(No Model.) 4 Sheets—Sheet 1.

F. W. COLE.

ELECTRIC VISUAL INDICATOR.

No. 445,796. Patented Feb. 3, 1891.

Fig: 1.

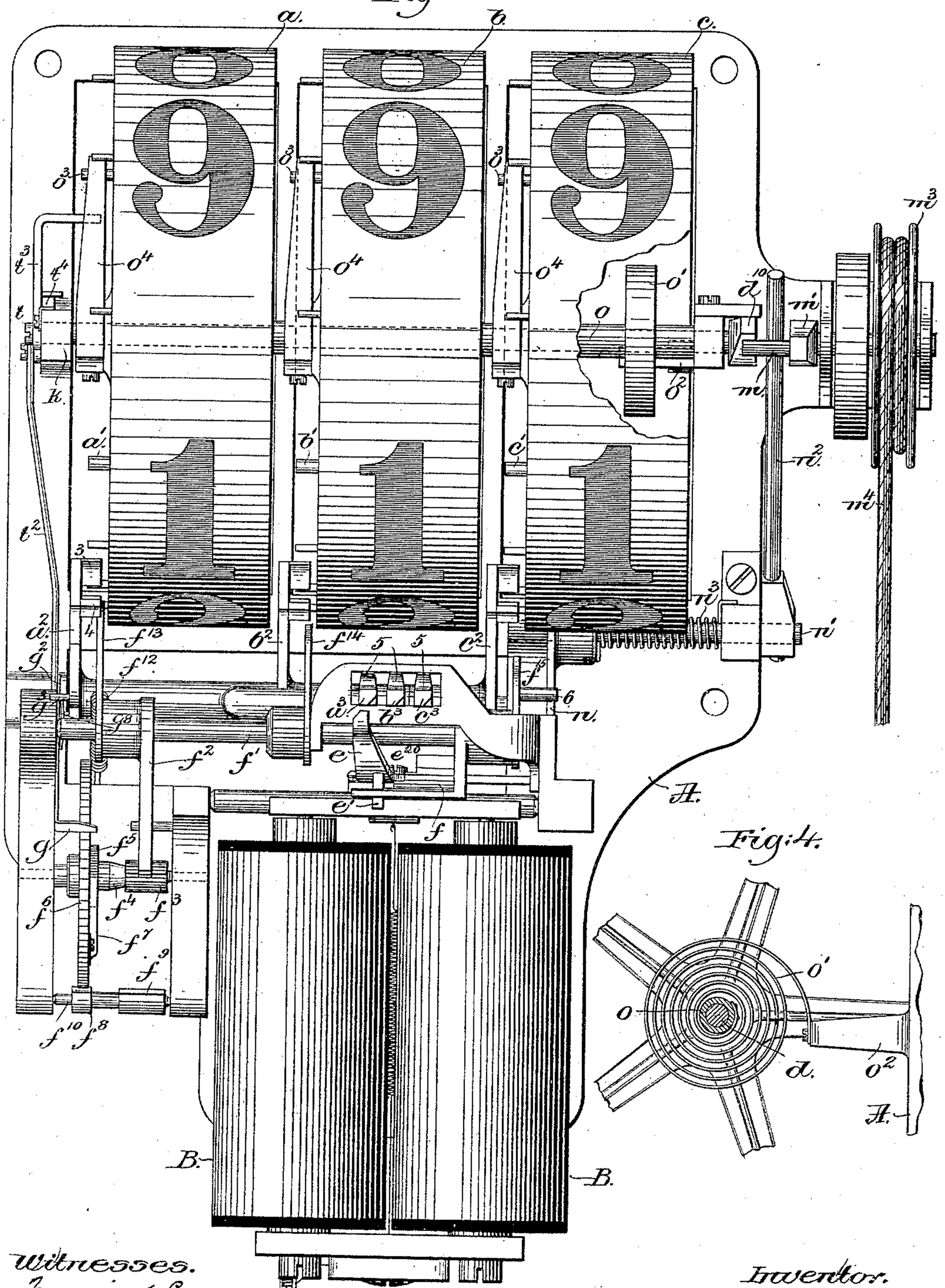

Fig: 4.

Witnesses.
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(No Model.) 4 Sheets—Sheet 2.

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Fig: 2.

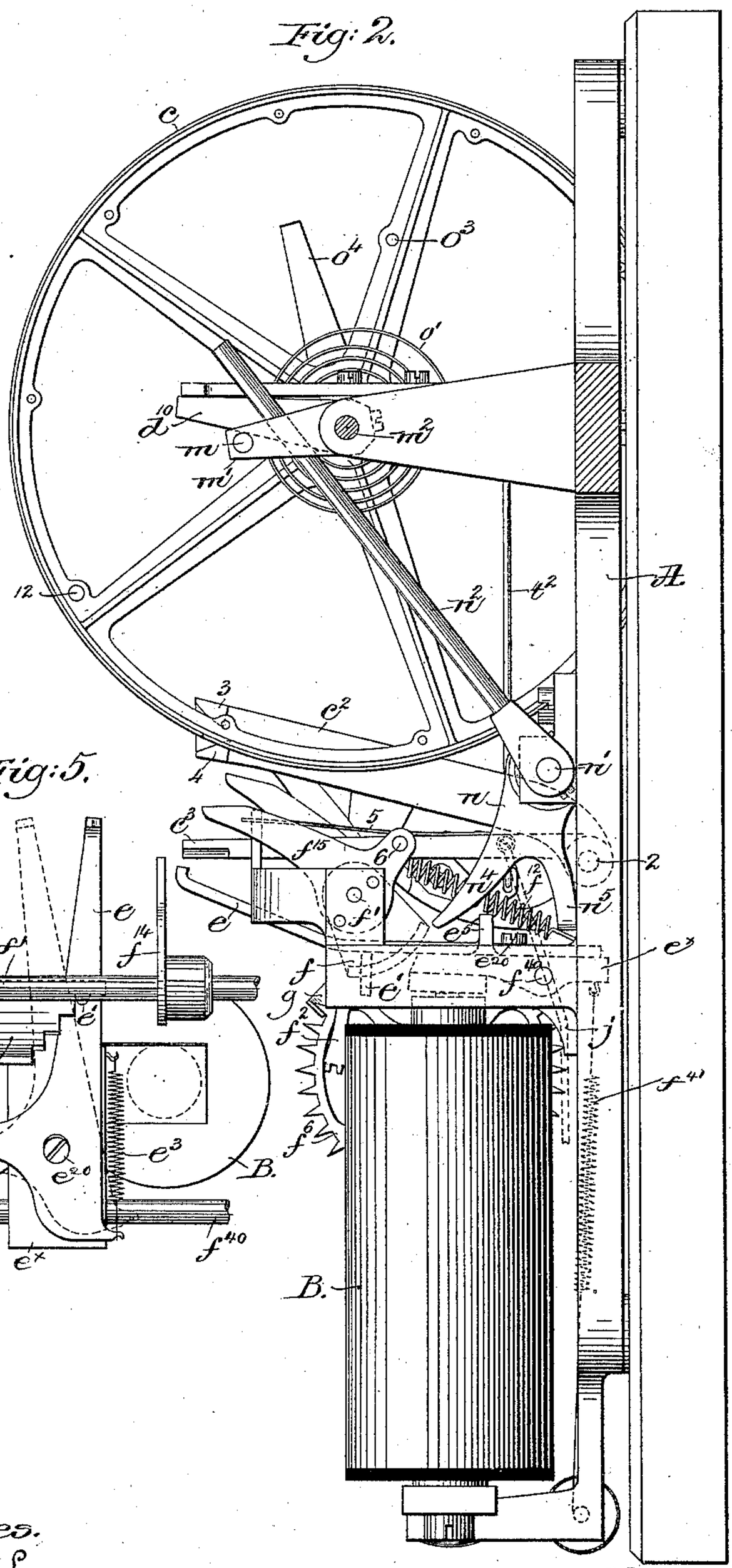
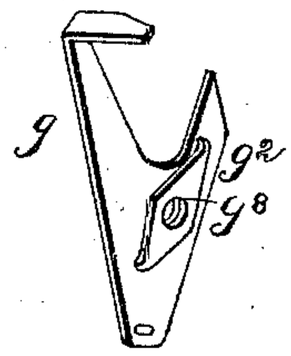


Fig: 5.

Fig: 10.



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ELECTRIC VISUAL INDICATOR.

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Fig: 3.

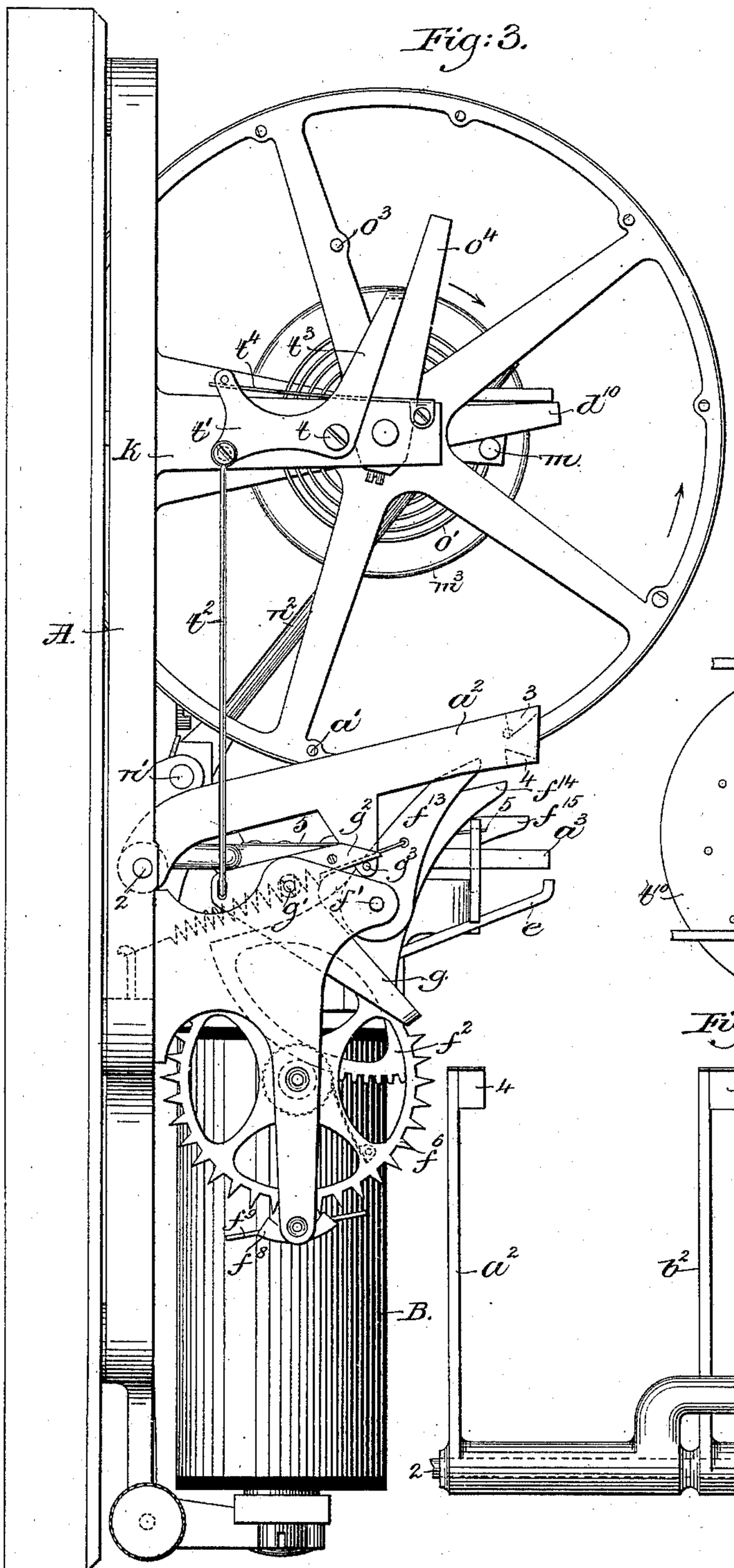

Fig: 9.

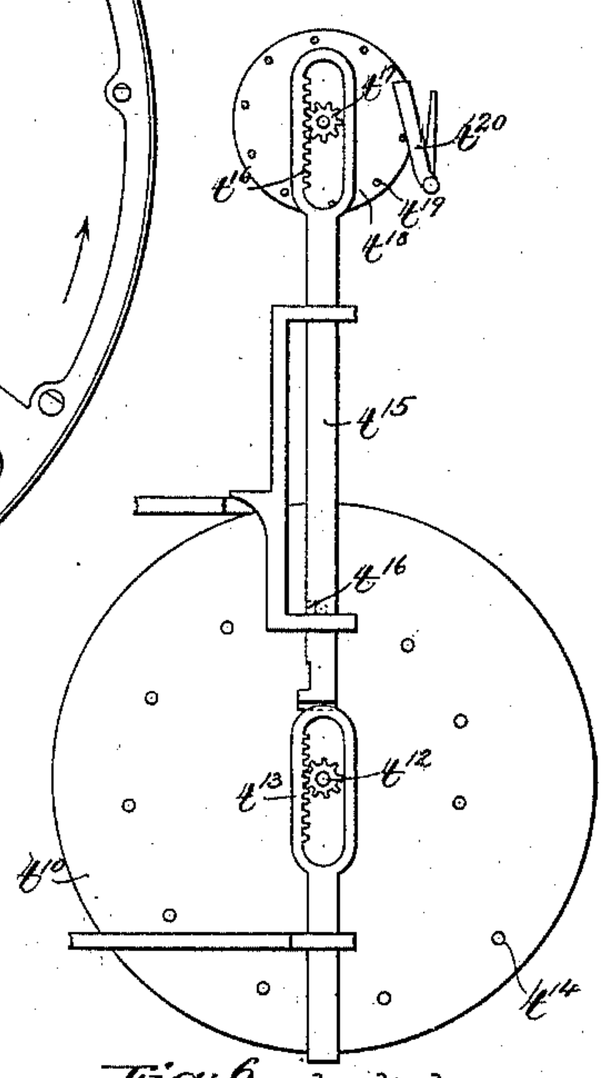

Fig: 6.

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ELECTRIC VISUAL INDICATOR.

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Fig: 7.

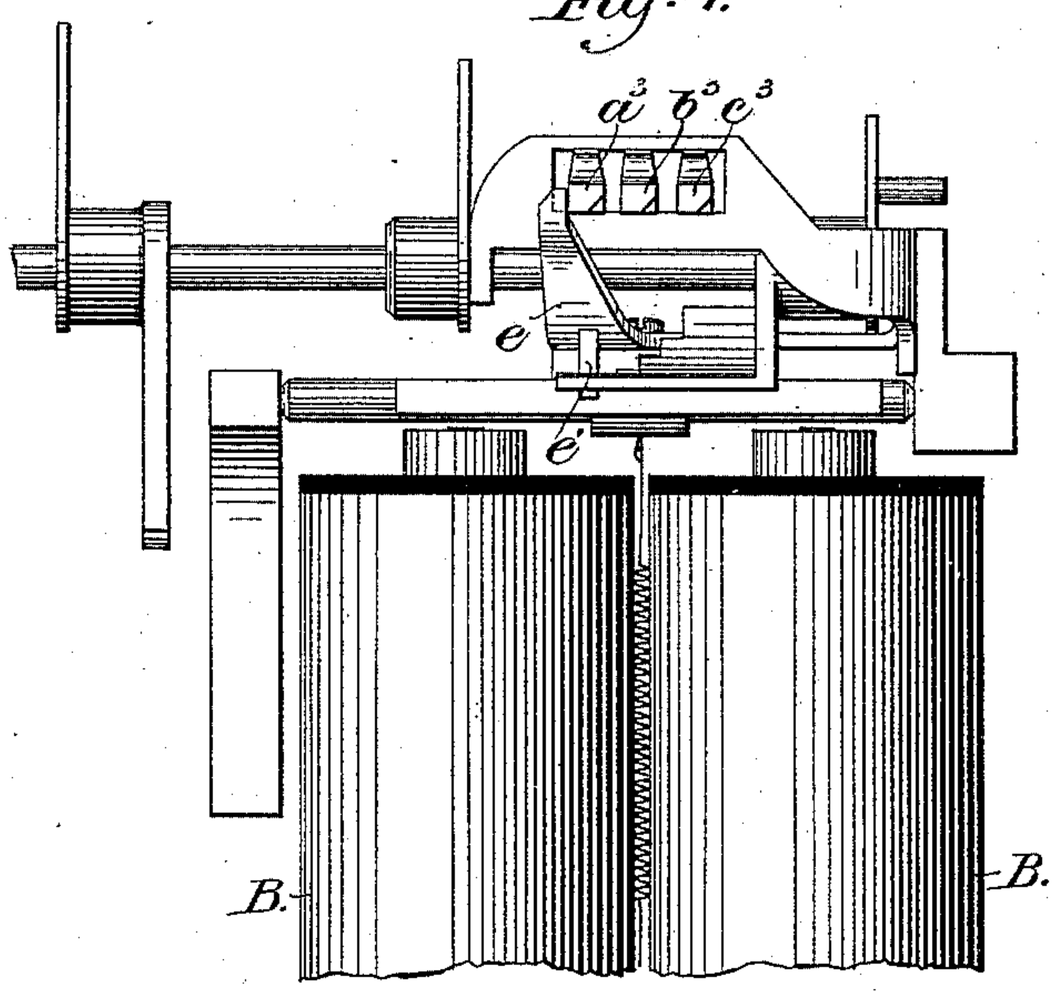
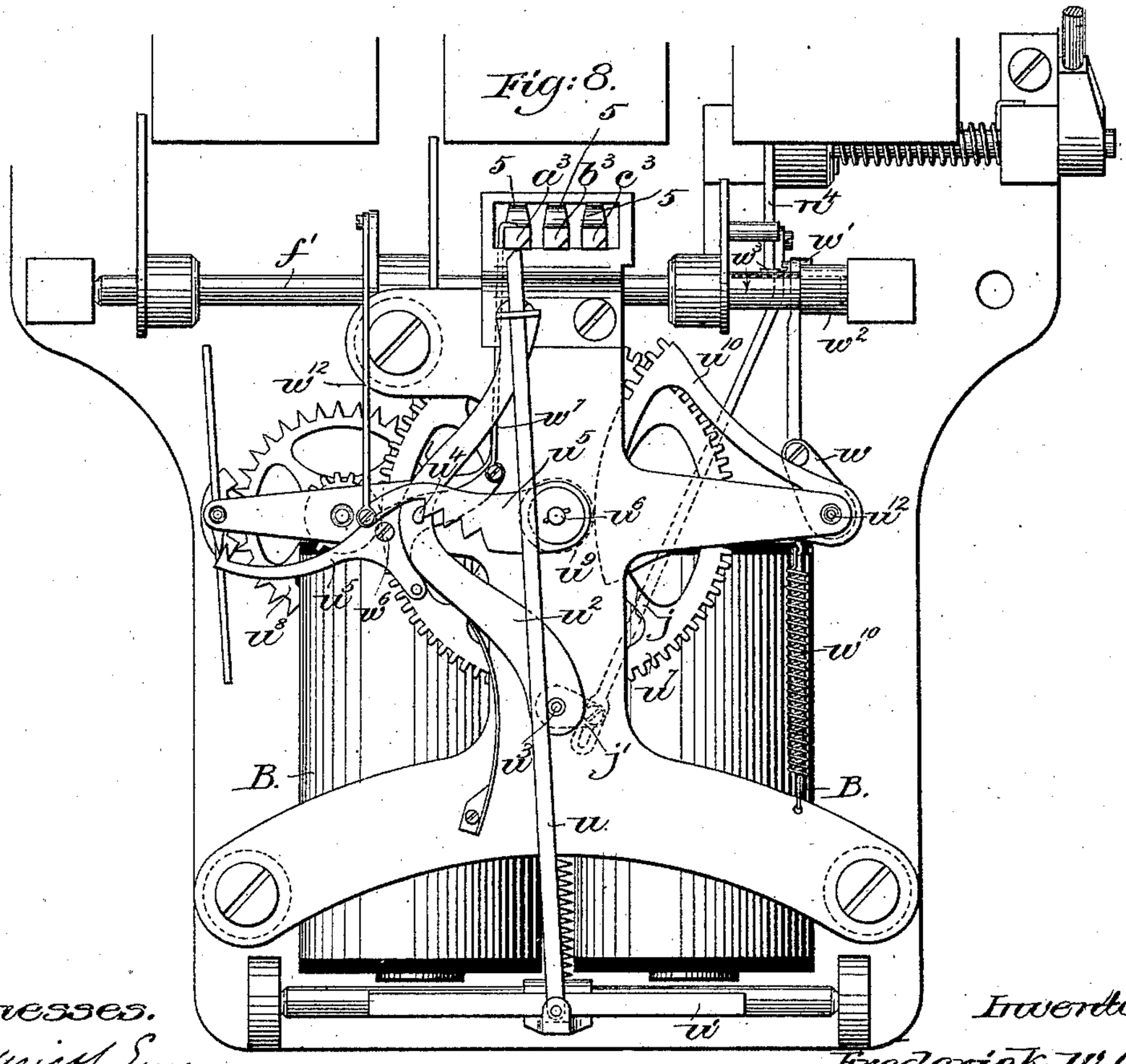


Fig: 8.



Witnesses.
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Edgar A. Goddin.

Inventor.
Frederick W. Cole,
by Lemby & Gregory Attys.

UNITED STATES PATENT OFFICE.

FREDERICK W. COLE, OF NEWTON, MASSACHUSETTS, ASSIGNOR OF ONE-HALF TO MOSES G. CRANE, OF SAME PLACE.

ELECTRIC VISUAL INDICATOR.

SPECIFICATION forming part of Letters Patent No. 445,796, dated February 3, 1891.

Application filed Jan. 7, 1890. Serial No. 342,950. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK W. COLE, of Newton, county of Middlesex, State of Massachusetts, have invented an Improvement in Electric Visual Indicators, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

This invention has for its object to construct a visual indicator adapted to display many different numbers for fire-alarm and other purposes which is quick-acting yet accurate in its movements.

In accordance with this invention figured drums are arranged on shafts and are moved by springs or equivalents. A let-off is employed for each drum independently movable one with relation to another. An operating-lever carried by the armature of the electro-magnet acts upon or against one or another let-off to release the drums directly or indirectly. The operating-lever is moved from one to another let-off by means of a spring or equivalent, and a motor mechanism, preferably a time-train, is employed to control such movement of said operating-lever. A suitable positioning device is provided for the operating-lever, having a series of rests, one opposite each let-off. The positioning device is moved in one direction by a time-train and is set back by the drums or other indicating-surfaces when operated, each drum setting the positioning device back at each intermittent movement to keep the operating-lever on or against its corresponding rest. Suitable means are provided for winding the motor mechanism, also for restoring the figured drums to their normal position, and also for winding the controlling-springs or equivalents of the said drums.

Figure 1 shows in plan view an indicator embodying this invention; Fig. 2, a right-hand view of the indicator shown in Fig. 1; Fig. 3, a left-hand side view of the indicator shown in Fig. 1; Fig. 4, a detail of one of the actuating-springs of the drums; Fig. 5, a detail of the operating-lever which moves the let-offs, together with a portion of the motor mechanism controlling the movements of said operating-lever; Fig. 6, a detail of the let-offs for the figured drums; Fig. 7, a detail showing the operating-lever connected with the armature of the electro-magnet, which is arranged in an open circuit; Figs. 8 and 9, modifications to be referred to, and Fig. 10 a detail to be referred to.

The main frame-work A is of any suitable construction to support the operating parts.

The figured drums $a\ b\ c$, three being herein represented, are arranged on a shaft d, having its bearings in the main frame-work. Each of the drums has on its periphery laterally-projecting pins $a'\ b'\ c'$, there being as many pins as there are figures and blank spaces, ten such pins being herein shown on each drum. The drums are spring-controlled or spring-actuated, as will be hereinafter described.

On a rod 2 three let-offs are arranged, one for each drum, and shown particularly in Fig. 6. Each let-off comprises two arms, as $a^2\ a^3\ b^2\ b^3\ c^2\ c^3$, one of which arms, as $a^2\ b^2\ c^2$, has two angular studs 3 4, (see Figs. 2 and 3,) arranged side by side, with a suitable space between them, and the other of which arms, as $a^3\ b^3\ c^3$, serving as an operating-lever, to be referred to, which strikes against and moves the let-off. Each arm which carries the studs 3 4 is arranged, respectively, opposite the figured drums, so that the pins $a'\ b'\ c'$ on the drums may co-operate with the said studs—as, for instance, referring to Fig. 3, the figured drum a moving in the direction of the arrow thereon when released, its pins a' strike the stud 4, then the stud 3, and then pass between them at each movement of the let-off a^2, the let-offs being held in position to hold the drums with the pins bearing against the studs 3 by means of springs 5, (see Figs. 2 and 3,) one spring for each let-off.

Directly below the arms $a^3\ b^3\ c^3$ of the let-offs an operating-lever e is located, (see Figs. 1, 2, and 5,) it being pivoted at e^{20} to the armature-carrying bar $e^{\times}$ of the electro-magnet B, which bar is pivoted at f^{40} and has connected to it a retractile spring f^{41}. The operating-lever e turns on its pivot in a horizontal plane beneath the arms $a^3\ b^3\ c^3$, and said operating-lever e is also moved toward and from the arms $a^3\ b^3\ c^3$ by the armature, which latter moves on the pivot f^{40}.

As herein shown, the electro-magnet B is included in a closed circuit, and hence the armature is normally attracted, and when the apparatus is in its normal condition, set ready to receive a signal, the operating-lever e is held by means to be described directly opposite the let-off a^3.

A stepped plate f is secured to a rocker-shaft f', having its bearings in the frame-work, said stepped plate being arranged adjacent to the operating-lever e, and a stud e' projects from said operating-lever e, which acts against one or another step of the plate f, according to the position of the latter. This stepped plate constitutes a positioning device for the operating-lever e, as will be more fully hereinafter described. A sector f^2 is also secured to the rocker-shaft f', which meshes with a pinion f^3, fixed to a sleeve f^4, carrying a ratchet-wheel f^5, and on the shaft carrying the sleeve an escape-wheel f^6 is secured, carrying a pawl f^7, which engages the ratchet-wheel f^5. A suitable pallet f^8 and fan f^9 are arranged on a rocker-shaft f^{10}, the pallet f^8 engaging the teeth of the escapement f^6. A spring f^{12} is secured at one end to an arm f^{13} and at the other end to the frame-work, said arm f^{13} being fixed to the rock-shaft f'.

When the indicator is in its normal condition—*i. e.*, set ready to receive a signal—this time mechanism is wound up and is locked by a dog g, (see Fig. 3,) pivoted at g', said dog having an arm g^2, against which the stud g^3, projecting laterally from the let-off a^2, acts when the let-off is moved. The dog g is held in its different positions by means of a friction-plate g^8 (see Fig. 10) bearing against it. Other arms f^{14} f^{15} are fixed to the rocker-shaft f', said arms being similar to the arm f^{13} and all occupying positions to co-operate with the laterally-projecting pins on the peripheries of the figured drums.

On the reception of the first impulse the armature is retracted, and the operating-lever e, which bears against the first step of the stepped plate f, and hence lies directly opposite the arm a^3 of the let-off a^2, strikes against the said arm a^3 of the let-off a^2 and moves it upwardly, permitting one of the pins of the figured drum a to pass between the studs thereon and the next pin of the series to strike against the stop or stud 4. At the same time the let-off a^2, by its stud g^3, moves the dog g out of engagement with the escape-wheel g^6 of the time-train, so that it commences to run.

On the reception of a second impulse after the restoration of the circuit to its normal condition the operating-lever e will again strike against the arm a^3 and a second time release the drum a, and so on in succession, and as the drum a moves forward intermittingly the successive pins a' strike the arm f^{13}, fixed to the rock-shaft f', and turn said shaft back to its starting-point. If, however, there is a sufficient lapse of time after an impulse or succession of impulses before the reception of another impulse or succession of impulses, the time-train will have moved the step-plate f far enough, so that the operating-lever e will pass farther to the right, its stud e' resting against the second step of the plate, and in this position it lies directly opposite the arm b^3 of the let-off b^2, which co-operates with the drum b. The desired number of impulses are received with the operating-lever e in this position, and if the number be one of three figures a lapse of time follows the completion of the second series of impulses sufficient to permit the stepped plate f to be moved far enough to permit the operating-lever e to move farther to the right opposite the arm c^3 of the let-off c^2, the stud e' of the operating-lever at such time bearing against the third step of the plate f. Thus it will be seen that the first drum—namely, a—may rotate intermittingly as long as desired, or until it has completed a rotation, provided the impulses succeed each other quickly, and if a long interval of time elapses the operating-lever is moved to the next drum, which may operate in like manner, and so on.

A bifurcated arm n (see Figs. 1 and 2) is fixed to a rod n', to which rod is also fixed an arm n^2, which lies in the path of movement of a pin m, attached to a crank-arm m', fixed to a shaft m^2, having its bearings in the frame-work, a pulley m^3 being secured to said shaft m^2, around which passes a cord m^4, which may be pulled to rotate the pulley m^3. A spring n^3 is arranged on the rod n', the action of which is to restore the arm n^2 to its normal position after having been depressed by the pin m. One portion, as n^4, of the bifurcated arm n, as the arm n^2 is moved by the pin m, strikes a pin 6 on the arm f^{15}, lifting said arm f^{15}, turning the shaft f', to which it is fixed, and winding up the time-train by means of the sector f^2, and the other portion, as n^5, of said bifurcated plate n strikes the laterally-extended arm e^5 of the operating-lever e and returns the said lever to its normal position against the tension of its actuating-spring e^3, thereby returning the operating parts thus described to their normal position ready to receive a signal.

The drums a b c are each fixed to a sleeve, as o, loosely arranged on the shaft d, and a separate volute spring o' is employed for each drum, said springs being attached at one end to the sleeves and at the other end to posts or standards o^2, arranged on the frame between the drums. Each drum has arranged on one of its spokes a pin o^3, and three arms o^4 are fixed to the rod or shaft d, one beside each drum, and so that when the rod or shaft is turned in one direction said arms strike the said pins o^3 and move the drums to a definite position or set them ready to receive a signal.

A plate is pivoted at t to the support k, one arm, as t', of which plate is connected with

the plate g g^2 by a rod t^2, and the other arm t^3 of which plate is engaged at times by the arm o^4. A spring t^4 is fastened to the post k, the outer or free end of which acts against the arm t', tending to move the plate t' t^3 in a direction opposite to the movement given to it by the arm o^4.

It is necessary, after a signal has been received, to first restore the operating-lever and time-train and then set back the drums and wind up the actuating-springs. To effect this result I have arranged the pin m of the crank-arm m' at the under side of the arm d^{10}, which is fixed to the shaft d, and have given the winding-cord m^4 two windings on the pulley m^3, so that by pulling the said cord m^4 its entire length the pulley m^3 will make two revolutions. During the first revolution the pin m will strike the arm n^2, and, as before described, set back the operating-lever e and wind up the time-train, and at such time the spring t^4 will move the plate t' t^3 and throw the plate g in engagement with the escape-wheel f^6 and thus lock the train. During the second revolution the pin m strikes the arm d^{10} and rotates the rod or shaft d in the direction of the arrow, Fig. 3, and in doing so the arms o^4 strike the pins o^3 on the drums and restore them to their normal position, and as the drums are restored the actuating-springs are also wound. During this retrograde movement of the drums the peripheral pins a' b' c' pass between the studs 3 4 of the let-offs, the latter slightly yielding for such purpose. Each drum has on it one large pin at a certain point, as 12, instead of a pin of regular size, such large pin being too large to pass between the studs 3 4, and hence serves as a stop to prevent the drums moving too far backward or too far forward.

Referring to Fig. 7, the electro-magnet B is included in an open circuit, and hence its armature is normally retracted. The operating-lever e is, however, held at the extreme left by bearing against the arm a^3. The operation of the instrument is substantially the same as before described.

Referring to Fig. 8, three let-offs are employed, which operate to release the drums, the arms a^3 b^3 c^3 thereof being shown. In lieu of the operating-lever and means for moving it, (shown in Figs. 1 to 7,) an operating-lever (shown as a bar u) is loosely connected to the armature u' of the magnet B, said bar being guided by a lever u^2, pivoted at u^3. A stud u^4 is arranged on the lever u^2, which cooperates with a stepped plate u^5, arranged frictionally on an arbor u^6 of a motor mechanism, which comprises a toothed wheel u^7, arranged on the arbor u^6, and with which cooperates a suitable escapement u^8.

A pinion u^9 (see dotted lines) is also fixed to the arbor u^6, which is engaged by a sector u^{10}, pivoted at u^{12}. A short arm w is fixed to the shaft carrying the sector u^{10}, said arm being connected by a link with a short arm w', fixed to a rock-shaft w^2. A lug w^3 projects from said shaft w^2, which is struck by the arm n^4 on the shaft n' of the winding mechanism, such mechanism being substantially the same as shown in Figs. 1 to 7. When the shaft n' is turned, the sector u^{10} winds the motor mechanism. A detent w^5 is pivoted at w^6, which engages the pallet of the escapement u^8, an arm on said detent having a link or hook w^7, which engages the arm a^3. When the arm a^3 is moved by the bar u, the detent w^5 is turned on its pivot and the motor released, which runs continuously by means of the spring w^{10} until it runs down. The stepped plate w^5 is connected by a link w^{12} with an arm on the rock-shaft f', said shaft being moved by pins on the drums, as in Figs. 1 to 6. Each backward movement of the rock-shaft f' moves the stepped plate w^5 back, it turning on its arbor frictionally, as before described. To restore the bar u to its normal position a link j (see dotted lines) connects a short arm j' on the rock-shaft w^2 of the winding mechanism. This modification is substantially such as represented in another application, Serial No. 342,963, filed March 7, 1890, and is herein shown for the purpose of representing how the indicating and winding mechanism herein shown may be applied to such a construction. It comprises a motor and a controlling or stepped plate connected to it frictionally.

Referring to Fig. 9, the figured drums are represented at t^{10} fixed to a shaft having a pinion t^{12}, which is engaged by a rack t^{13}, carrying a weight or equivalent. A series of pins t^{14} are arranged on the drums, such pins being a different distance from the periphery. A bar t^{15} has a stud t^{16}, (see dotted lines,) which is engaged by one of the pins t^{14} of the drums. This bar t^{15} depends from a rack t^{16}, which engages a pinion t^{17}, fixed to a shaft carrying a disk t^{18}, provided with a series of pins t^{19}. A suitable let-off t^{20} is provided for the disk t^{18}, which when moved permits the disk to rotate by means of the weight of the bar t^{15}, or it may be an additional weight. By this construction the let-offs hereinbefore described and the controlling means therefor may permit a very rapid movement of the disk t^{18}, while the drums may move much slower and continuously. Hence it will be understood that many of the novel features of this invention are equally as well applicable to other forms of indicator.

I claim—

1. In an electric indicator, two or more indicating-surfaces intermittingly and independently movable and let-offs for said drums, combined with an operating-lever for said let-offs, an electro-magnet for controlling the movement of the said operating-lever, and a reciprocating stepped plate, against the stepped side of which the operating-lever bears, substantially as described.

2. In an electric indicator, two or more indicating-surfaces and let-offs for moving them intermittingly, combined with an operating-lever, an electro-magnet for controlling the

movement of said operating-lever to move said let-offs, a stepped plate controlling the position of said operating-lever, a time-train for moving said stepped plate, and a spring, as e^3, for moving said operating-lever in engagement with the said stepped plate, substantially as described.

3. In an electric indicator, two or more indicating-surfaces intermittingly and independently movable, combined with an operating-lever, an electro-magnet for effecting its movement, a stepped plate which controls the position of said operating-lever, a time-train for moving said plate in one direction, and means moved by the indicating-surfaces for setting the stepped plate back, substantially as described.

4. In an electric indicator, two or more drums intermittingly and independently movable and let-offs for said drums, combined with an operating-lever for said let-offs, an electro-magnet for controlling the movement of the operating-lever, a stepped plate and time-train for moving it in one direction, and pins on the said drums for moving said plate back a short distance, substantially as described.

5. In an electric indicator, two or more drums intermittingly and independently movable and let-offs for said drums, combined with an operating-lever for said let-offs, an electro-magnet for controlling the movement of the operating-lever, a stepped plate controlling the position of said operating-lever, a rock-shaft to which it is attached, and arms arranged thereon which are engaged by the drums for moving the stepped plate back a short distance each engagement, and a time-train for moving the stepped plate forward, substantially as described.

6. In an electric indicator, two or more drums intermittingly and independently movable and let-offs for said drums, combined with an operating-lever for said let-offs, an electro-magnet for controlling the movement of the operating-lever, a stepped plate controlling the position of said operating-lever, a rock-shaft to which it is attached, and arms arranged thereon in different radial positions which are engaged by the drums for moving the stepped plate back a short distance each engagement, and a time-train for moving the stepped plate forward, substantially as described.

7. In an electric indicator, two or more indicating-surfaces, let-offs for moving them independently, and an operating-lever for said let-offs, combined with a stepped plate the steps of which serve as rests for the operating-lever in its different positions, means, substantially as described, for moving the stepped plate forward, and means, substantially as described, for setting it back when the impulses succeed each other rapidly, substantially as described.

8. In an electric indicator, two or more indicating-surfaces, let-offs for moving them independently, and an operating-lever for said let-offs, combined with a series of stops for holding said operating-lever in its different positions and means controlled by the drum for moving said stops back, substantially as described.

9. In an electric indicator, two or more indicating-surfaces, let-offs for moving them independently, and an operating-lever for said let-offs, combined with a series of stops for holding said operating-lever in its different positions, a series of arms controlled, respectively, by the indicating-surfaces for setting the stops back when the impulses succeed each other rapidly, and a time-train for moving said stops forward, substantially as described.

10. In an electric indicator, two or more circular indicating-drums mounted on a rotary reciprocating shaft, each having on it a series of pins, and let-offs for said indicating-drums, one of the pins of said series being larger in diameter than the others and serving as a limiting-stop for the drums in each direction, substantially as described.

11. In an electric indicator, a series of indicating-surfaces and means for moving them, combined with an operating-lever and a plate, as *f*, having a series of steps, which serve as rests for the operating-lever in its different positions, substantially as described.

12. In an indicator, two or more indicating-surfaces, springs for moving them, and let-offs, combined with an operating-lever for moving the let-offs, a stepped plate the stepped side of which presents a series of rests for the operating-lever, one rest for each different position of said lever, a time-train, and an electro-magnet, substantially as described.

13. In an indicator, the drums and means for moving them, arms on the shaft for restoring the drums to their normal position, the arm d^{10} on said shaft, the winding-crank and means for rotating it, the operating-lever *e*, and a time-train which co-operates with the said operating-lever, the arm n^4, rock-shaft n', and arm n^2, all arranged substantially as described.

14. In an electric indicator, two or more indicating-surfaces, let-offs for moving them independently, and an adjusting-lever for said let-offs, combined with a positioning device for holding said operating-lever in its different positions and means controlled by the drums for moving said positioning device back, substantially as described.

15. In an electric indicator, two or more indicating-surfaces, let-offs for moving them independently, and an operating-lever for said let-offs, combined with a positioning device for holding the operating-lever in its different positions, and means for moving said positioning device forward continuously, and means controlled by each indicating-surface for setting it back to keep the operating-lever in operative connection with its corresponding let-off, substantially as described.

16. In an electric visual indicator, two or more indicating-surfaces, let-offs therefor and an operating-lever for said let-offs, means for moving said lever to move the let-offs, and means for transferring said lever from one to the next let-off, and a positioning device for said operating-lever moved in one direction by a time-train and in the opposite direction by the indicating-surface, substantially as described.

17. In an electric visual indicator, two or more indicating-surfaces, let-offs therefor, and a vibratory and laterally movable operating-lever, and electro-magnet controlling its vibratory movement, and a time-train, together with the indicating-surfaces controlling its lateral movement, substantially as described.

18. In an electric visual indicator, two or more indicating-surfaces, let-offs therefor, and an operating-lever for said let-offs, each indicating-surface when operating keeping the operating-lever in position to operate it, substantially as described.

19. In an electric visual indicator, two or more indicating-surfaces, let-offs therefor, an operating-lever, and a positioning device for the operating-lever, combined with a time-train for transferring the operating-lever from one to the next let-off, the actuating-spring of which is wound by the indicating-surfaces when operating, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

FREDERICK W. COLE.

Witnesses:

BERNICE J. NOYES,

FREDERICK L. EMERY.