

(No Model.)

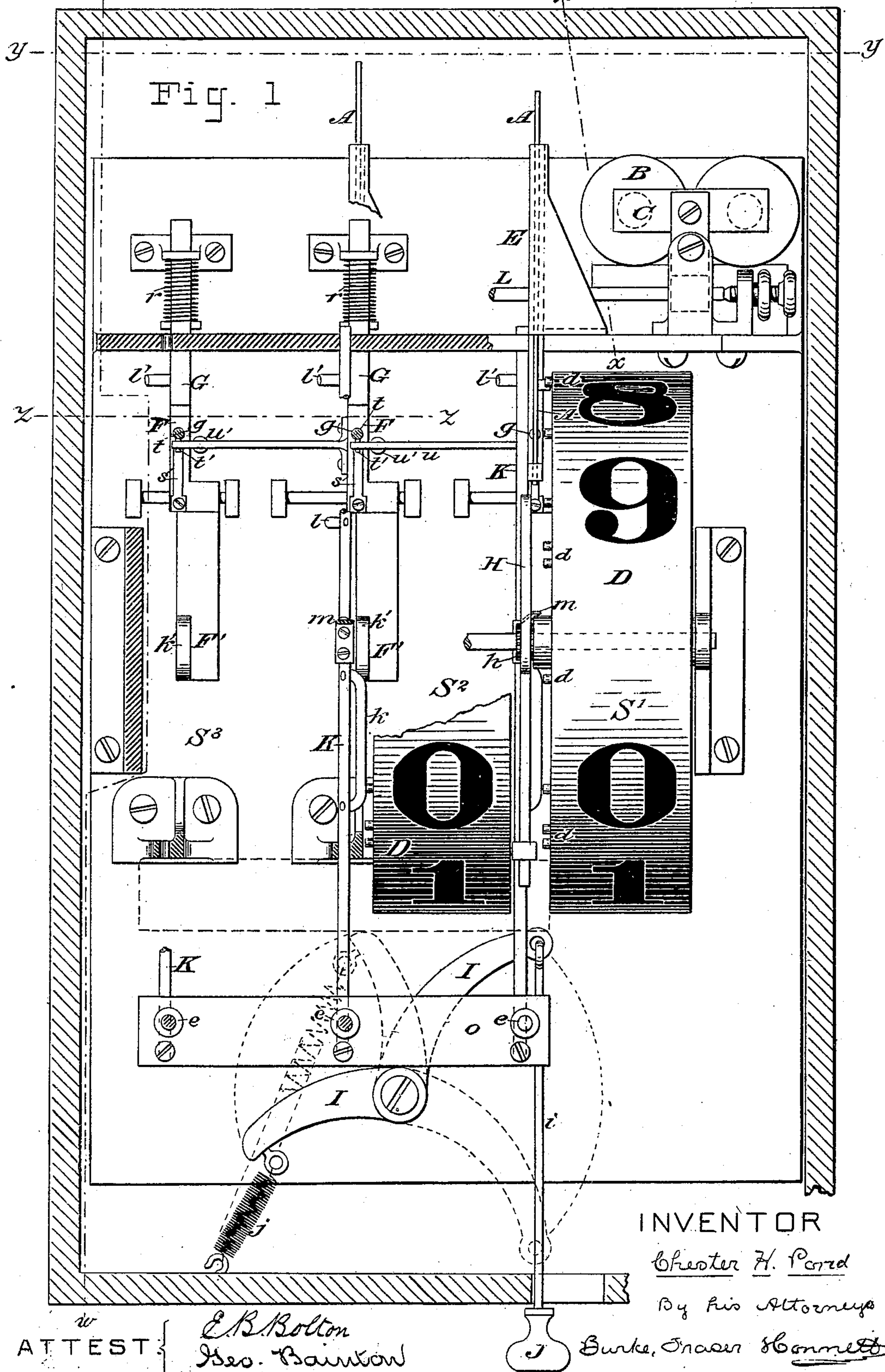
3 Sheets—Sheet 1.

C. H. POND.

# ELECTRICAL VISUAL INDICATOR.

No. 252,897.

Patented Jan. 31, 1882.



INVENTOR

Chester H. Ford

By His Attorneys

Burke, Fraser Honnet

ATTEST

E. B. Bolton

Geo. Bainton

(No Model.)

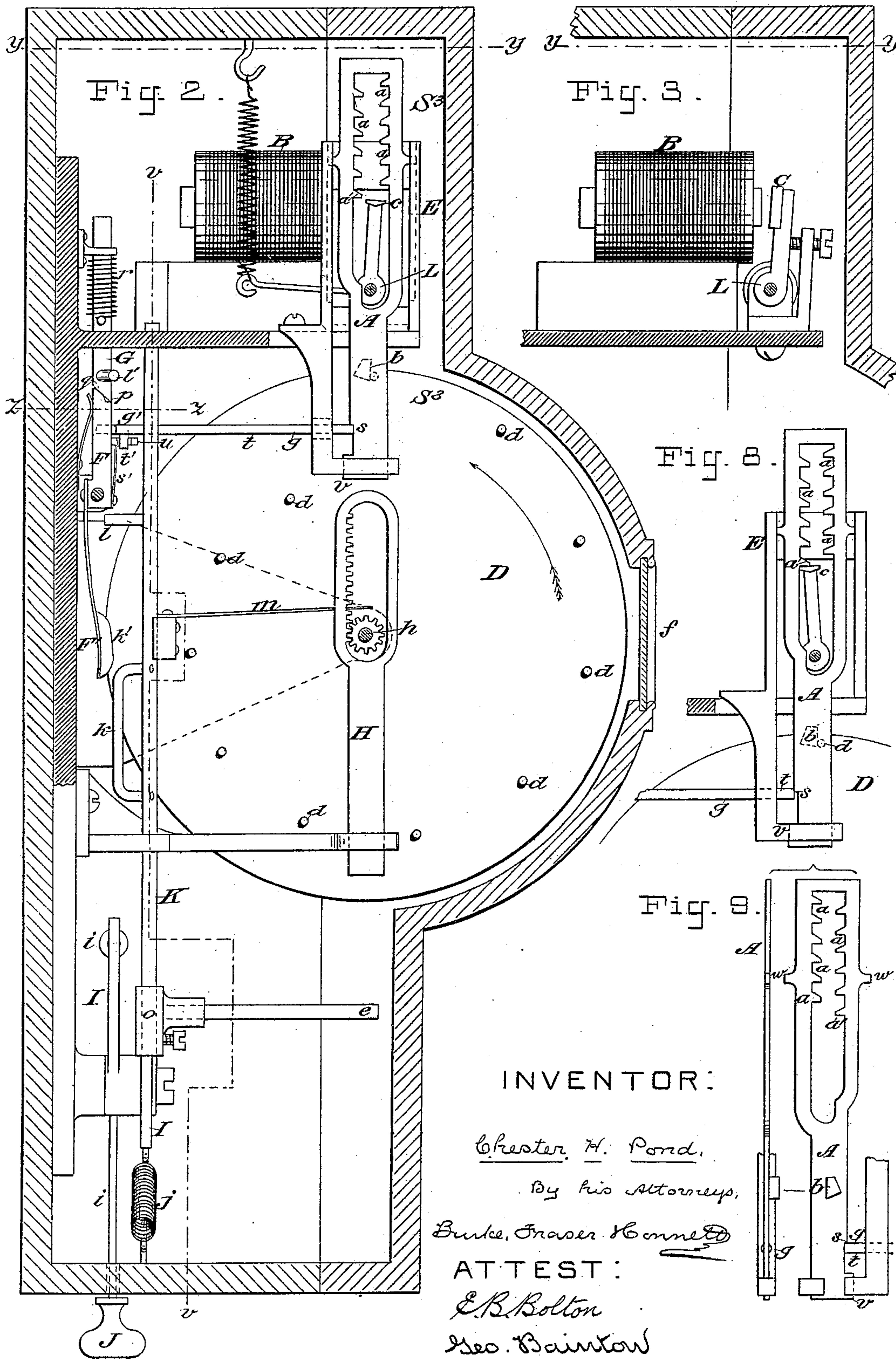
3 Sheets—Sheet 2

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INVENTOR:

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By his Attorney,

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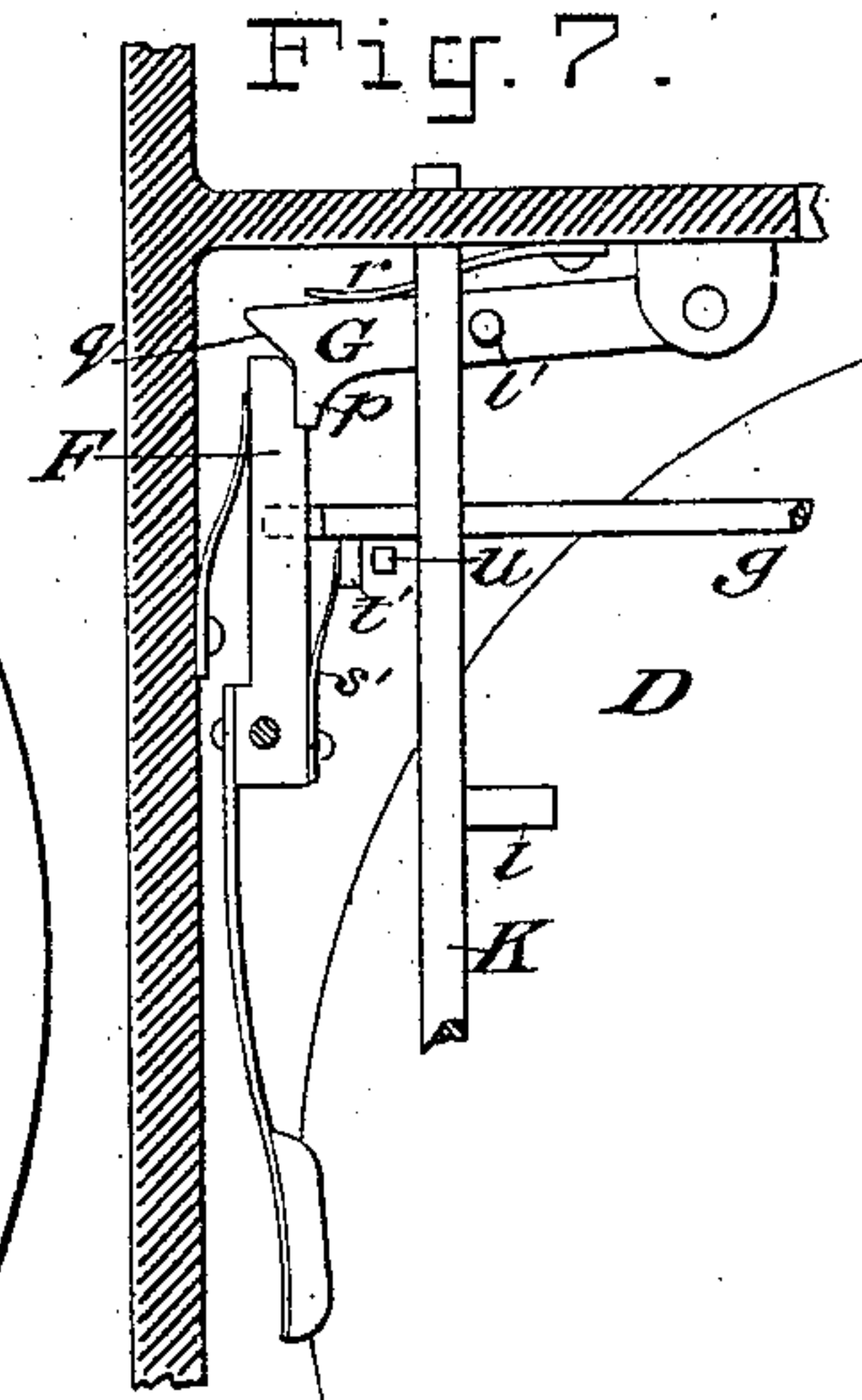
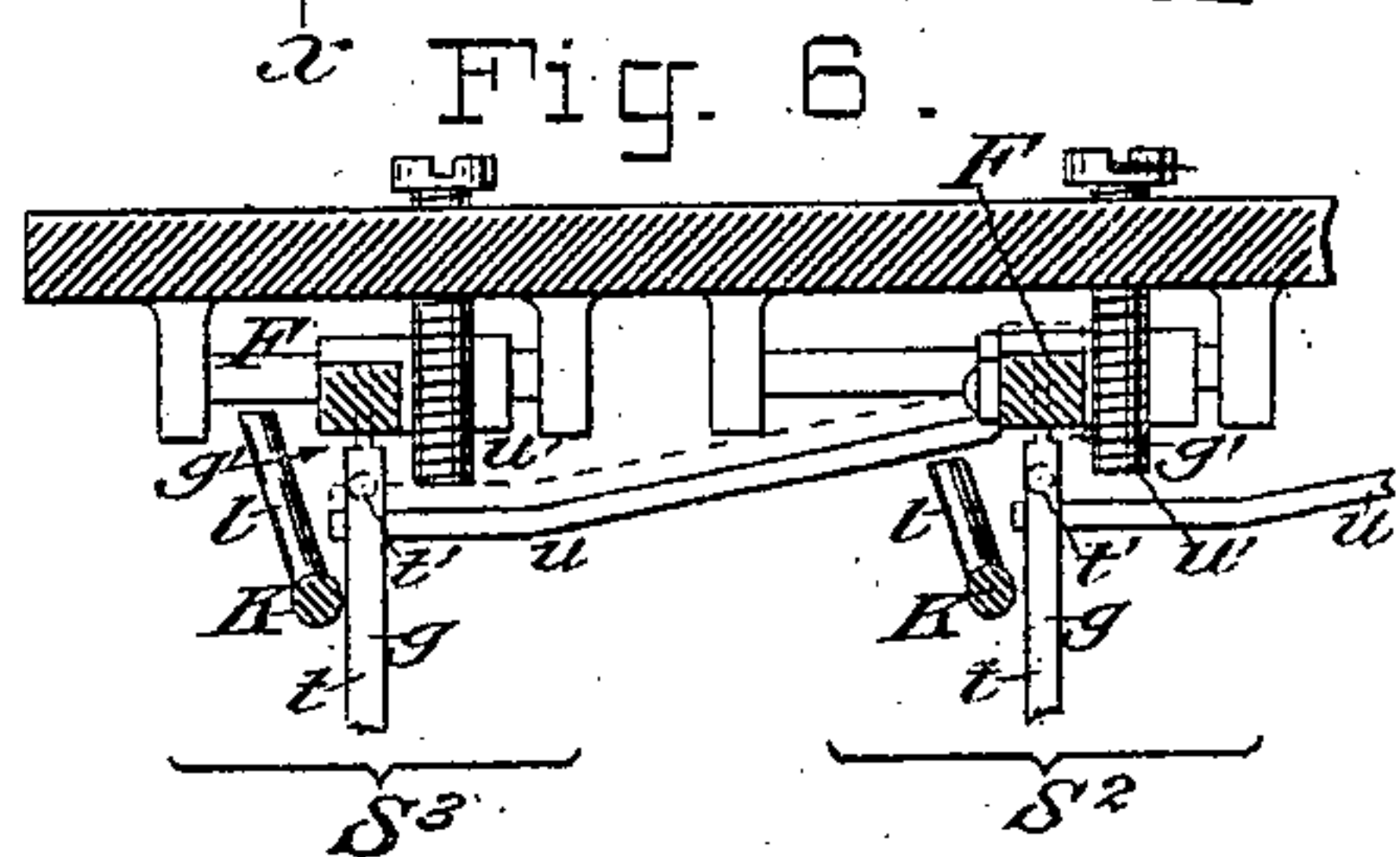
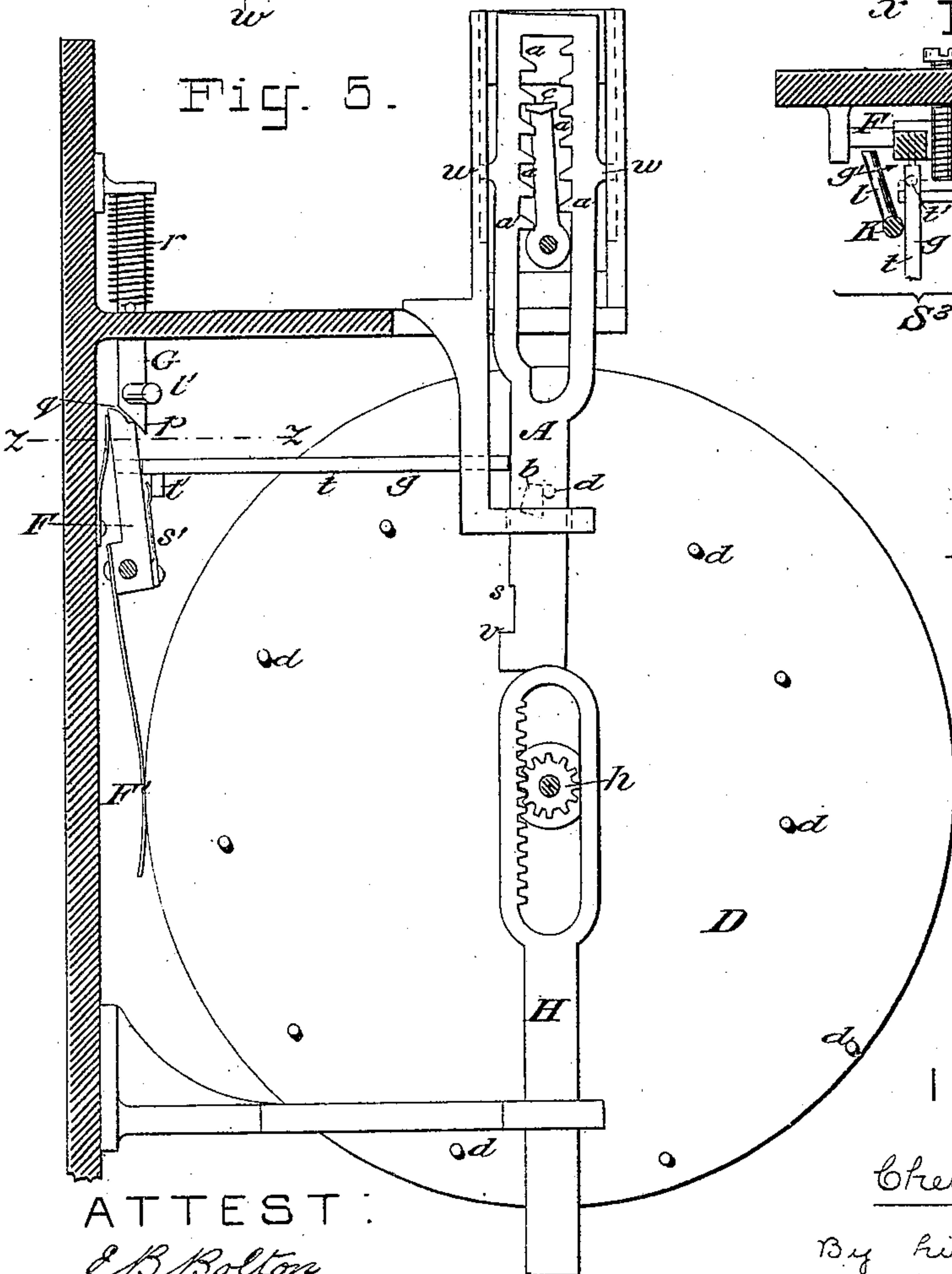
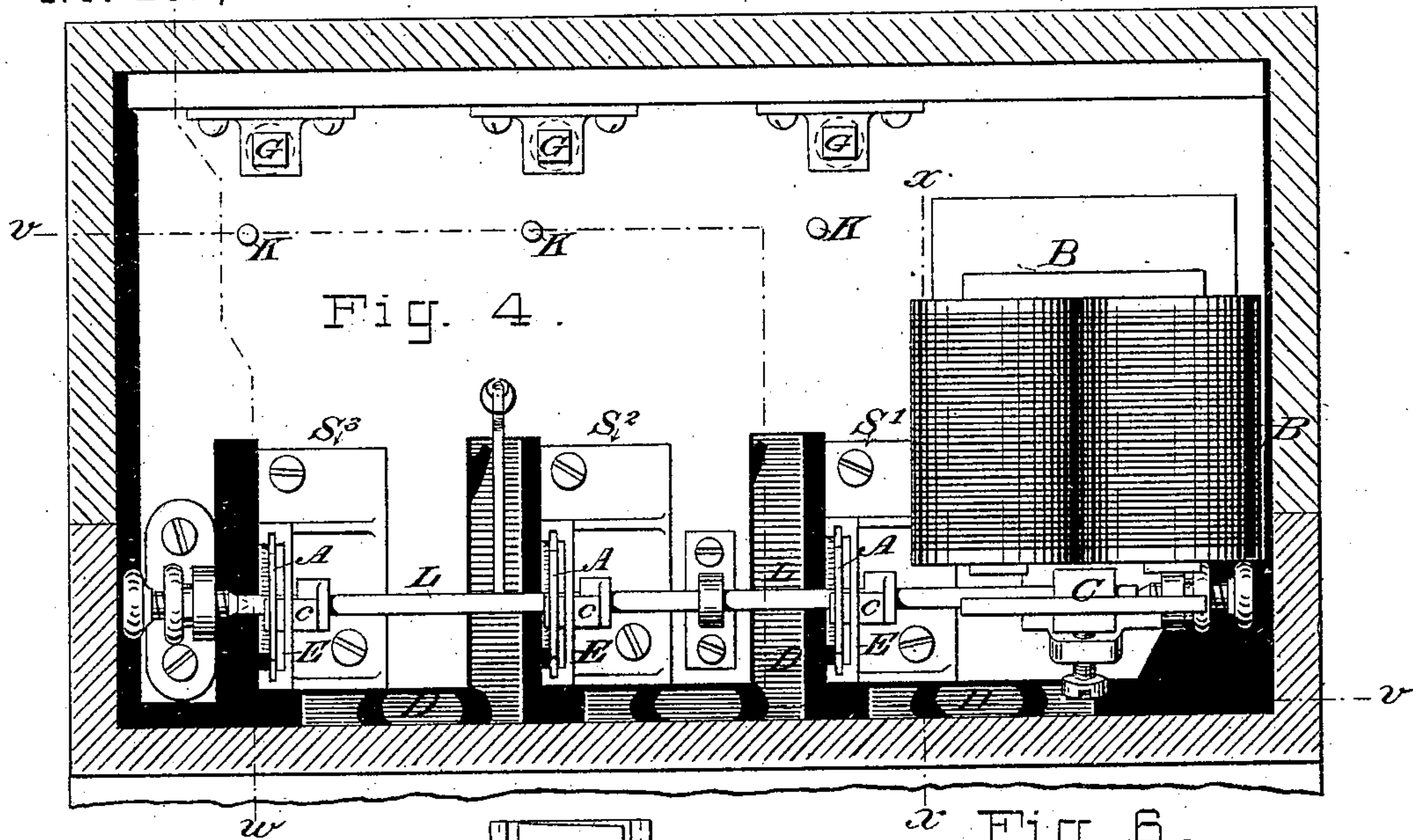
(No Model.)

3 Sheets—Sheet 3.

C. H. POND.  
ELECTRICAL VISUAL INDICATOR.

No. 252,897.

Patented Jan. 31, 1882.



ATTEST:

*E. B. Bolton*  
Res. Bailiff

INVENTOR:

*Chester H. Pond.*

By his Attorneys,

*Burke, Fraser & Connors*



# UNITED STATES PATENT OFFICE.

CHESTER H. POND, OF NEW YORK, N. Y., ASSIGNOR TO THE POND ELECTRIC SIGNAL COMPANY, OF SAME PLACE.

## ELECTRICAL VISUAL INDICATOR.

SPECIFICATION forming part of Letters Patent No. 252,897, dated January 31, 1882.

Application filed November 19, 1880. Renewed December 16, 1881. (No model.)

*To all whom it may concern:*

Be it known that I, CHESTER H. POND, a citizen of the United States, residing in the city, county, and State of New York, have invented certain Improvements in Visual Indicators, of which the following is a specification.

This application was originally filed November 19, 1880, and allowed March 23, 1881, it having since been renewed.

This invention is an improvement upon the indicator claimed in my Patent No. 232,415, of September 21, 1880, its main object being to simplify that apparatus and improve its operation.

By my present improvements I am enabled to dispense with all but one of the actuating-magnets, with all the system-switches, with all the correcting-switches, with all the locking-pins on the character-bearing wheels, and with a portion of the restoring mechanism, besides having somewhat simplified the remaining parts and rendered an indicator of two or more indicating systems capable of working in the line-circuit, as desired, thus dispensing with the local battery and relay.

In the accompanying drawings I have shown an indicator of three indicating systems, or one capable of displaying to view three characters (as a number of three figures) at the same time.

Figure 1 is a front elevation, the inclosing-case and the left-hand portion of the mechanism being in vertical section, taken in the plane of the lines *vv* in Figs. 2 and 4. Fig. 2 is a side elevation, partly in vertical section, taken in the plane of the line *ww* in Figs. 1 and 4. Fig. 3 is a fragmentary vertical section taken in a plane farther to the right than Fig. 2, as substantially indicated by the line *xx* in Figs. 1 and 4. Fig. 4 is a plan, the inclosing-case being in horizontal section, taken in the plane of the line *yy* in Figs. 1, 2, and 3. Fig. 5 answers to Fig. 2, and shows the position of the parts after the operation of the apparatus, the case and restoring device being omitted.

Fig. 6 is a fragmentary horizontal section taken in the plane of the line *zz* in Figs. 1 and 2. Fig. 7 is a fragmentary view taken in the same plane as Fig. 2, and illustrating a modification. Fig. 8 is a fragmentary view taken in the same plane as Fig. 2; and Fig. 9 includes

two views, the right-hand one being a detached view, looking in the opposite direction from Figs. 2 and 8, and the left-hand one being a front view of the same parts.

I will first name the parts shown in my before mentioned patent which I have retained in my present construction.

A is the intermittently-moving fall, which I now call the "escapement-rack." *aa* are the escapement-teeth thereof. *b* is the intermittent stop.

B is the actuating electro-magnet. C is the armature thereof. *c* is the pallet, receiving motion from said armature.

D is the moving part or wheel, the extent of whose movement determines which character of a series is to be displayed, and which by preference bears the characters upon its surface. This I shall hereinafter refer to as the non-intermittently-moving part or wheel, to distinguish it from those heretofore used whose movement is intermittent. *dd* are the pins or stops on the part D. E is the escapement as a whole, including the parts A, *aa*, and *c*.

*f* is the aperture in the inclosing-case, through which the characters on the wheel D may be seen.

F is the locking-lever for the wheel D.

*g* is the rod which moves said lever back, and G is the drop which holds said lever back.

Of the resetting or restoring mechanism, K is the vertically-sliding rod. *k* is the depressor borne thereby, which engages the toe or wiper *k'* on the spring-tail of the lever F.

*l* is the shoulder for lifting the drop G, and *m* is the spring-arm for lifting the rack A.

The parts thus far referred to are designated in my former patent by the same reference-letters that I have here applied to them, and for a full description of their construction, operation, essential and non-essential features, and modifications, I hereby refer the public to my said patent.

I will now describe my present improvements.

The wheel D is rotated by means of a vertically-sliding rack, H, engaging a pinion, *h*, fixed to the wheel. The weight of the rack gives to the wheel a continual tendency to revolve in the direction of the arrow. The use of the rack obviates the difficulties incident to



the stretching and breakage of the cord before used, and also enables me to dispense with the second cord, (lettered *r* in my previous patent,) employed to rotate the wheel backward in restoring the apparatus. This simplifies the restoring device, a mere projecting arm, *e*, moving with the rod *K*, and arranged to take under and lift the rack *H* when the rod *K* is moved upward, being all that is required to rotate the wheel *D* back to its starting-point.

The part *H* may be a pivoted segment instead of a sliding rack, the essentials being that it shall have cog-teeth to engage the pinion *h*, and shall have sufficient weight to rotate the wheel *D*.

I am aware that the indicating-wheel of the well-known "step-by-step indicator" has been given a rotative tendency by means of a toothed segment pressed upon by a spring and meshing with a pinion on the spindle of the wheel; but in such indicators the wheel is operated by different means from mine, and is capable of advancing only from one character to the next at each movement, while my indicating-wheel may advance at one movement to any of the characters.

The several rods *K* are fixed at their bottom ends to a cross-bar, *o*, so that all move simultaneously, and they are lifted to restore the apparatus by a lever, *I*, which takes under said bar, and is operated by a rod, *i*, terminating in a knob, *J*. By pulling down the knob the lever is tilted into the position shown by dotted lines in Fig. 1, and the cross-bar *o* and rods *K* thereby lifted to the requisite height. When the operator releases the knob *J* it is lifted and the lever *I* drawn back by a spring, *j*, whereupon the rods *K* descend by their own weight, or by the force of a spring, if found necessary. Instead of employing the knob *J* and rod *i*, the end of the lever *I* may extend through a slot in the side of the case, so as to be grasped by the hand.

For locking the wheel *D* when it is stopped, I no longer employ pins on its periphery to be engaged by a socket in the lower arm of the lever *F*. Instead of this I adapt the spring-tail to press directly upon the periphery of the wheel, so as to act as a friction-brake, and I provide for forcibly pressing this brake (lettered *F'*) against the wheel when the latter is stopped.

The drop *G* is provided with a narrow toe, *p*, which normally rests upon the front edge of the upper end of the lever *F*, and with an inclined wedging or cam surface, *q*, which normally is out of forcible contact with the lever *F*, though it may touch it lightly. The drop is pressed downward by a spring, *r*, or by its own weight. When the backward movement of the rod *g* has pressed back the upper arm of the lever *F* but slightly the lever passes from under the toe *p* and the drop *G* falls, whereupon its inclined surface *q* engages the upper end of the lever *F* and forcibly presses it still farther back, forcing the brake *F'* into close contact with the wheel *D*. I thus employ the

power of the spring *r* to operate the brake *F'*, instead of relying upon the momentum of the wheel *D* for this purpose, the latter being used merely to release the drop.

I have shown two forms of the drop *G*, the preferable one (shown in Figs. 1, 2, 4, and 5) consisting of a vertically-sliding bolt, with a helical spring, *r*, surrounding it. The other form is shown in Fig. 7, the drop being there a lever or pivoted dog with a leaf-spring, *r*. The drop is susceptible of considerable modification without impairing its essential character. It is provided with a pin or projecting shoulder, *l'*, for engagement with the shoulder *l* of the restoring mechanism.

Instead of employing a separate magnet, *B*, for each indicating system and switching the circuit from each magnet to the succeeding one, as in my former patent, I now employ but one magnet for all the indicating systems, and dispense entirely with the switches, substituting therefor means for shifting the action of the magnet from one system to the next.

Referring to Figs. 1, 2, 3, and 4, each pallet *c* is borne on a radial arm, which is fixed to and vibrated by a rock-shaft, *L*, to which shaft is also fixed another arm, which bears the armature *C*. A retracting spring or weight will be used to normally draw the armature away from the magnet *B*, and suitable stops will be provided for limiting the play of the armature and shaft. This shaft should be very light and stiff, being preferably made of steel rod. Each movement of the armature is communicated through the shaft to all the pallets.

The rack *A* of the first indicating system is or may be constructed precisely as shown in Fig. 1 of my Patent No. 232,415, before referred to, its lowest tooth *a* resting normally on its pallet *c*. In my present construction I have reversed the arrangement of the indicating systems, the first to operate being now at the right and the last being at the left. For convenience I will refer to the first, second, and third systems by the letters *S'*, *S*<sup>2</sup>, and *S*<sup>3</sup>, respectively, the system *S'* being at the right and *S*<sup>3</sup> at the left. The devices shown in Figs. 2, 5, 8, and 9 belong only to the system *S*<sup>3</sup>. Fig. 6 shows devices belonging only to the systems *S*<sup>2</sup> and *S*<sup>3</sup>, and Figs. 1 and 4 show all three systems. The systems *S*<sup>2</sup> and *S*<sup>3</sup> are in every respect counterparts of each other.

To prevent the systems *S*<sup>2</sup> and *S*<sup>3</sup> from operating while the system *S'* is being operated, they are thrown out of gear with their pallets by the rack *A* of each being lifted slightly and there sustained, so that its bottom tooth *a* is clear of the pallet *c*. This permits the pallets to vibrate freely without encountering any resistance from the racks *A* of the systems *S*<sup>2</sup> and *S*<sup>3</sup>, the pallets *c* of these systems being then idlers. Thus the vibrations of the armature *C* and pallets *c c c* first operate only the system *S'*. When that system has ceased its operation, the rack *A* of the system *S*<sup>2</sup> is automatically dropped onto its pallet *c*, and the



subsequent vibrations of the armature and pallets effect the operation of the second system. When the operation of that is completed the rack A of the system S<sup>3</sup> is also automatically dropped, thus bringing that system into connection with its pallet.

The automatic dropping of the rack of one system, when the operation of the preceding system is completed, may be accomplished in several ways, the preferable one being shown in the drawings. The rack A of each of the systems S<sup>2</sup> and S<sup>3</sup> is provided with a downwardly-bearing shoulder, *s*, which rests upon a detent, *t*. This detent, which I have shown in the form of a sliding rod, is moved out from under the shoulder *s* by the movement of the lever F of the preceding system. The said lever bears an arm, *u*, preferably a spring-arm, which, as the lever moves back, strikes a projecting pin or shoulder, *t'*, on the detent *t*, thus pressing back the latter. The detent is normally pressed forward by a very light spring, *s'*, which I have shown as taking against the back of the pin *t'*, and as fixed to the lever F, which supports the rear end of the detent-rod. I prefer that the rod *g* and the detent *t* shall be identical, as shown, in which case I form a shoulder, *g'*, near the rear end of the rod, for engaging the lever F, this shoulder being normally pressed out of contact with the lever by the spring *s'*. The arm *u* presses back the rod *t g* only far enough to clear the shoulder *s*, and not far enough to force the shoulder *g'* against the lever F, so as to press the latter back, and the spring *s'*, which is compressed by this movement, is too weak to press the lever back. During this first movement the rod *t g* acts only as the detent *t*, it being then in position to act as the rod *g* upon the stoppage of the wheel D. In restoring the apparatus after use the forward movement of the lever F, when released, forces the rod *t g* and rack A forward, and when the rack reaches its uppermost position the spring *s'* presses the rod *t g* still farther forward under the shoulder *s*.

In order that the backward movement of the arm *u* may not press back the rod *t g* so far that its shoulder *g'* forces back the lever F and releases the drop G, I provide a guard or fixed stop, *u'*, (shown in Figs. 1 and 6,) against which the arm *u* will strike when it has moved back far enough.

I am aware that step-by-step indicators having two indicating systems have had both systems operated by one electro-magnet, they being brought successively into operative connection therewith; but in indicators of that character the means for shifting the connection from one system to the next is necessarily operated by clock-work or some similar device, and cannot be operated by the stoppage of the indicating part, since that part may stop several times before it reaches the character to be displayed, and consequently before it is desired to transfer the connection with the magnet to the succeeding system. In my indicator the

indicating part is not stopped until it displays the figure desired, and the bringing of the succeeding system into connection with the magnet is effected by its stoppage.

It is evident that if all the racks A were like that of the system S', as shown in Fig. 1 of my previous patent, then at the completion of the operation of that system, in case the actuating-circuit were in the opposite of its normal condition, or in the condition prearranged to effect the starting of the systems, the system S<sup>2</sup> would be at once started, without waiting for the manipulation of the circuit to be resumed, its rack A would fall one tooth, and the wheel D would be released and would display its first character and stop, thus causing an erroneous indication.

In my previous patent I employed a "correcting-switch" to obviate this difficulty; but in my present construction I employ instead a novel form of the rack A.

Referring to Figs. 2, 5, 8, and 9, *a'* is an additional tooth formed on the rack beneath the lowest tooth *a*, and corresponding to the teeth *a a* in form and arrangement. The rack is normally held up so high by the detent *t*, or by other means, that this tooth *a'* is slightly above the pallet *c*, as shown in Fig. 2, and the stop *b* is prolonged downward sufficiently to restrain the first pin *d* when it is thus lifted. I will here assume that the actuating-circuit, which includes the magnet B, is normally open, its first closure effecting the starting of the apparatus, this being the method provided for by the arrangement of parts shown in the drawings. If the operation of the system S' ceases with the circuit open or in its normal condition, the rack A of the system S<sup>2</sup> will drop until its lowest tooth *a* rests upon the pallet. When it is in the position normally occupied by the rack A of the system S', and when the circuit is again closed, the operation of the system S<sup>2</sup> will commence. In this case the tooth *a'* does not come into use; but if, on the contrary, the operation of the system S' ceases when the circuit is closed, or in the condition prearranged to effect the starting of the systems, the rack A will drop only until its tooth *a'* rests upon the pallet, as shown in Fig. 8. Then when the circuit is broken or brought back to its normal condition the pallet moves from under said tooth and the rack drops until its lowest tooth *a* rests upon the pallet, it being then in its starting position, so that the next closure of the circuit will commence the operation of the system. This means for insuring the correct operation of the indicator is much simpler and cheaper than the correcting switch employed in my previous patent, and is equally reliable in its operation. It is as applicable to the construction shown in my previous patent, where each pallet is operated by a separate magnet and the circuit is shunted from one magnet to another, as to my present construction. In that patent the magnet of the succeeding system was kept out of circuit after the operation of the preceding sys-



tem until the circuit assumed its normal condition. By my improved method the magnet is kept in the circuit and permitted to operate; but both the act of shifting the operative connection from the preceding to the succeeding system and the movement of the pallet as the circuit resumes its normal condition are rendered impotent to commence the operation of the succeeding system. Other means than that shown may be readily devised to accomplish this result, and my present means may be applied to insuring the correct operation of step-by-step or intermittently-moving indicators.

In order to prevent any accidental backward movement of the rack A while it is in its normal position, and until it descends to such a point as to release the wheel D, I provide it with a projection, *v*, which abuts against a fixed surface or shoulder back of it when the rack is raised or in its normal position, and passes below said shoulder when the rack falls far enough to release the wheel D. While the projection *v* is in abutment with the shoulder the rack A has no backward play; but when it passes below the shoulder the rack may be driven backward by the impact of the wheel D in stopping.

Instead of making the rack A in two pieces jointed together, I now make it in one piece and provide its upper portion with two opposite laterally-projecting ears, *w w*, which slide in the vertical guides. When the lower portion of the rack is driven backward by the impact of the wheel D, the rack tilts on these ears as a fulcrum, as shown in Fig. 5.

I claim as my invention—

1. In a visual indicator, the combination of intermittently-moving stop *b*, electro-magnetic mechanism for controlling its intermittent movements, wheel D, pins *d d* thereon, pinion *h*, connected therewith, and toothed weight H, meshing with said pinion, and thereby imparting to the wheel D a normal tendency to rotate, substantially as set forth.

2. In a visual indicator, the combination of stop *b*, an electro-magnetic escapement for controlling its movement, wheel D, pins *d d*, pinion *h*, and toothed weight H, meshing therewith, with a restoring device consisting of an upwardly-moving part, K, provided with a shoulder or arm, *e*, adapted to engage said weight and lift it to its normal position, substantially as set forth.

3. In a visual indicator comprising a rack, A, wheel D, weight H, and connection between said wheel and weight, whereby the dropping of the latter causes the rotation of said wheel, the combination, with said parts, of a restoring mechanism consisting of a sliding rod, K, bearing shoulder *m*, adapted to take under and lift rack A, lever L, adapted when pulled to take under and lift said rod, and means actuated by said movement of said lever for lifting said weight and effecting thereby the return revolution of the wheel, substantially as set forth.

4. In a visual indicator employing a non-

intermittently-rotating wheel, D, and mechanism for releasing and stopping it, the combination of said wheel with a friction-brake, F', adapted to press against the surface thereof, of mechanism adapted, when released, to press said brake forcibly against said wheel, and of means for releasing said mechanism by the stoppage of the wheel, substantially as set forth.

5. In a visual indicator, the combination of the wheel D, means for releasing it, means for rotating it, and means for stopping it, lever F, bearing the friction-brake F', drop G, inclined or wedging surface *q*, and means for releasing said drop by the stoppage of the wheel, substantially as set forth.

6. In a visual indicator, the combination of an intermittently-moving rack, A, the wheel D, the rod *g*, the lever F, bearing the friction-brake F', and the drop G, substantially as set forth.

7. The combination, with the wheel D, of the lever F, bearing the friction-brake F', the drop G, having cam-surface *q* and toe *p*, which normally rests on lever F, and thereby upholds the drop, and means for releasing said drop by pressing back the lever F until it no longer upholds said toe, substantially as set forth.

8. In a visual indicator, one indicating system consisting of a non-intermittently-moving part, so arranged relatively to a series of characters that the extent of its movement from its normal position determines which of said characters is displayed, an intermittently-moving part the number of whose advances determines the extent of movement of the first-named part, and an escapement whose operation controls the movement of said intermittently-moving part, in combination with a second like indicating system, with one electro-magnet adapted to operate the escapement of either system and normally in operative connection with that of the first system only, and with means, actuated automatically by the stoppage of the movement of the non-intermittently-moving part of the first system, for bringing said magnet into operative connection with the escapement of the second system, substantially as and for the purposes set forth.

9. In a visual indicator, an indicating system consisting of a non-intermittently-moving part, D, tending to move in one direction, but normally restrained from moving, mechanism for releasing it and for stopping it after it has traveled a greater or less distance, and an escapement, E, for controlling said stopping mechanism and determining the point in its travel at which the moving part is stopped, in combination with a second like system, with one electro-magnet, B, whose armature is normally in operative connection with the escapement of the first system only, whereby its vibrations operate said escapement, and with mechanical means, in connection with said stopping mechanism of the first system, whereby the stoppage of the part D thereof establishes an operative connection between the



armature of said magnet and the escapement of the second system, that the subsequent vibrations of said armature shall effect the operation of the second system, substantially as set forth.

10. In a visual indicator, an indicating system consisting of an escapement, E, an intermittent stop, *b*, and a non-intermittently-moving part, D, bearing a series of pins, *d d*, in combination with a second like system, with one electro-magnet for operating the escapement of either system, the same being normally in operative connection with the first system only, and with means for automatically bringing said magnet into operative connection with the second system upon the completion of the operation of the first, substantially as set forth.

11. In a visual indicator, an indicating system consisting of a pallet, *c*, rack A, having teeth *a a*, intermittent stop *b*, and non-intermittently-moving part D, having a series of pins, *d d*, in combination with a second like system, with means for vibrating the pallets of both systems simultaneously, with means for holding the rack of the second system up out of engagement with its pallet during the operation of the first system, and with means for automatically dropping it onto said pallet upon the completion of the operation of the first system, substantially as set forth.

12. In a visual indicator, an indicating system consisting of a pallet, *c*, rack A, having teeth *a a*, intermittent stop *b*, and non-intermittently-moving part D, having a series of pins, *d d*, in combination with a second like system, with means for simultaneously vibrating the pallets of the two systems, with a detent, *t*, arranged to normally uphold the rack of the second system out of connection with its pallet, and with means for withdrawing said detent and dropping the said rack onto its pallet upon the completion of the operation of the first system, substantially as set forth.

13. In a visual indicator, an indicating system consisting of a pallet, *c*, rack A, having teeth *a a*, intermittent stop *b*, and non-intermittently-moving part D, with a second like system whose rack A has a shoulder, *s*, with means for simultaneously vibrating the pallets of both systems, with a detent, *t*, for engaging said shoulder *s*, with an arm, *u*, for withdrawing said detent, and with means for moving said arm by the stoppage of the part D of the first system, substantially as set forth.

14. In a visual indicator, the combination of an indicating system consisting of a pallet, *c*, rack A, having teeth *a a*, stop *b*, and wheel D, bearing pins *d d*, with a second like system, with means for vibrating both pallets simultaneously, with a rod, *g*, in connection with the rack A of the first system, with an arm, *u*, moved by said rod, and with a detent, *t*, moved

by said arm, and normally engaging a shoulder, *s*, on the rack A of the second system, substantially as set forth.

15. The combination of two electrically-actuated indicator systems, each adapted to advance one character for each break or closure of their actuating-circuit, the first system only being in operative connection with said circuit, with means for bringing the second system into connection therewith upon the completion of the operation of the first system, and with mechanical means for preventing the act of effecting this connection from prematurely starting the second system in case the circuit at the time said connection is made is in the condition (either open or closed) prearranged to effect the starting thereof, without withholding the circuit from the magnet which actuates said second system, substantially as set forth.

16. The combination of two indicator systems, both operated by the same electro-magnet, and each adapted to advance one character for each closure and break of the actuating-circuit, and the first system only normally in operative connection with the magnet, with means for automatically establishing an operative connection between the second system and said magnet upon the completion of the operation of the first system, and with mechanical means for preventing the act of establishing such connection from prematurely starting the second system, substantially as set forth.

17. In a visual indicator, an indicating system consisting of a character-displaying mechanism whose movement is controlled by a pallet, *c*, and rack A, having teeth *a a*, in combination with a second like system whose rack A is formed with an additional tooth, *a'*, and is normally sustained with said tooth above its pallet, with means for vibrating said pallets, and with means for dropping the said rack into connection with its pallet upon the completion of the operation of the first system, substantially as set forth.

18. In a visual indicator, a non-intermittently-moving part, D, having pins *d d*, in combination with an intermittently-moving part, A, bearing a stop, *b*, and having a projection, *v*, which normally bears against a fixed shoulder and confines the part A laterally, but which, when said part has passed out of its normal position, passes beyond said shoulder and leaves the part A free to be moved laterally by the contact of either of the pins *d* with its stop *b*, substantially as set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

CHESTER H. POND.

Witnesses:

HENRY CONNETT,  
E. B. BOLTON.