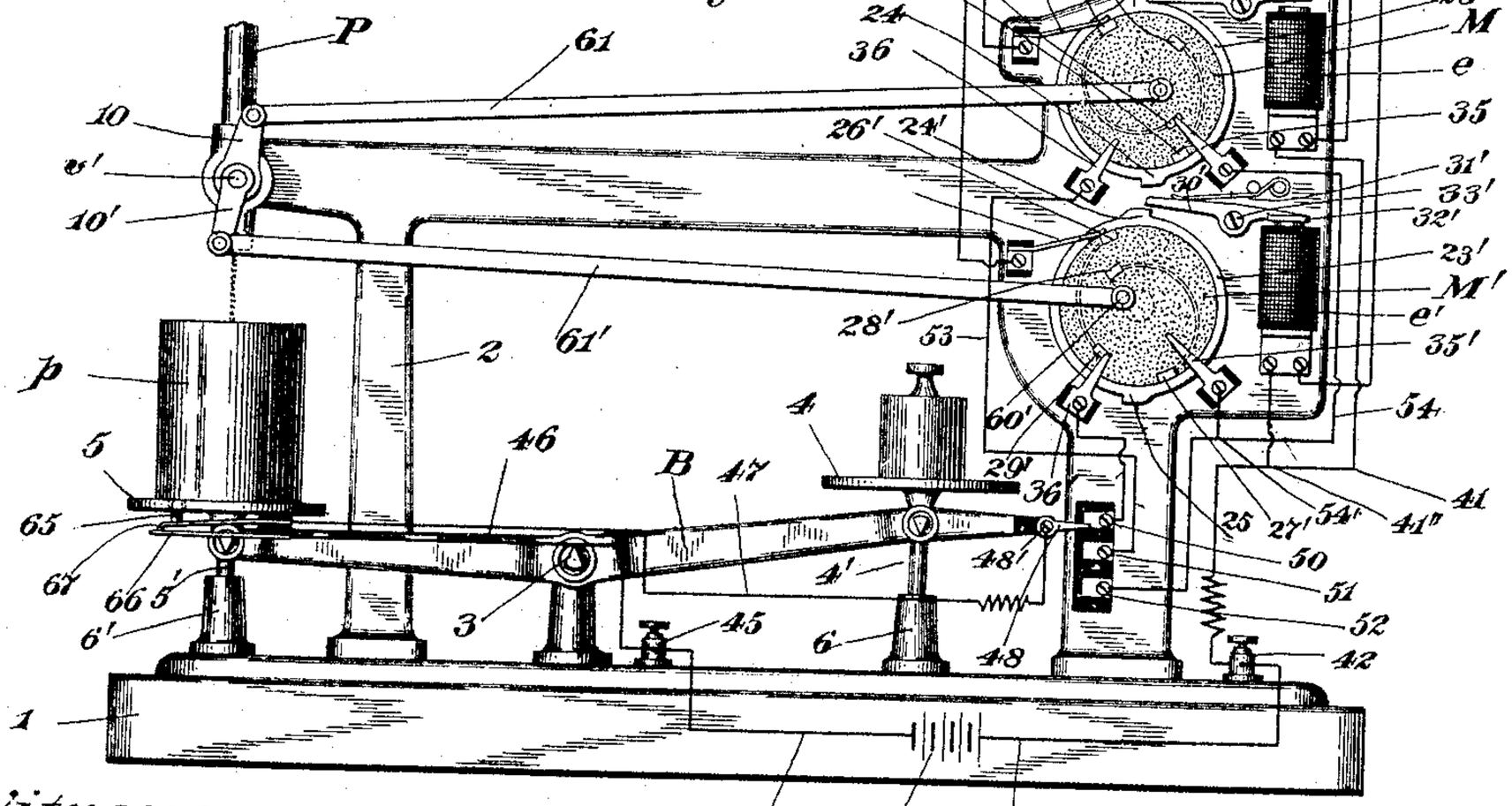

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Fig. 5.

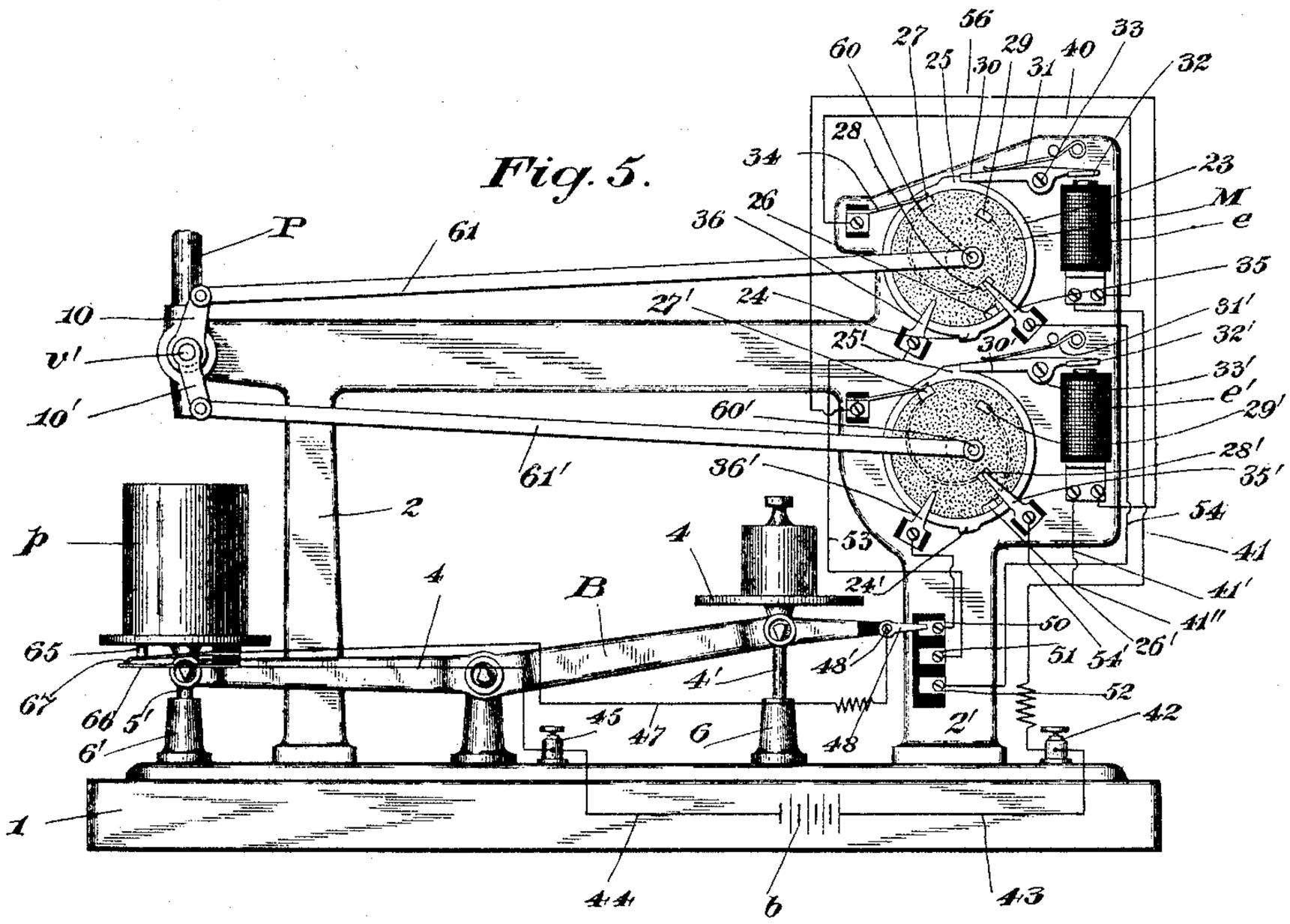


Fig. 6.

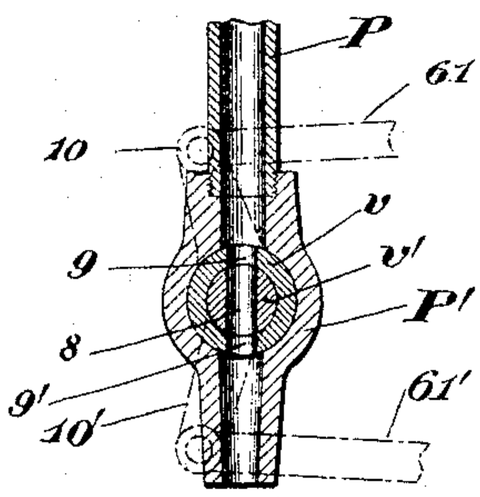


Fig. 7.

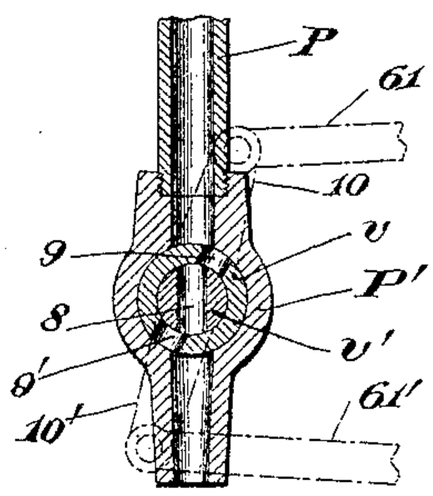


Fig. 8.

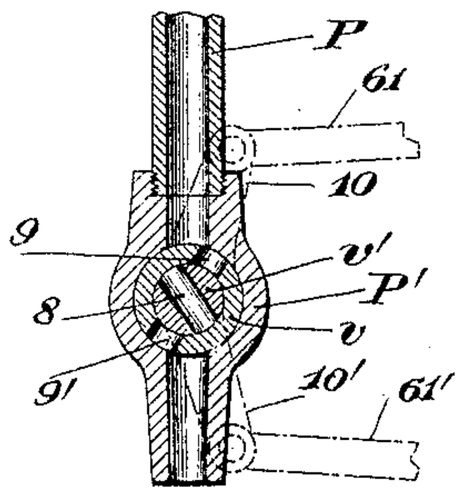
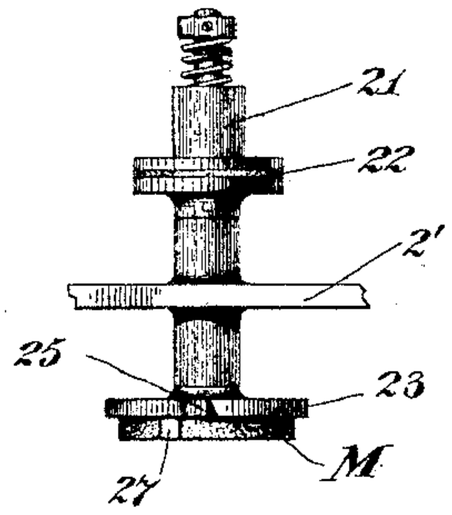


Fig. 9.



Witnesses:
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Fred. J. Dole.

Inventor:
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UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT.

AUTOMATIC WEIGHING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 616,861, dated December 27, 1898.

Application filed December 10, 1897. Serial No. 661,411. (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 improvements in weighing-machines; and it has for its main object the provision of an improved automatic machine of this type adapted for weighing predetermined quantities of material and in which all of the parts will be simple in construction and operation and the movements thereof will be controlled with great facility and precision.

The machine illustrated in the drawings of this application is especially designed and intended to be controlled in its movements by electrically-operated devices. The times at which the valve or valves of the stream-controlling means open or shut will be governed by suitable circuit-controlling means included in a corresponding electric circuit or circuits, all of these operations being preferably dependent upon the position of the weighing mechanism proper as the latter rises and falls when there is no poising-load thereon or when poised by the delivery of a partial or full charge into a suitable receiver or package carried by this mechanism.

One of the main features of this invention is the employment of valve mechanism in which the operation of one valve or each valve, if there be more than one, is controlled by actuating means which when exerting upon the valve a force suitable for actuating the latter will not apply to such valve any opposing or counteracting force, as is usually the case with valve-actuating devices in weighing-machines as heretofore constructed. In other words, if I employ valve-actuating means for applying force to the valve at different times for imparting different movements to the valve, whether these movements be two successive closing movements or alternate opening and closing movements, the force so applied will never be exerted in opposition to any other force acting upon the valve, and hence if this actuating means is operating to open the valve there will be no opposing force which would have a tendency to close the valve at such time, while if the force exerted be a valve-closing one there will be opposing valve-opening force applied to such valve.

As the machine embodying my present improvements is especially designed as an electrically-controlled scale, I employ in connection with the valve-actuating means just described one or more electric circuits and a corresponding circuit-controller or circuit-controllers for governing one or more of the movements of the valve-actuating means, and as I will make use, preferably, of two coöperative stream-controlling valves, one of which may constitute a main valve for permitting the principal flow-stream to run into a suitable receiver or package, while the other may be a drip-valve for regulating the flow of the material substantially in the usual manner during the last stages of each loading operation, these two valves will of course close successively, and in connection therewith valve-actuating means will be employed which will be operative for applying to the stream-controlling means or valve successive and independent closing forces neither of which will in any way interfere with the other. As the principal reason for employing actuating means of this type is to prevent the opposition or counteraction of the valve-opening and valve-closing forces, it will be apparent that my invention embodies as one of its essential features a pair of successively-closing valves and valve-actuating means which will operate to apply to said valve successive and independent and preferably discontinuous valve-opening and valve-closing forces.

Any suitable type of stream-controlling means or valve mechanism may be used; but in the present instance I have illustrated a simple form in which a pair of oscillatory plug-valves control the flow of the stream through a pipe or conduit in which the plug-valves are mounted. One of these valves will be preferably carried by and journaled on the other in such a manner that the two will be capable of oscillation in concentric arcs, one of said valves having an opening therein which may lie in alinement with a corresponding opening or openings in the other to permit them to register with one another and also with the opening in the supply-pipe. These

valves will preferably oscillate in opposite directions, one of them being turned one way for reducing the flow-stream to a drip-stream and the other or drip-valve being turned in the opposite direction to cut off the flow entirely at the proper point in the operation of the machine.

In the construction illustrated in the drawings, while the operation of the two valves is governed by electrically-actuated devices, yet the movements of the valves are not effected directly by such electrical means. Instead I prefer to employ valve-actuating means which will tend to operate continuously and when so operating will of course move the valve or valves; but in order to control or stop the operation of this valve-actuating means I employ a suitable electrically-operated device or devices, which when in engagement with such actuating means will of course prevent the application of any operating force to either of the valves. This electrically-controlled operating mechanism or valve-actuating means constitutes an important feature of this invention, and in the preferred construction a continuously-operative driver, preferably rotary, will intermittently engage and operate or rotate a driven member, which will be clutched to the driver in some suitable manner when permitted by the electrical controlling means. In this case I make use of coupling or clutch mechanism of the "frictional" type, in which a continuously-rotative driver is in frictional sliding contact with an intermittently-rotative driven member or friction-disk, the adjustment of these parts with respect to each other being such as to cause the driver to rotate the driven member instantaneously when the latter is released by the controlling means and is free to operate. As a driven member of this type will usually rotate at each release through an arc less than a full circle, such a driven member may be controlled advantageously by means of escapement mechanism, and one of the principal features of these improvements is the employment, in connection with a friction-clutch the driven member of which operates a suitable movable member of the weighing-machine—such, for instance, as a valve—of an escapement controlling the release, and hence the rotation, of said driven member and preferably governed electrically by a circuit or circuits controlled by the weighing mechanism of the machine. The movement of the driven member may be transmitted to the valve in any suitable manner; but I prefer to employ a connection—as, for example, an eccentric, a connecting-rod, and a rock-shaft—which will transform the rotary movement of the driven member into a reciprocatory movement of the member to be actuated.

As the valve mechanism of my present machine comprises as its essential features two successively-closing valves, I have illustrated in connection therewith two sets of actuating and controlling devices, each capable of operating independently of the other, but both preferably controlled by the electrical devices in such a manner that the driven members of the two independent operating mechanisms may rotate simultaneously to open the valves in a corresponding manner, although, of course, these driven members will operate separately and independently when the valves are to close. Hence it will be clear that while the actuating means for each valve is capable of applying thereto alternate valve-opening and valve-closing forces entirely independent of each other, yet the combined valve-opening forces of these mechanisms may be exerted and applied simultaneously to open the two valves at the same time.

The electrical controlling devices by means of which the movements of the valves are governed constitute one of the leading features of these improvements. In the preferred construction, as before stated, all of the valve movements will be controlled electrically, and preferably the weighing mechanism of the machine will govern the operation of the circuit-controlling means in circuit with the electrically-operated escapements, to which reference has been made. All of the parts of the machine will coöperate in such a manner that the circuits to the electrically-operated escapements will be made successively at different points in the movements of the weighing mechanism when the valves are to be closed, while such circuits may be made simultaneously when the valves are to be opened. This result may be attained by employing a circuit-controller movable with the weighing mechanism and operative for closing successively three circuits, one of which is connected only with one of the electrically-operated devices just mentioned, and another of which is connected only with the other of such devices, while the third circuit is connected with both of the electrically-operated means controlling the escapements. As it will be obvious that if each of these circuits had therein only a single break adapted to be closed in the manner just described the circuits of one or both of the electrically-operated escapements would be closed and the movement or movements of the valve mechanism permitted, and as the machine shown in the drawings is not designed to carry a permanent receiver forming part of the weighing-machine, but will operate to deliver material into separate and removable receivers or packages, it will be seen that unless additional controlling means be provided the valves might deliver material therefrom while no package was in position to receive the charge. Hence in connection with the circuit-controlling means before described I employ a separate circuit-controller spanning a second break in the controlling circuit or circuits and adapted to close the same only when a can or package is properly positioned on its carrier on the beam mechanism.

In connection with the circuit-controlling

means governed by the weighing mechanism proper and by the placing of a package upon the package-carrier in its proper position I employ also circuit-controlling means governed directly by the movements of the valve mechanism in such a manner that it will be impossible for any circuit to be closed for permitting the further movement of a valve until the latter shall have been carried to the end of the last preceding movement thereof. The means which I prefer to make use of for this purpose is a make-and-break wheel cooperative with the clutch mechanism hereinbefore referred to and preferably rotatable in unison with and carried by the driven member of such clutch. When this make-and-break wheel is operated positively in this manner, it will be clear that unless such driven member shall have completed its partial or step movement the corresponding movement of the valve will not have been completely accomplished, nor will that of the circuit-controlling make-and-break wheel, and hence the non-completion of any partial movement of the latter may be employed as a means for preventing improper operation of the parts, this result being attained by placing the coöperating contact arm or arms in such positions that the proper circuit or circuits will not be closed unless the make-and-break wheel is at the end of such step of its complete movement.

In the machine embodying my present invention I prefer to employ two make-and-break wheels, each controlling a determined number of circuits and operative conjointly with the other circuit-controlling means hereinbefore described to govern the movements of the corresponding valve. In all cases the proper operation of the weighing mechanism and the rotation of the make-and-break wheels to predetermined points are controlled not only by these valve movements, but also by the energization of the electrically-operated devices for releasing the escapements, which permit the turning of the make-and-break wheels themselves.

It may be noted here that the make-and-break wheels employed herein are of novel construction, as will be fully set forth hereinafter in the detailed description of the parts.

In the drawings accompanying and forming part of this specification, Figure 1 is a side elevation of an automatic weighing-machine constructed in accordance with my present invention and illustrating the positions of the parts during the delivery of the full stream into a receiver or package on the weighing-machine. Fig. 2 is a similar view showing the positions of the parts on the descent of the weighing mechanism and illustrates also the release of the escapement for permitting the rotation of the driven member of the friction-clutch and the make-and-break wheel carried thereon and controlling the operation of the main valve. Fig. 3 is a similar view showing the positions of the parts when this driven member of the clutch for the main valve is stopped at the end of its stage of movement just described, with the main valve in position to reduce the flow-stream to a drip-stream. Fig. 4 shows the positions of the parts on the descent of the weighing mechanism to about the cut-off position and illustrates also the driven member of the clutch for the cut-off valve released to permit the shutting of the latter. Fig. 5 is a similar view showing the positions of the parts at the end of the movements of this driven member of the clutch for the cut-off valve with the valve fully closed and the load completed. Figs. 6, 7, and 8 are enlarged sectional detail views of the valve mechanism, illustrating the parts in the full-stream, drip, and cut-off positions, respectively; and Fig. 9 is a detail plan of a portion of the driving mechanism, illustrating one of the friction-clutches by means of which the movement of a valve is controlled.

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 machine. That illustrated herein embodies a base or bed plate, such as 1, from which rises a framework comprising a pair of standards or uprights, such as 2 and 2′, connected by a suitable member or members in such a manner as to form preferably a single or unitary casting on which most of the controlling mechanism will be mounted.

The weighing mechanism may be of any usual or suitable construction, but preferably embodies as its main features beam mechanism pivoted on the base 1 and preferably in the form of a single beam (indicated by B) supported by the usual knife-edge bearings or pivots, (indicated by 3.) Near the opposite ends thereof this beam mechanism may have pivoted thereon a pair of supports, one of which is indicated by 4 and constitutes a substantially flat weight-receiving pan, while the other is represented by 5 and forms a corresponding substantially flat scale-pan or package-carrier for sustaining the load-receiver or package into which the material of the charge is to be delivered. These two pans 4 and 5 may be guided during the ascending and descending movements of the weighing mechanism proper in any suitable manner—as, for example, by means of the depending guides or hangers 4′ and 5′, working in openings in a pair of bosses 6 and 6′, rising from the base 1.

The stream-controlling means by which the supply of material to the receiver or package-carrier is regulated may also be of any proper type; but I prefer to employ valve mechanism of simple construction and preferably embodying a pair of valves constituting, respectively, a main or reducing valve and a drip or cut-off valve, one of which obviously may operate as a means for reducing the full stream to a drip-stream and the other as a device for cutting off the drip-stream, and

thereby stopping entirely the flow of material. In this case the stream-supplying means may be in the form of a supply-pipe, (indicated by P,) and the material flowing therethrough may be controlled by a pair of plug-valves, one journaled on and preferably movable oppositely to the other. These two plug-valves are indicated by v and v', the valve v forming the main valve, while that shown at v' is the drip-valve. The drip-valve is a plain plug-valve supported in the usual manner in an ordinary valve-body P', which may form part of the pipe P or be screwed thereonto, so as to be removable. The main valve is in the form of an annular member or shell surrounding and journaled on the drip-valve, so as to be capable of turning freely thereon independently thereof, while the drip-valve v' will also be capable of turning freely while the main valve is held. These two valves have suitable openings therein for permitting the passage of material therethrough, the drip-valve having in this case an opening or channel 8, adapted to register with a pair of openings 9 and 9' in the main valve when the full stream is flowing into the receiver. When it is desired to reduce the flow-stream to a drip-stream, the valve v will be turned to the position shown in Fig. 7 by suitable actuating means, to be hereinafter described, and thereupon only a small amount of material will flow through the several openings 8, 9, and 9', as the openings 9 and 9' in the main valve will obviously be out of alinement with the opening 8 and with the openings in the pipe and the valve-body. To cut off the stream entirely, the drip-valve v' may be turned in the opposite direction, as illustrated clearly in Fig. 8, from which it will be seen that when the parts are in the positions shown therein no material at all can pass into the opening in the valve-body P to discharge into the receiver.

The valve-actuating means which I employ is of such construction and operates in such a manner as to transmit no force to either valve to open the same when a valve-closing force is being applied thereto, and vice versa. The mechanism operating in this manner constitutes one of the most important features of this invention; but so long as this principle of operation is retained it may of course be embodied in a variety of different constructions, one of which is illustrated in the drawings of this case and is deemed a desirable one for the purpose. In the construction shown each of the valves is intended to oscillate, and each has secured to the stem thereof a rock-arm by means of which movements of a suitable member or members may be transmitted thereto for operating the valve. The rock-arm for the main valve is indicated by 10 and that for the drip-valve by 10'.

The actuating means proper, by which the movements of each valve are controlled, will preferably embody as its essential features a continuously-operative driver, usually a rotary driving member and a driven member, which may be clutched intermittently and instantaneously to the driver and the movement of the latter transmitted in turn to the proper valve, which it controls. In the construction shown I have illustrated two sets of actuating devices, which may be operated by means of a common driving member, such as 15, and as these two actuating means are substantially identical in construction and operation a description of one will suffice for both, appropriate prime-marks being employed to designate those corresponding parts of the actuating means for the drip-valve which are not referred to particularly herein in the detailed description of the actuating means for the main valve. The driving-belt 15 passes around a pair of rotary driving members 20 and 20', one of which will be secured to the driving-shaft 21 and the other to a corresponding shaft 21'.

The band wheel or pulley constitutes, as will be obvious, a continuously-rotative driver or driving member, and in connection therewith I prefer to employ an intermittently-rotative driven member, which will be clutched or coupled to the driver in some suitable manner when the valve v is to be operated. This driven member and the driving member are separated from each other preferably by means of a leather or similar washer, such as 22, which lies between these two parts, these members constituting a friction clutch or coupling, which will assure the positive rotation of the driven member whenever the latter is released from engagement with a suitable holding device. As the driver is continuously rotating and the parts are in frictional sliding engagement at all times, it will be seen that this connection constitutes a very positive driving means for instantaneously effecting the rotation of the driven member when the latter is released in the manner just described. This driven member is indicated by 23 and is in the form of a friction-disk, having one or more stops thereon, preferably disposed circumferentially therearound, the two stops shown herein being indicated, respectively, by 24 and 25. With these stops may coöperate a suitable intercepting device or devices, preferably in the form of an escapement—such, for instance, as that indicated at 30—which has a light spring 31, normally tending to maintain the stop member or escapement 30 in engagement with one or the other of the stops 24 and 25, according to the position in which the driven member or friction-wheel 23 may be. As it is only necessary in this case to provide for two movements of each valve, it will be clear that not only may two stops be used, but that these may be disposed in diametrically opposite positions, so that the driven member may rotate a half-turn at each release thereof, and thus accomplish the opening and the closing of the valve by movements in equal arcs.

The escapement 30 is preferably electrically

operated, and the operation of the escapement may be controlled in any suitable manner by an electric circuit. In this case, however, I have illustrated for actuating the escapement member or stop-arm an ordinary electromagnet *e*, the armature 32 of which is carried by the member 30, the latter being pivoted at 33 on the framework. It will be clear that when the electromagnet *e* is energized the escapement will be released and the driven member 23 will be permitted to rotate. As it is absolutely essential, however, that this driven member should be stopped properly at the end of each half-turn and as it is rotated instantaneously by the driver when the arm 30 is released from one of the stops 24 and 25, it will be apparent that some means must be provided for breaking the circuit to the electromagnet *e* almost as quickly as it is made in order that the stop on the driving member may not pass by the escapement and hence rotate too far. Therefore I have illustrated herein, in connection with each of the driven members, circuit-controlling means, preferably in the form of a make-and-break wheel rotatable in unison with the driven member and carried thereby. It will be apparent that a circuit-controller mounted in this way will move exactly in unison with the driven member, and with a contact terminal or terminals thereon properly coöperating with another terminal or arm on the framework a second break in the circuit to the electromagnet *e* may be opened and closed by a very slight movement of the driven member 23 in circumferential direction. As the two make-and-break wheels and their coöperating contact-arms may be substantially similar in construction, a description of one of these will also suffice for both. Preferably this make-and-break wheel, which is indicated herein by M, will be secured to the shaft carrying the driven member 23 and may be made of insulating material having suitable conducting contact-terminals embedded therein. In this case four contact-terminals are carried by this wheel, and they are indicated, respectively, by 26, 27, 28, and 29. The two terminals 26 and 27 are disposed circumferentially in the insulating-wheel M, while the contacts 28 and 29 are located in one side face thereof. Moreover, the terminals 26 and 29 are connected by a suitable conducting member, and the terminals 27 and 28 are correspondingly joined. It will be clear, therefore, that a pair of contact members or arms carried on the framework and located in such positions as to coöperate with these terminals will serve as means for controlling the circuit or circuits in which the contact-arms may be included. It will be noticed that not only are the terminals 28 and 29 disposed in one of the side faces of the make-and-break wheel, but that they are also located at different distances from the axis of rotation of said wheel, and hence may coöperate with contact-arms having their contact-making faces at different distances from the periphery of the wheel. One of these contact-arms is indicated by 35 and coöperates with the contact-terminal 28, while the other contact-arm is designated by 36 and controls in a corresponding manner the terminal 29. A single contact-arm or circuit-controller is sufficient for the purpose of coöperating with the terminals 26 and 27 in the periphery of the wheel, and this arm is indicated by 34.

The conductive connections between the several electrical controlling devices just described and a suitable source of electric energy, such as that indicated herein by *b*, are shown clearly in the drawings. The contact-arm 34 is connected by a conductor 40 with one terminal of the electromagnet *e*, the other terminal of the latter being connected in turn by means of a conductor 41 with a suitable binding-post 42, from which a wire 43 extends to one pole of the source of energy. The other pole of such source is connected by a conductor 44 to a binding-post 45, from which passes a conductor 46 to circuit-controlling means governed by the placing of a package in position on the carrier of the beam mechanism. From this circuit-controlling means passes a conductor 47 to circuit-controlling means governed by the movements of the weighing mechanism proper, this controlling means embodying in this case a contact-arm 48, carried by the beam mechanism, and a series of three insulated contact-terminals supported on the upright 2′ and indicated, respectively, by 50, 51, and 52. From the contact-arm 36, hereinbefore referred to, passes a conductor 53 to the terminal 51, while from the contact-arm 35 a conductor 54 passes to the terminal 52. The terminal 50 is connected by a conductor 55 with the contact-arm 36′ of the lower make-and-break wheel M′, governing the operation of the drip-valve *v*′. The contact-arm 35′ of this last-mentioned make-and-break wheel is connected by a conductor 54′ with the conductor 54, and hence with the contact-terminal 52, while the circuit-controlling arm 34′ is connected by a conductor 56 with one terminal of the electromagnet *e*′, the other terminal of said electromagnet being connected by a conductor 41′ with the conductor 41, and hence with one side of the battery *b*.

The terminals 52, 51, and 50 control, respectively, in that order the full-stream, drip-stream, and cut-off positions of the valve mechanism; and it will be clear that through the terminals 50 and 51, connected, respectively, with the contact-arms 36′ and 36, circuits to the electromagnets *e* and *e*′ will only be closed successively and never simultaneously, thus rendering it impossible to apply to the two valves *v* and *v*′ simultaneous closing forces. On the other hand, the contact-terminal 52 is connected both to the contact-arm 35′ and to the corresponding arm 35 of the upper make-and-break wheel, and hence for opening the valves the circuits to both

electromagnets may be made simultaneously, as it is not necessary that the two valves should be opened successively. It will be apparent, however, that by reason of the positioning of the contact arms and terminals of the make-and-break wheels and of the circuit-controlling means governed by the beam mechanism of the machine a circuit will never be closed to either electromagnet for releasing the escapement thereof and permitting the opening of the valve while such electromagnet is energized to release the escapement and permit the closing of such valve; and the converse of this is also true.

The connection between the driven members and the rock-arms 10 10′ may be made in any well-known manner; but in the present case I have illustrated, in connection with each of the driven members of the two sets of valve-actuating means, an eccentric or eccentric-pin connected by means of a pitman or connecting-rod with the proper valve and rock-arm. These two eccentric-pins are indicated at 60 and 60′ and the connecting-rods by 61 and 61′, these transmitting members constituting means for changing the rotary movement of the driven members of the clutch mechanisms into oscillatory movements of the valves.

As before stated, my improved electrically-controlled automatic machine illustrated herein is especially useful as a scale for making up small predetermined loads in vessels or packages removable from the machine, and for this reason the scale-pan or package-carrier 5 is preferably flat in order to support thereon flat-bottom packages, such as that shown at *p*, which, when filled, will be removed from under the mouth of the supply spout or pipe. As it would frequently happen in actual practice that no package would be on the receiver 5, I prefer to employ, in connection with the electrical controlling devices hereinbefore described in detail, circuit-controlling means governed by the placing of the package in position on the package-carrier, this circuit-controlling means operating, preferably, to keep all of the circuits open unless a package is in place and serving to close the proper circuit (determined by the other controlling devices) when it is in place. Any suitable form of circuit-controlling means may be used for this purpose, and in this case I have shown at 65 a pin projecting through an opening in the package-carrier 5 and adapted to be depressed by a can or package properly placed on the carrier 5. To this pin 65 may be secured one of a pair of contact-arms, such as 66 and 67, connected, respectively, with conducting-wires 46 and 47. When this break is closed, any one of the three circuits hereinbefore referred to which happens to be closed by the other circuit-controlling devices will be completed and the valves will be operated correspondingly. Obviously, the placing of the package in position will usually close and complete the circuits to both electromagnets for opening the two valves.

The circuit-controlling means governed by the weighing mechanism proper has been hereinbefore referred to and may be of simple construction. Preferably the contact-arm 48 will be carried by the beam mechanism at the extreme end of the latter and will be adjustable thereon, so that it may be set and held positively when suitably adjusted. A small set-screw 48′ may be used for this purpose.

The operation of a weighing-machine constructed in accordance with my present invention, as illustrated in the drawings of this application, is as follows: It being understood that all of the parts are in the positions shown in Fig. 1 and that both of the valves have been opened wide by that operation of the actuating mechanism which is controlled by the completion of the circuit for opening the valves on the placing of an empty package or can *p* in position on the scale-pan 5, it will be seen, as indicated in Fig. 6, that the full stream is being delivered into the can. As soon as the weight of the material of the charge is sufficient to change the position of the weighing mechanism proper the beam mechanism will descend and the circuit-controller 48 will rise and be carried off from the terminal 52 and onto the contact 51, whereupon a circuit will be completed from the battery through conductors 44 and 46, contact-arms 66 and 67, conductor 47, contact-arm 48, terminal 51, conductor 53, contact-arm 36, terminals 29 and 28, contact-arm 34, conductor 40, electromagnet *e*, conductor 41, and conductor 43, thus causing the energization of this electromagnet, the release of the escapement 30, and consequently permitting rotation of the driven member 23 of the upper friction-clutch and therewith the make-and-break wheel M. The beginning of this movement is shown in Fig. 2. Immediately after the driven member and the make-and-break wheel begin to turn the contact is broken at 34 26 and at 36 29, and the electromagnet *e* being deënergized its armature is released, and the spring 31 carries the escapement member into engagement with the stop 25 as soon as a half-rotation of the make-and-break wheel and the driven member 23 shall have been completed. At the end of this partial movement, which is indicated in Fig. 3, the main valve *v*, actuated to the position shown in Fig. 7, will be in position to deliver a drip-stream to the package or can *p*, the stop 25 will be in engagement with the end of the escapement member 30, and the contact-arm 34 will be in engagement with the terminal 27 of the make-and-break wheel, while at the opposite side of said wheel the break in the circuit will have been closed by the contact-terminal 28 engaging the contact-arm 35. The drip-stream will continue to flow into the can *p* until the beam mechanism is poised and practically the full charge is in

the receiver, whereupon the circuit-controlling arm 38 will be carried off from the contact 51 and onto the terminal 50, (see Fig. 4,) thus closing a circuit from the battery, which will follow the same path, as hereinbefore described, as far as the contact-arm 48, from which the course of the current will be through contact-terminal 50, conductor 55, contact-arm 36′, contact 29′, contact 26′, circuit-controlling arm 34′, conductor 56, electromagnet *e*′, conductor 41′, conductor 41, and conductor 43. The completion of this circuit causes the energization of the electromagnet *e*′, and hence the release of the escapement 30′, controlling the rotation of the driven member 23′ of the friction-clutch governing the operation of the drip-valve *v*′. The release of this driven member 23′ and the beginning of the rotation thereof and of the make-and-break wheel M′ are shown in Fig. 4. The completion of the movement is illustrated in Fig. 5. Immediately after the stop 24′ is released by the escapement member 30′ and the make-and-break wheel M′ begins rotating the contact is broken at 34′ 26′ and at 36′ 29′, and hence the electromagnet *e*′ is deënergized and the escapement member 30′ is carried by its spring 31′ into position to engage the stop 25′ on the completion of the half-rotation of the driven member 23′. By referring to Fig. 5 it will be seen that on the completion of this movement the drip-valve *v*′ will have been oscillated in the opposite direction to the previously-described movement of the valve *v* and will have cut off the flow of material entirely. Moreover, the stop 25′ will be in engagement with the escapement member 30′ and the terminal 27′ will have come into contact with the circuit-controlling arm 34′, while the terminal 28′ will be in contact with the circuit-controlling arm 35′. The package or can *p* is now filled and may be removed from the machine. As soon as this is done of course all of the circuits will be open and no circuit will be closed again until an empty can is placed under the mouth of the supply-spout. On the removal of the filled can the weighing mechanism will return to the position shown in Fig. 1 and the contact-arm 48 will be on the terminal 52. As soon as the circuit is closed at 66 67 by the placing of a can in position on the carrier 5 a circuit will be completed, which follows the same path as before described to the circuit-controlling arm 48, when the course of the current will be from contact-terminal 52, through conductor 54, to the point 54″, where the circuit will divide, one branch going by way of conductor 54 to the contact-arm 35, contact 28, contact 27, circuit-controlling arm 34, conductor 40, electromagnet *e*, and conductor 41 to the point 41″, while the other branch goes by way of conductor 54′, contact-arm 35′, contact 28′, contact 27′, circuit-controlling arm 34′, conductor 56, electromagnet *e*′, and conductor 41 to the point 41″, both currents going then by way of conductor 41 and conductor 43. The closing of the circuits through these two parallel branches of course causes the energization of both electromagnets *e* and *e*′, and hence the release of the two escapements 30 and 30′, whereupon both driven members 23 and 23′ and the two make-and-break wheels M and M′ will be rotated each a half-turn and the valves *v* and *v*′ opened wide, as shown in Fig. 1, the contacts at 34 27, 35 28, 34 27′, and 35 28′ being broken and the contacts remade, as shown in Fig. 1, the stops 24 and 24′ being also engaged by the escapements 30 and 30′ at the end of such movements, whereupon all of the parts will be in position for making up a new load.

Having described my invention, I claim—

1. In a weighing-machine, the combination, with weighing mechanism, of stream-supplying means; a stream-controller; a device operable to actuate the stream-controller either to permit the flow of, or to cut off, the supply-stream; a continuously-operative driver frictionally clutched to said device; and electrically-operated means, controlled by the weighing mechanism for permitting at certain periods the operation of said device by said driver.

2. In a weighing-machine, the combination, with weighing mechanism, of stream-supplying means; a stream-controller; a rotative device operable to actuate the stream-controller either to permit the flow of, or to cut off, the supply-stream; a continuously-operative driver involving a friction-clutch; and means, controlled by the weighing mechanism for permitting the operation of said device by said driver at predetermined times.

3. In a weighing-machine, the combination, with weighing mechanism, of stream-supplying means; a stream-controller; an axially-movable device; a continuously-operative driver involving a friction-clutch; a link jointed eccentrically to said device and connected with the stream-controller; and means, controlled by the weighing mechanism, for permitting the operation of said device by said driver.

4. In a weighing-machine, the combination, with weighing mechanism, of stream-supplying means; a stream-controller; a continuously-operative driver involving a friction-clutch, a device operable to actuate the stream-controller either to permit the flow of, or to cut off, the supply-stream; an electrically-operated detent for engaging and releasing said device; and circuit-controlling means carried by said device.

5. In a weighing-machine, the combination, with weighing mechanism, of stream-supplying means; a stream-controller; a rotary actuating device for the stream-controller, said device involving a friction-clutch; a link connected respectively with the actuating device and with the stream-controller; a detent for engaging said device; and elec-

trically-operated means, controlled by the weighing mechanism, for tripping said detent.

6. In a weighing-machine, the combination, with weighing mechanism, of stream-supplying means; a stream-controller; a continuously-operative driver involving a friction-clutch, a device actuated by said driver and operable to actuate the stream-controller either to permit the flow of, or to cut off, the supply-stream, and connected with said stream-controller, and having a pair of projections; and a detent adapted to engage either projection.

7. In a weighing-machine, the combination, with weighing mechanism, of stream-supplying means; a stream-controller; a continuously-operative driver involving a friction-clutch, a rotary device operable to actuate the stream-controller and provided with peripheral projections; a link connected eccentrically to said rotary device and also to the stream-controller; and a detent adapted to successively engage said projections, thereby to hold the stream-controller in certain positions.

8. In a weighing-machine, the combination, with stream-supplying means and with a pair of coöperative plug-valves, one journaled on the other, of valve-actuating means involving a friction-clutch operative for applying to said valves successive and independent valve-opening and valve-closing forces.

9. In a weighing-machine, the combination, with stream-supplying means and with a pair of oppositely-movable coöperating valves, of valve-actuating means involving a friction-clutch operative for applying to said valves successive and independent valve-opening and valve-closing forces.

10. In a weighing-machine, the combination, with weighing mechanism, of stream-supplying means; an oscillatory plug-valve for controlling the supply; a single device involving a friction-clutch operable to actuate the valve either to permit the flow of, or to cut off, the supply-stream; and means, controlled by the weighing mechanism, for throwing said actuating device into and out of action.

11. In a weighing-machine, the combination, with stream-supplying means and with a pair of coöperative plug-valves, one journaled on the other, and said plug-valves being oppositely oscillatory, of two independent actuating devices connected respectively with the said valves and rotative in the same direction; continuously-driven mechanism; means for normally coupling the actuating devices to the continuously-driven mechanism; two detents adapted to engage said devices; and means for successively tripping said detents.

12. In a weighing-machine, the combination with weighing mechanism, of stream-supplying means; a stream-controller; a rotary wheel; a link connected eccentrically to said wheel and also connected with the stream-controller; a spring-actuated detent adapted normally to engage the wheel; continuously-operative driving mechanism involving a clutch adapted to be coupled with said rotary wheel; and means, operative with the weighing mechanism, for tripping said detent.

13. In a weighing-machine, the combination, with stream-supplying means and with a stream-controller, of a friction-clutch comprising a continuously-rotative driver and a frictionally-rotated driven member in frictional sliding contact with said driver, said driven member governing the opening and the closing of the stream-controller, and an escapement controlling the rotation of said driven member.

14. In a weighing-machine, the combination, with stream-supplying means and with an oscillatory stream-controller, of a friction-clutch comprising a continuously-rotative driver and a frictionally-rotated driven member in frictional sliding contact with said driver, said driven member governing the oscillation of the stream-controller, and an escapement controlling the rotation of said driven member.

15. In a weighing-machine, the combination, with a supply-pipe, of an oscillatory plug-valve therein; a friction-clutch comprising a continuously-rotative driver and a frictionally-rotated driven member, the latter in frictional sliding contact with said driver and connected with the plug-valve, and an escapement controlling the rotation of said driven member.

16. In a weighing-machine, the combination, with stream-supplying means and with a stream-controller, of a friction-clutch comprising a continuously-rotative driver and a frictionally-rotated driven member in frictional sliding contact with said driver, said driven member governing the closing movement of the stream-controller, and an escapement controlling the rotation of said driven member and governed by the beam mechanism on the movement of the latter to a predetermined position.

17. In a weighing-machine, the combination, with stream-supplying means and with a stream-controller, of a friction-clutch comprising a continuously-rotative driver and a frictionally-rotated driven member, the latter in frictional sliding contact with said driver; an escapement controlling the rotation of said driven member; an eccentric movable in unison with said driven member; and connecting means between the eccentric and the stream-controller.

18. In a weighing-machine, the combination, with stream-supplying means and with a pair of coöperative stream-controlling valves, of a pair of clutch mechanisms one for each valve and each comprising a driver and a driven member, the latter governing the operation of the corresponding valve, and a pair of separately-operative escapements controlling the rotation of said respective driven members.

19. In a weighing-machine, the combination, with stream-supplying means and with an oscillatory main valve, of an oppositely-oscillatory drip-valve; a pair of clutch mechanisms one for each valve and each comprising a driver and a driven member, the latter governing the operation of the corresponding valve; and a pair of separately-operative escapements controlling the rotation of said respective driven members.

20. The combination, with weighing mechanism including a package-support, of stream-supplying means; a stream-controller; a stream-controller-actuating device; an electrically-operated device for controlling the action of said stream-controller-actuating device; and circuit making and breaking means operative, respectively, with the stream-controller-actuating device and the weighing mechanism, and by a package when said package is placed upon its support.

21. In a weighing-machine, the combination, with stream-supplying means, of a pair of oscillatory plug-valves, one journaled on the other and each having a crank-arm, and said valves being oppositely oscillatory; two friction-clutches each comprising a continuously-rotative driver and a frictionally-rotative driven member, the two parts being in frictional sliding contact; a pair of links pivoted respectively at their opposite ends to the crank-arms and to said driven members, two detents adapted respectively for controlling the operation of the driven members, and electrically-operated means for successively tripping said detents.

22. In a weighing-machine, the combination, with stream-supplying means and with a stream-controller, of weighing mechanism; clutch mechanism comprising a driver and a driven member; an escapement controlling the rotation of said driven member; an electric circuit controlling the operation of said escapement; and automatic electrical circuit-controlling means governed by the weighing mechanism.

23. In a weighing-machine, the combination, with stream-supplying means and with a stream-controller, of weighing mechanism; clutch mechanism comprising a driver and a driven member; an electrically-operated spring-pressed escapement controlling the rotation of said driven member; an electric circuit controlling the operation of said escapement; and automatic electrical circuit-controlling means governed by the weighing mechanism.

24. In a weighing-machine, the combination, with stream-supplying means and with a stream-controller, of weighing mechanism; clutch mechanism comprising a driver and a driven member; an escapement controlling the rotation of said driven member; an electric circuit controlling the operation of said escapement; and an automatic electrical circuit-controller carried by the weighing mechanism.

25. The combination, with clutch mechanism embodying a driver and a driven member, of a make-and-break wheel movable in unison with said driven member; means for bringing one of said clutch members into operative relation with the other; and an electric circuit controlled by said make-and-break wheel.

26. The combination, with a friction-clutch comprising a continuously-rotative driver and a frictionally-rotated driven member in frictional sliding contact with said driver, of an escapement controlling the rotation of said driven member; a make-and-break wheel movable in unison with said driven member; and an electric circuit controlled by said make-and-break wheel.

27. In a weighing-machine, the combination, with stream-supplying means and with a stream-controlling valve, of a make-and-break wheel; an electric circuit controlled by said make-and-break wheel and governing a movement of the valve; and means involving a friction-clutch for intermittently rotating the make-and-break wheel.

28. In a weighing-machine, the combination, with stream-supplying means and with a stream-controlling valve, of a pair of electric circuits governing two different movements of the valve; a make-and-break wheel controlling said circuits successively; and means for intermittently rotating the make-and-break wheel.

29. In a weighing-machine, the combination, with stream-supplying means and with a stream-controlling valve, of weighing mechanism embodying a package-carrier; a make-and-break wheel; an electric circuit governing a movement of the valve; means for intermittently rotating the make-and-break wheel; and a circuit-controller governed by the placing of a package in position on the package-carrier and controlling said circuit conjointly with the make-and-break wheel.

30. In a weighing-machine, the combination, with stream-supplying means and with a stream-controlling valve, of weighing mechanism embodying a package-carrier; a make-and-break wheel; an electric circuit governing a movement of the valve; means for intermittently rotating the make-and-break wheel; 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 and controlling said circuit conjointly with the make-and-break wheel.

31. In a weighing-machine, the combination, with stream-supplying means and with a stream-controlling valve, of weighing mechanism embodying a package-carrier; a make-and-break wheel; an electric circuit governing the movement of the valve; means for intermittently rotating the make-and-break wheel; and a circuit-controller governed by the weighing mechanism and controlling said circuit conjointly with the make-and-break wheel.

32. In a weighing-machine, the combination, with stream-supplying means and with a stream-controlling valve, of weighing mechanism; an intermittently-rotative make-and-break wheel; an electric circuit governing a movement of the valve and controlled by said make-and-break wheel; and an electrical circuit-controller governed by the weighing mechanism and controlling the rotation of the make-and-break wheel.

33. In a weighing-machine, the combination, with stream-supplying means and with a stream-controlling valve, of weighing mechanism; an intermittently-rotative make-and-break wheel; an electric circuit governing the opening and closing movements of said valve and controlled by said make-and-break wheel; and electrical circuit-controlling means governed by the weighing mechanism and controlling the rotation of the make-and-break wheel and operative for making said circuit at successive points in the movements of the weighing and also for breaking said circuit.

34. In a weighing-machine, the combination, with stream-supplying means and with a stream-controlling valve, of an electric circuit; a single electrically-operated valve-actuating device in said circuit and controlling, when energized, successive movements of the valve; and an electrical circuit-controller in said circuit.

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Witnesses:
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