E. McGARVEY.

AUTOMATIC RECORDING SCALE.

APPLICATION FILED MAR. 14, 1910.

1,149,378

Patented Aug. 10, 1915.

4 SHEETS—SHEET 1.

Fig. 1.

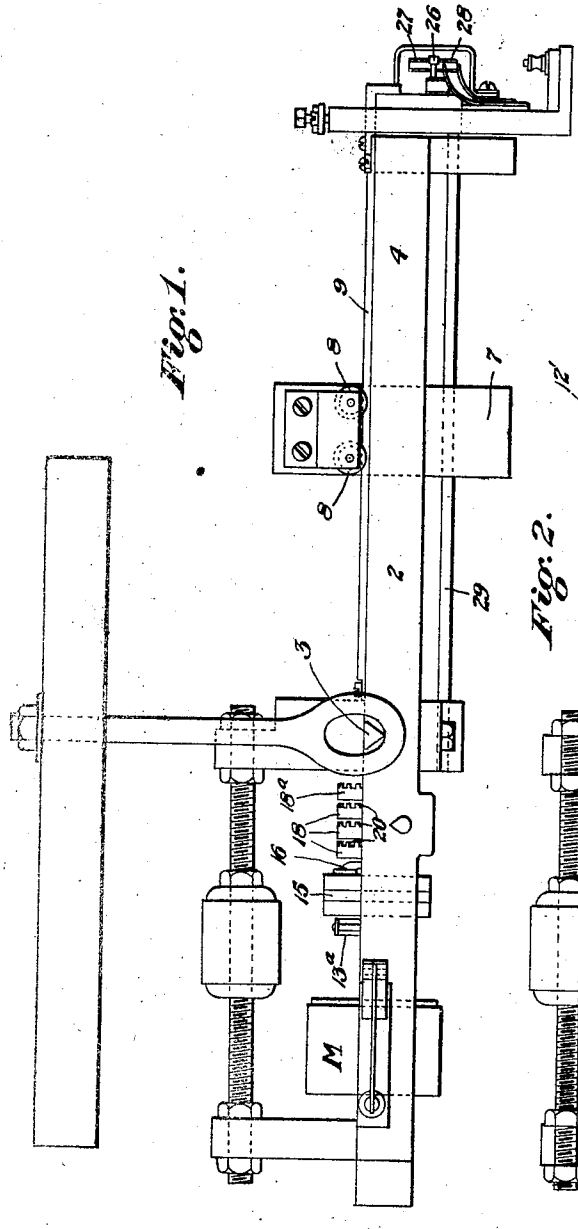
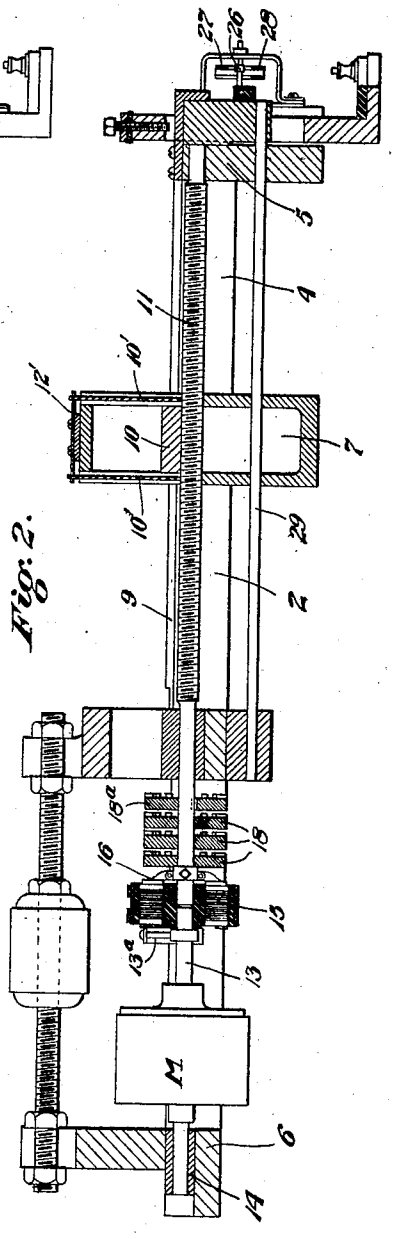


Fig. 2.



Witnesses:

Chas. S. Lepley.

Henry Sims.

Inventor:

Edward McGarvey

by Chas. M. Clarke

his attorney

E. McGARVEY.

AUTOMATIC RECORDING SCALE.

APPLICATION FILED MAR. 14, 1910.

1,149,378.

Patented Aug. 10, 1915.

4 SHEETS—SHEET 2.

Fig. 3.

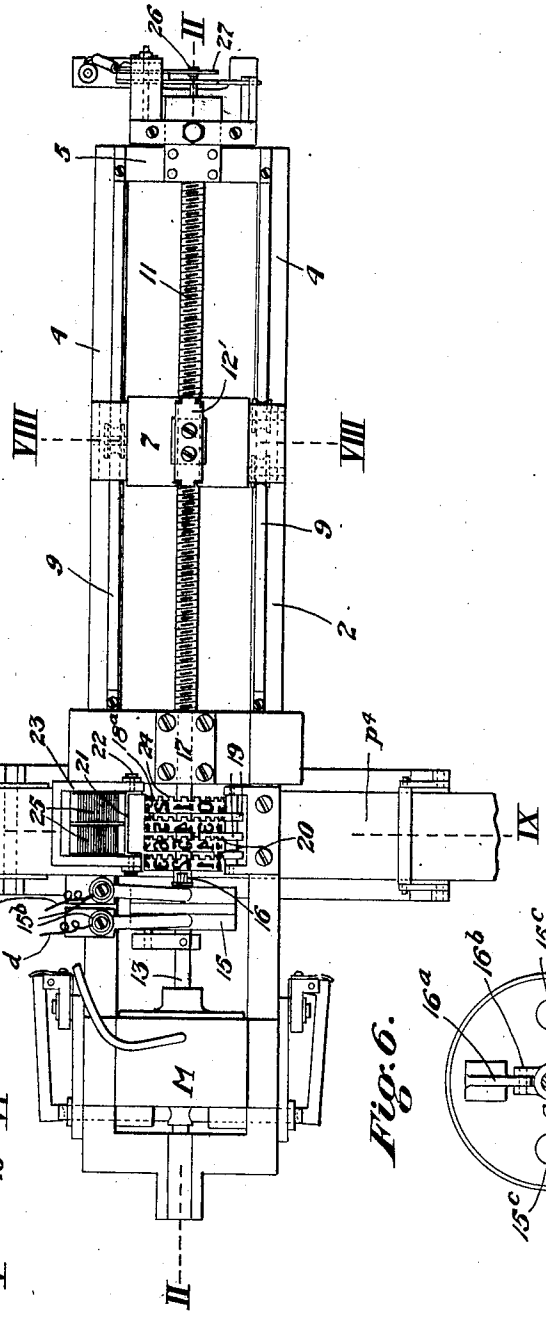


Fig. 5.

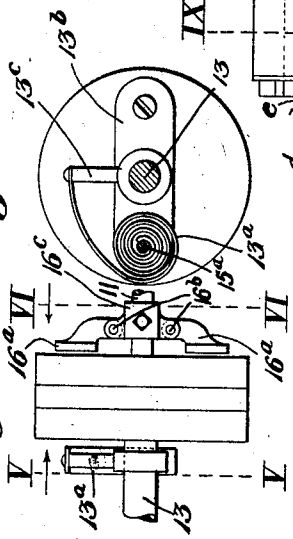
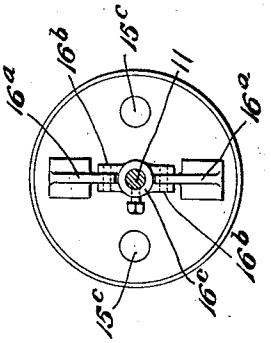


Fig. 4.

Fig. 6.



Witnesses:

Chas. S. Lepley

Henry Sens

Inventor:

Edward McGarvey

by C. M. Clarke

his attorney

E. McGARVEY.

AUTOMATIC RECORDING SCALE.

APPLICATION FILED MAR. 14, 1910.

1,149,378.

Patented Aug. 10, 1915.

4 SHEETS—SHEET 3.

Fig. 7.

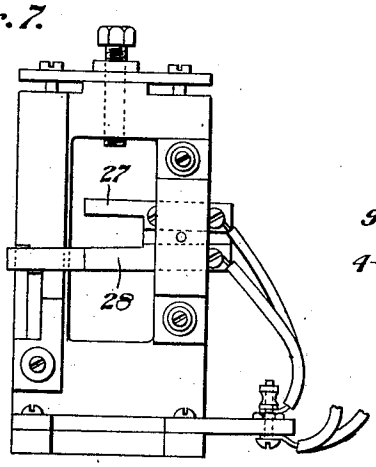


Fig. 8.

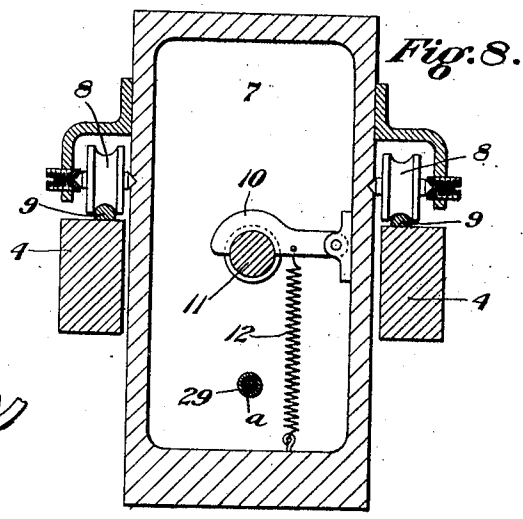


Fig. 9.

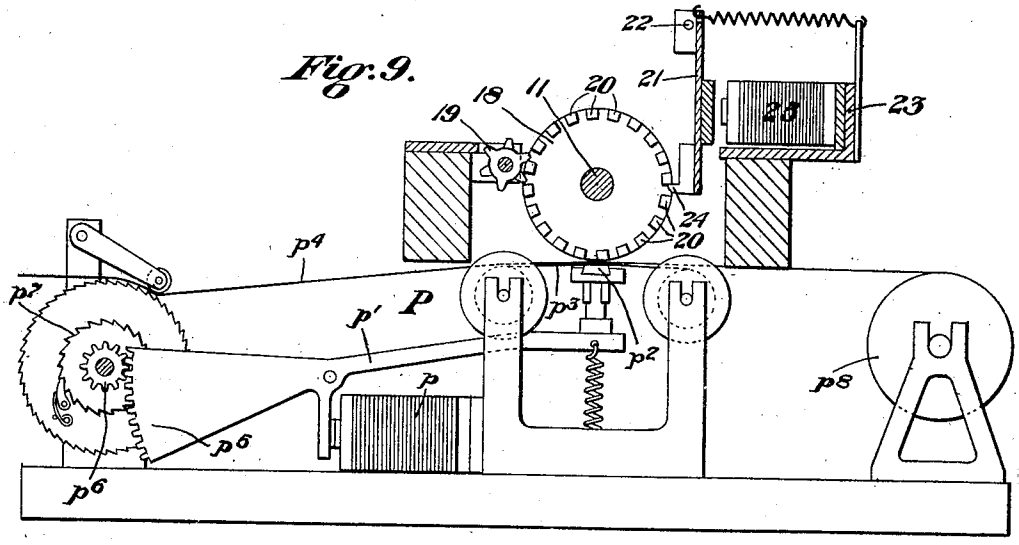
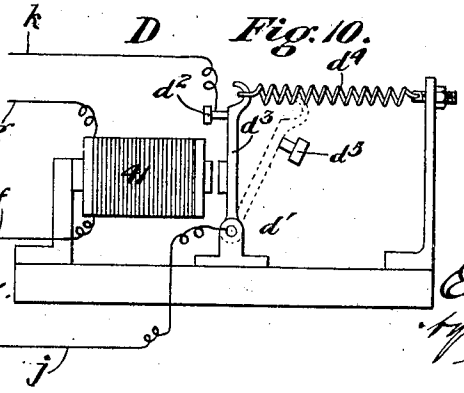


Fig. 10.



Witnesses:
Chas. S. Lyon.
Henry Sims.

Inventor:
Edward McGarvey
by C. M. Clarke
his attorney

E. McGARVEY.

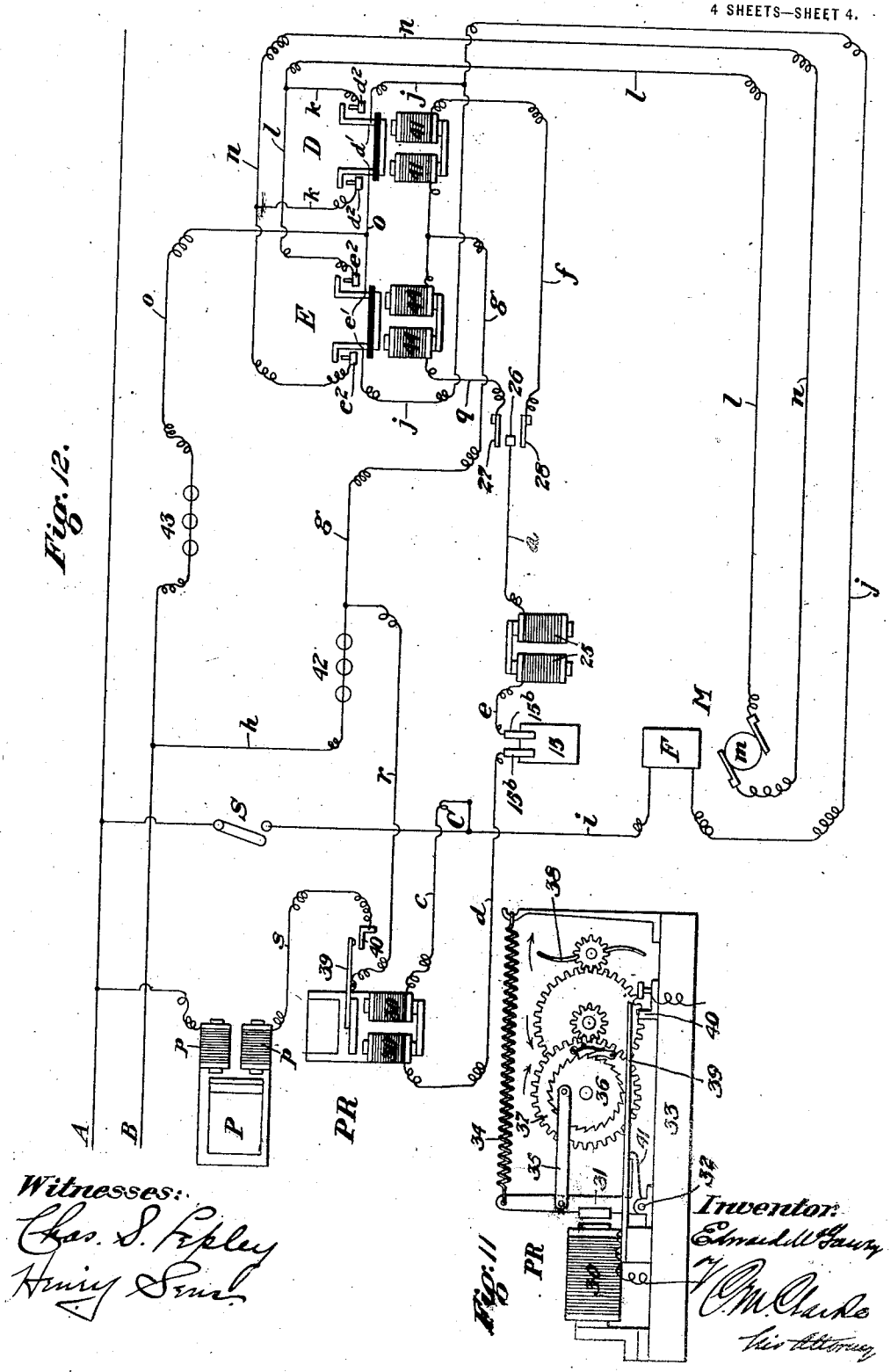
AUTOMATIC RECORDING SCALE.

APPLICATION FILED MAR. 14, 1910.

1,149,378.

Patented Aug. 10, 1915.

4 SHEETS—SHEET 4.



Witnesses:
Chas. S. Ripley
Henry Sinn

Inventor:
Edmund McGarvey
by C. M. Clarke
their Attorney

UNITED STATES PATENT OFFICE.

EDWARD McGARVEY, OF BELLEFONTE, PENNSYLVANIA, ASSIGNOR TO INTERNATIONAL ELECTRIC COMPANY, OF BELLEFONTE, PENNSYLVANIA, A CORPORATION OF ARIZONA.

AUTOMATIC RECORDING-SCALE.

1,149,378. Specification of Letters Patent. Patented Aug. 10, 1915.

Application filed March 14, 1910. Serial No. 549,204.

To all whom it may concern:

Be it known that I, EDWARD McGARVEY, a citizen of the United States, residing at Bellefonte, in the county of Center and State of Pennsylvania, have invented certain new and useful Improvements in Automatic Recording-Scales, of which the following is a specification, reference being had therein to the accompanying drawing.

My invention consists of an improvement in weighing scales, more particularly the class of automatic recording scales.

It has for its object to provide a scale mechanism in which the poise beam is provided with an adjustable poise controlled by a motor subject to circuits effected by contacts which are made and broken by the poise beam terminal or other equivalent contact mechanism, operating to shift the poise in either direction until the beam is poised, at which position its terminal is out of contact.

The invention also embraces means for reversing the current of the motor, means for actuating printing wheels to positions corresponding to the proper weight to be indicated, depending upon the amount of rotation of the feed screw for the poise; means for actuating and controlling printing mechanism so that it will print only at the time when the beam is in equi-poise and to various other features of construction and operation as shall be more fully hereinafter described.

Referring to the drawings: Figure 1 is a view of the poise beam of a scale and its parts in side elevation. Fig. 2 is a longitudinal sectional view centrally therethrough indicated by the line II. II. of Fig. 3. Fig. 3 is a plan view of Fig. 1. Fig. 4 is a detail view of the magnetic clutch in elevation. Fig. 5 is a cross section on line V. V. of Fig. 4. Fig. 6 is a similar view on line VI. VI. of Fig. 4. Fig. 7 is an enlarged view in elevation of the terminal contacts for the vibrating end of the beam. Fig. 8 is an enlarged cross section through the poise on the line VIII. VIII. of Fig. 3. Fig. 9 is a similar view of the printing mechanism on the line IX. IX. of Fig. 3. Fig. 10 is a detail view of one of the beam-contact-operated motor relays. Fig. 11 is a detail view of the printing relay and retard mechanism. Fig. 12 is a diagram of the circuits.

Referring to the drawings, 2 is the usual balancing beam of a scale mounted by knife edge bearings 3 in any suitable support, as from the cap of a scale frame. The beam 2 is in the form of a rectangular framework having two oppositely arranged side bars 4, 4, joined at their ends by cross bars 5 and 6 respectively of any suitable construction, the end 5 providing bearings for the outer end of the poise feed screw and for mounting of the terminal contact element, the inner end 6 providing a bearing for the motor shaft.

7 is the adjustable poise mounted by carrying wheels 8, at each side, on supporting tracks 9 along the upper edges of bars 4, provided with an internal nut 10 pressed into engagement with the threads of a feed screw 11 by any suitable spring mechanism 12, whereby the poise is placed in feeding engagement with the threaded shaft 11. It will thus be seen that upon rotation of the shaft 11 in either direction the poise 7 may be located at any position on the beam to operate in the same manner generally as in the ordinary poise of the usual weighing scale. One or more additional nuts 10′ of blade form are preferably provided at the front and back of the poise, pressed toward the shaft by a top spring plate 12′ the purpose of which is to clean the threads of all dust, etc. By means of these spring-actuated nuts all wear of the threads is compensated for, thereby avoiding all lost motion and insuring accuracy of operation.

The machine is designed to operate automatically, so that the poise will be located at the proper position, dependent upon the weight of the goods or article being weighed, and for the purpose of actuating the screw 11 in either direction I provide a motor M, the armature of which and shaft 13 rotate in the usual way between the fields of the motor. Shaft 13 is provided at its outer end with a bearing terminal mounted in any suitable bearing 14 in the end 6 of the beam and is coupled at its inner end with a magnet 15. It is designed that the screw shaft 11 shall be subject to magnetic clutch engagement with said magnet 15, for which purpose it is provided with an armature 16 secured to the inner end of the threaded shaft, whereby said shaft is rotatably coupled with the magnet and motor shaft and will rotate with it in either direction when the motor is operated.

The construction of the magnetic clutch

is shown in detail in Figs. 4, 5 and 6. The magnet is freely rotatable with relation to motor shaft 13 and is coupled therewith by a resilient spring 13^a secured to a head 13^b or a post 13^c thereof secured to the shaft, the coiled end of the spring engaging a pin 15^a of the magnet. The magnet 15 is of any suitable construction, receiving current by the terminals 15^b, 15^b, of the beam circuit conductors *e* and *d*, and is provided with the maagetic poles 15^c, 15^c. Armature 16, as shown, is preferably of two jointed members 16^a, 16^a, pivoted at 16^b to a head 16^c secured to the end of screw shaft 11, the inner end of which may have a free telescoping engagement with the central portion of the magnet. By reason of the momentum of the motor the magnetic clutch is of advantage in that immediate uncoupling of the motor and shaft 11 is effected, the factors of small inertia and high friction of the shaft avoiding any tendency to rotate after the connection is broken. As additional means for arresting the shaft upon the breaking of the circuit through magnet 15 the arresting of the printing wheel which is fixed on the shaft by one of the teeth 24, hereinafter described, is of advantage and utility. By these means overrunning of the poise to any great extent is avoided.

The machine is provided with printing mechanism indicated by the letter P comprising means for printing the weight as determined by the poise at the time when the terminal 26 has come to rest. Mounted around the inner end of shaft 11 between a bearing 17 therefor and magnet 15 is a series of printing wheels 18, the outer one 18^a of which is fixedly secured to the shaft, the other printing wheels being loosely mounted thereon and automatically actuated by the rotation of the first printing wheel through automatically operative transmitting gearing 19 co-acting with series of inter-engaging teeth 20 on the wheels, of well known construction, and similar to the printing wheels 4 to 10 inclusive of my prior Patent No. 701,757.

21 is a centralizing plate pivoted at 22 in a supporting framework 23 and having alining teeth 24 at its lower portion adapted to engage between the teeth 20 of said printing wheels 18 to aline them for printing, plate 21 being normally held retracted by stop magnets 25 operating on the plate as an armature.

p, *p*, are the magnets which actuate the printing lever *p'*, the inner end of which is provided with a platen p^2 adapted to throw the ribbon p^3 and strip of paper p^4 upwardly against the under side of the printing wheels when magnets *p* are energized, as hereinafter described. The outer end of lever *p'* is provided with a toothed segment p^5 engaging gear p^6 and rotating ratchet wheel p^7 freely on the printing movement, but operatively engaging the same on reverse movement to feed the paper strip p^4 on drum p^8 for the next operation, as will be readily understood.

26 represents a contacting terminal extending beyond the end 5 of balancing beam 2, adapted to make contact with the terminal 27 or 28 of the motor-controlling circuit, hereinafter described. Terminal 26 is connected by conductor *a* with the stop magnets 25, conductor *a* passing through a supporting tube 29 mounted in the ends of the beam as shown in Fig. 2, the poise 7 having a clearance opening permitting it to travel along without interference.

PR is the printing relay, the function of which is to establish an actuating circuit to the magnets *p*, *p*, of printing mechanism P only when the poise has finally come to rest and the beam to an equi-poised position.

While the beam is vibrated up and down during the back and forth shifting of the poise, circuit is maintained broken to the magnets of the printing mechanism, and is finally established by the printing relay, shown more fully in detail in Fig. 11. In said construction, 30 represents the magnets which are normally energized when contact 26 energizes either contact 27 or 28 and which become dormant when either of said contacts is permanently broken at the equi-poised position. 31 is an armature lever pivotally mounted at 32 on a base 33 normally retracted by a spring 34 when the circuit is dis-established. 35 is a connecting arm attached to the ratchet wheel 36 on the shaft of the first wheel 37 of a train of clock-work gearing, the final shaft of which is provided with a retarding fan or impedance device 38. 39 is a contact spring normally maintained out of contact with terminal 40 by an arm 41 of armature lever 31 and which will only make contact to establish the circuit to the magnets of the printing mechanism *p*, when magnets 30 become de-magnetized. By reason of the retarding fan 38 and the clock-work gearing, the operation of spring 34 is partially checked so that there is an appreciable delay after terminal 26 arrives at its equi-poised position, before the printing mechanism is operated. This is of considerable advantage in that it allows enough time to elapse to permit the spring 34 to withdraw the armature lever 31 and actuate the train of gears to close the contact with the printing mechanism, thereby insuring against premature operation thereof.

In the diagram of Fig. 12, I have illustrated the complete wiring of the mechanism and the necessary electrical elements to provide for the several operations, as shall now be described. It will be understood that

there are three possible operations of the beam, to wit; that in which the contacting terminal 26 is in contact with terminal 28; that in which terminal 26 is in contact with terminal 27; and the intervening position. Also, that in order to operate the mechanism the motor must be alternately reversed so as to shift the poise 7 back and forth until it finally arrives at the desired position for the printing operation to be performed. When the beam is down in the "trig loop" or in other words, when the poise is beyond the balancing position, the flow of current from the source of supply is as follows: A and B represent the main conducting wires from any source of electrical energy. The current flows from conductor A to switch S, the function of which is to throw the entire mechanism into or out of operation, and to the distributing point C on the beam. Here the conductors are divided, the current flowing by conductor *c* through the magnets 30 of the printing relay P, R, and thence by conductor *d* to magnetic clutch 15, from thence by conductor *e* to magnets 25 of the stop mechanism, and from thence by conductor *a* to terminal contact 26 on end of beam. From lower contact 28 by conductor *f* to the magnets 41 of relay D; by conductor *g* to lamp resistance 42 thence by conductor *h* to main conductor B, the opposite side of supply.

In Fig. 10 I have shown in detail, one of the motor relays D. The opening and closing armature d^3 is pivotally mounted at d^1 and connected with the field connection *j* and is normally retracted by a spring d^4 and limited as to its movement by set screw d^5. When magnets 41 are energized through either conductor *f* or *q* and main line conductor *g*, armature d^3 contacts with binding post d^2, closing the circuit from field magnet conductor *j* to motor conductor *n*. It will thus be seen that in the open position of the relay the armature lever lies against the limiting stop d^5 and after the circuit is closed by the beam contact 26 an appreciable period of time will elapse while the armature lever moves from its position of rest toward the magnet and into contact with d^2, establishing connection with the motor. However, on the opening of the beam circuit, connection is broken instantly. In this way, for any period of time that the beam circuit might be closed, the motor circuit will be closed for a shorter period, and the action will be as follows on the beam coming to balance: Assuming the poise 7 to be in a position of several hundred pounds variation from the point of balance, the relay D will close and operate to start the motor, moving the poise toward the point of balance, and slightly beyond, such movement being accomplished by a very rapid movement of the motor M, say 1200 R. P. M. The beam, upon arriving within a variation of a few pounds of the correct position and due to its alternating movement, will vibrate from one to the other contacts, *i. e.*, from 27 to 28. For each short period of time however, during which the beam makes connection above and below, the time lost in the closing of the relay is taken from the period of time during which the motor is energized and so operating to feed the poise rapidly toward the point of balance. The effect of the arc is counteracted by adjusting the return spring d^4 on the relay so that an appreciable weakening of the beam circuit, even if still maintained through the arc from the contact, will operate the relay. From the above it will be seen that the adjustment of the motor relays is dependent to a certain extent, like the printing relay, on the time of vibration of the beam. The operation of the motor relays in this manner contributes to the practicable operation of the machine as follows: First: They do away with a multiplicity of contacts on the beam. Second: By splitting the current used into different independent circuits they obviate the faults produced by burning when a heavy circuit is broken. Third: They operate to bring the beam more quickly to a balance, as follows: Assuming the moving mechanism operating the poise comes to rest instantly on the breaking of the circuit at the beam contact (26, 27, 28), two factors still operate to carry the poise from the point of balance. First, the beam along with the weight of the scale, due to their inertia, does not immediately start to swing on coming to an absolute balance, and therefore an appreciable amount of time elapses after the poise has arrived at the balance point before the beam leaves the upper or lower contact, during which time the poise is still moving; and, second, on the breaking of any circuit conveying electric current, an arc is formed at the breaking point, thus supplying current to the mechanism a small fraction of a second after the beam has left the upper or lower contact. Both of these factors tend to carry the poise over the balancing point.

The motor circuit is as follows: from the main conductor A through the switch and distributing points C by conductor *i* to the fields F of the motor M and field wire *j* to contacts d^1 and e^1 of relays D and E respectively. Relay D being closed at this time under the influence of magnets 41 establishes circuit by post d^2 and conductors *k* to wires *l* and *n* and armature *m* of the motor, connecting wire *n* leading from the other side of the motor to contact post d^2. Through conductor *o* circuit is established through lamp resistance 43 to the other main conductor B. When the beam is at the upward position, the operation is the same, except that cur-

rent flowing from contact 27 through wire q instead of other conductor f, energizes magnets 44 of relay E closing the circuit from field wire j through contacts e^1 and e^2 to conductors a and k, thereby reversing the direction of the armature current and also the direction of rotation in the motor. When the beam is in balance and the circuit open at all points for a sufficient time allowance, the return spring 34 on the printing relay P, R, draws the armature back to its retracted position as described, at which position this relay closes the circuit by spring 39 and terminal 40 thereby establishing the circuit through conductors r and s to the magnets p, p, of printing mechanism P. The current then flows from main conductor A through the printing mechanism to armature conductor r and through the various connections back to main conductor B.

What I claim is:—

1. In an automatic recording scale, the combination of a beam, its poise, a poise-operating screw, an electric motor for actuating the poise screw, and a magnetic clutch directly connecting the motor and the screw; means controlled by the beam for operating said clutch with relays and their circuits for controlling the time of operation of the motor independent of the operation of the beam, contacts in said relay circuits and a contact on said beam adapted to close the relay circuits.

2. In an automatic recording scale, the combination with the beam, its poise, a poise screw geared with the poise, an electric motor for actuating the poise screw, and a magnetic clutch for directly coupling the poise screw and motor together; of means for controlling the operation of the motor and clutch dependent on the operation of the beam, and interposed mechanism dependent on the movement of the beam for controlling the operation of the motor.

3. In an automatic recording scale, the combination with the beam, its poise, a poise operating screw geared with the poise, an electric motor, and a magnetic clutch for directly connecting the motor and screw; of means for controlling the operation of the motor and clutch dependent on the operation of the beam, and interpose compensating relay mechanism, circuits and contacts dependent on the movement of the beam for controlling the operation of the motor.

4. The combination with a scale beam, of a poise, a poise-operating screw, an electric motor for operating the screw, means controlled by the beam for operating the motor, a magnetic clutch for directly coupling the motor and screw together, means controlling the clutch dependent on the position of the beam, type-wheels controlled by the screw, printing mechanism, and operating means therefor controlled by the position of the beam.

5. The combination with the beam, its poise, the poise-operating screw, of an electric motor for operating the screw, means controlled by the beam for operating the motor, a magnetic clutch directly coupling the motor and the screw, means controlling the clutch dependent on the position of the beam, type-mechanism mounted on the screw, electrically-controlled means for moving the type-mechanism, contacts for said electrically-controlled means, and a contact on the beam adapted to close the circuits of said electrically-controlled means.

6. The combination with a scale beam, a poise thereon, a feed screw therefor, an electric motor for actuating the feed screw, a magnetic clutch interposed between the motor and the feed screw for directly coupling the two together, of type wheels controlled by the screw, printing mechanism, and means controlled by the position of the beam for operating the motor and the printing mechanism.

7. The combination with the poise beam, the poise feeding screw, a poise on said screw, an electric motor and its shaft for actuating said screw, of means independent of the motor and its shaft, controlled by the position of the beam, for locking the screw against movement.

In testimony whereof I affix my signature in presence of two witnesses.

EDWARD McGARVEY.

Witnesses:

A. A. Dale,

Leonard Rhone.