(No Model.) 3 Sheets—Sheet 1.

# J. P. TIRRELL.

## ELECTRIC SIGNALING APPARATUS.

No. 313,784. Patented Mar. 10, 1885.

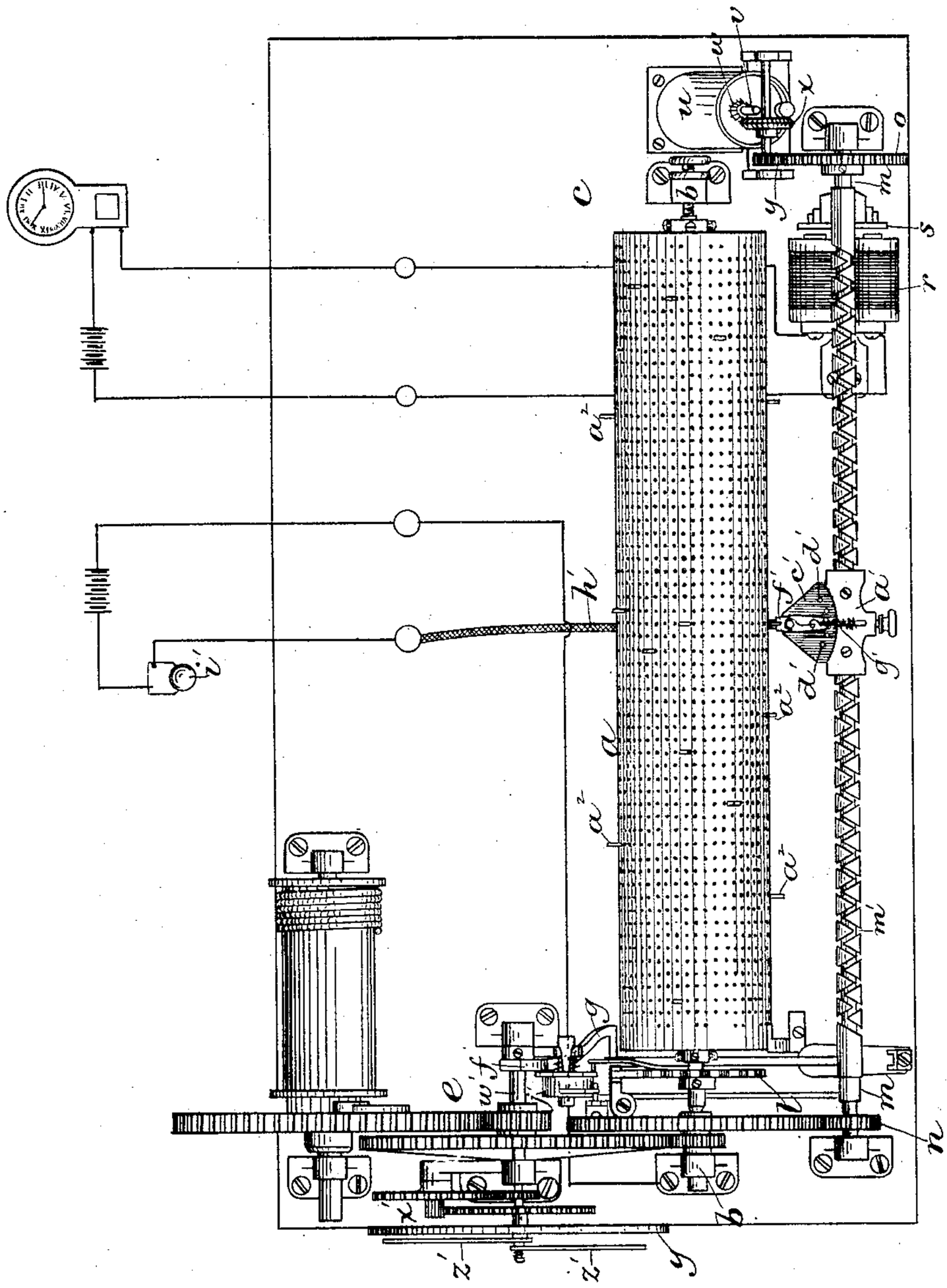

Fig. 1.

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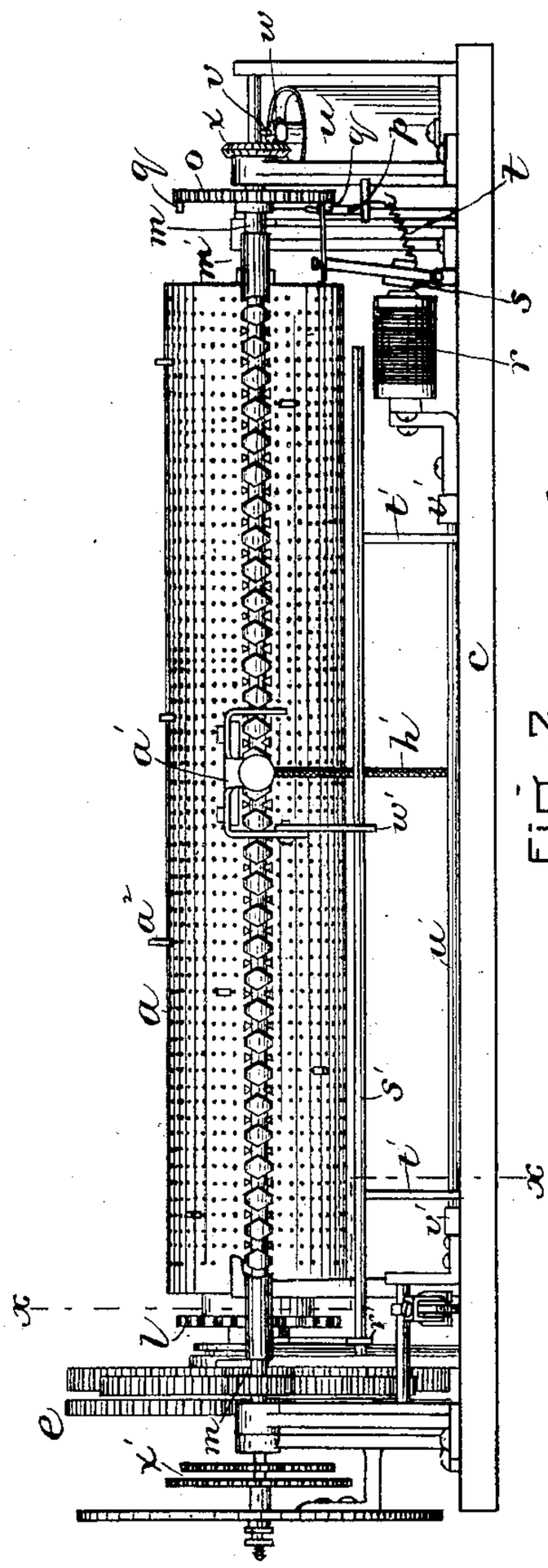

Fig. 2.

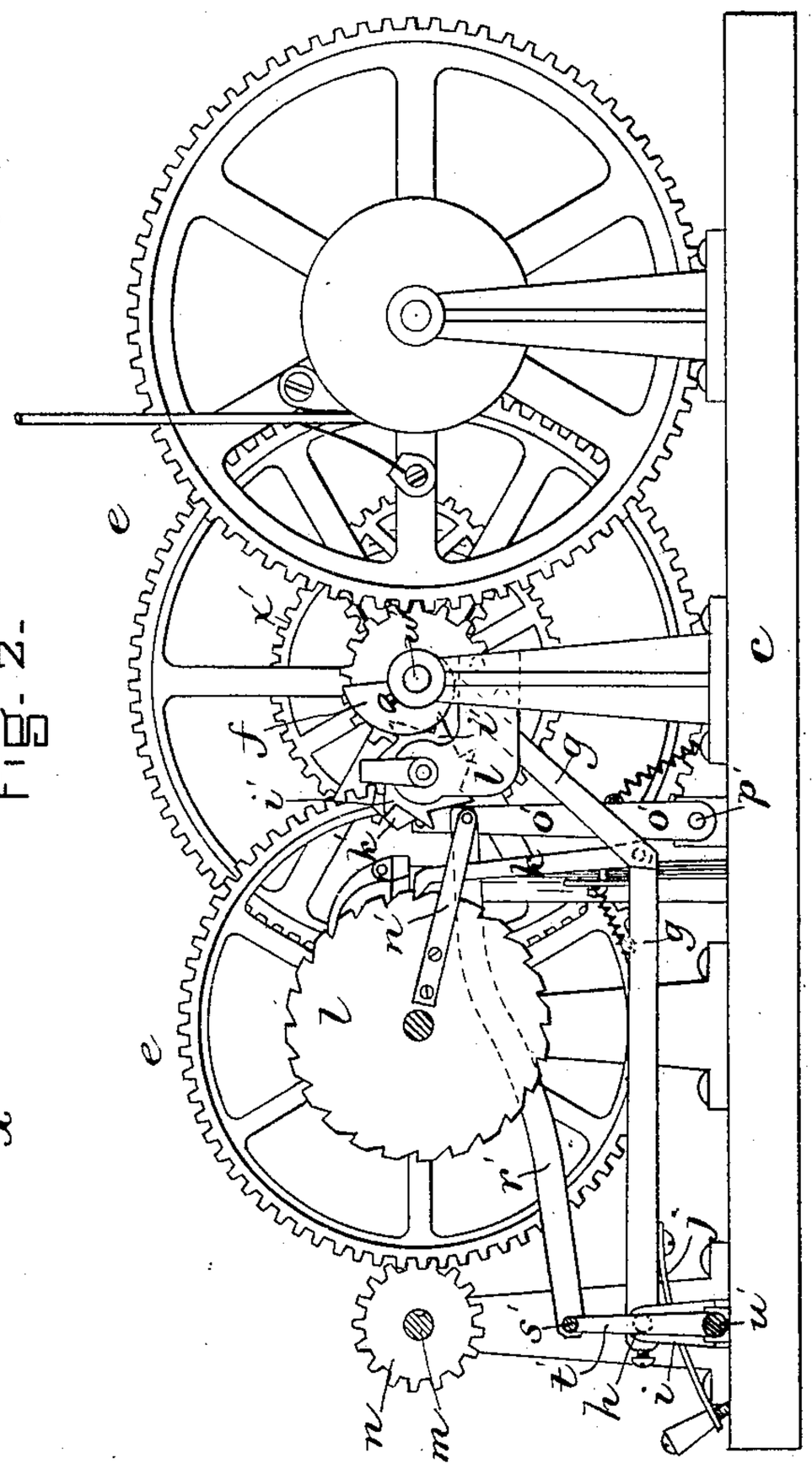

Fig. 3.

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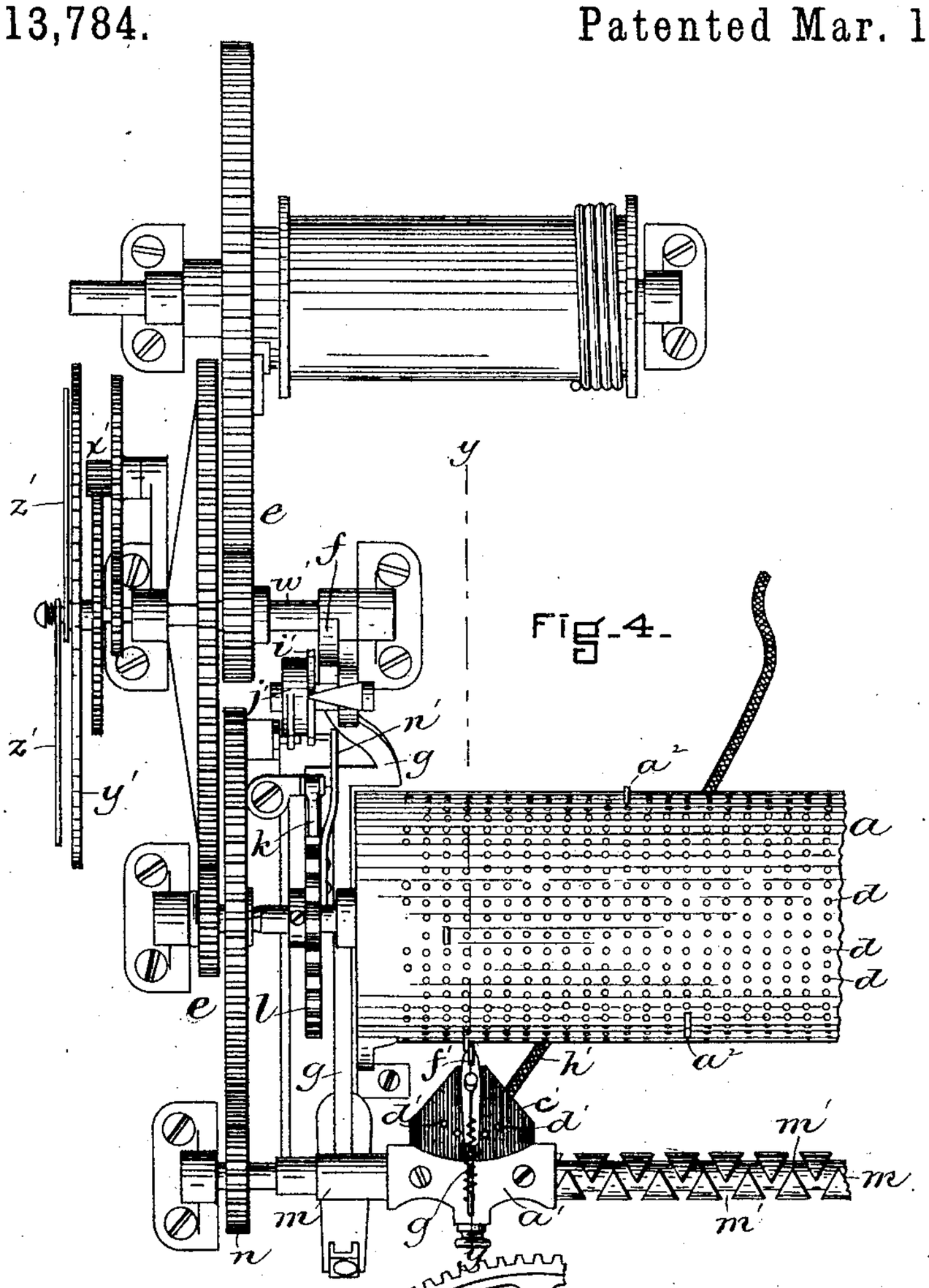


Fig. 4.


Fig. 7.

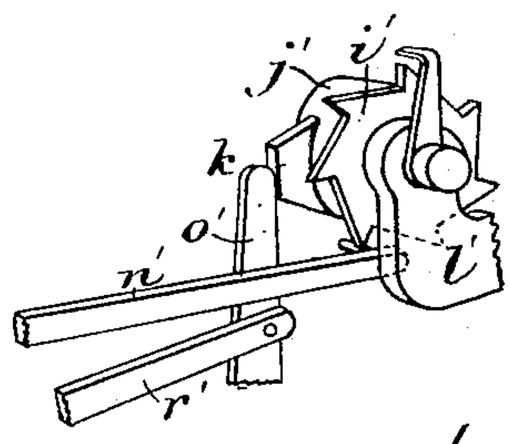


Fig. 6.

Fig. 5.

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# UNITED STATES PATENT OFFICE.

JACOB P. TIRRELL, OF BOSTON, MASSACHUSETTS.

## ELECTRIC SIGNALING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 313,784, dated March 10, 1885.

Application filed February 23, 1884. (No model.)

*To all whom it may concern:*

Be it known that I, JACOB P. TIRRELL, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain Improvements in Electric Signaling Apparatus, of which the following is a specification.

This invention relates to that class of automatic electric signals in which a cylinder is employed having holes for removable electrodes corresponding in number to the minutes in twenty-four hours, and a traveling electrode is employed which makes contact with each electrode of the cylinder at the minute to which such electrode corresponds, suitable mechanism being employed to rotate the cylinder and to move the traveling electrode at proper intervals. Each contact of the traveling electrode closes a circuit through a gong or signal, so that signals can be given at any minute or minutes during the day or night by arranging the cylinder-electrodes according to the desired schedule.

The invention has for its object to provide an apparatus of this class simpler in its construction and less liable to derangement than any heretofore produced; and to this end it consists in the improved mechanism which I will now proceed to describe and claim.

Of the accompanying drawings, forming a part of this specification, Figure 1 represents a top plan view of my improved apparatus. Fig. 2 represents a front elevation of the same. Fig. 3 represents a vertical offset section on line *x x*. Fig. 4 represents an enlarged top view of a portion of the apparatus. Fig. 5 represents a section on line *y y*, Fig. 4. Figs. 6 and 7 represent detail views.

The same letters of reference indicate the same parts in all the figures.

In the drawings, *a* represents a substantially horizontal metal cylinder, journaled in standards *b b*, affixed to the supporting-base *c*, and provided with forty-eight parallel longitudinal rows of holes, *d*, each row being composed of sixty holes (see Figs. 4 and 5) adapted to receive electrodes or metal pins $a^2$. The cylinder is rotated one step each hour, making one twenty-fourth of a complete rotation at each step, so that it makes a complete rotation in twenty-four hours. This step-by-step rotation is effected, preferably, by means of a train of gearing, *e*, impelled by a weight or other suitable motor, and controlled either by an electrically or a mechanically operated let-off, as hereinafter described, a snail-wheel or cam, *f*, on one of the arbors of said train, and a lever, *g*, pivoted at *h* to a fixed support, *i*, and pressed by a spring, *j*, against the cam *f*, and provided with a pawl, *k*, bearing against a ratchet, *l*, having twenty-four teeth, affixed to the arbor of the cylinder *a*. The rate of movement of the train *e* is such that the cam *f* makes a complete rotation once in each hour, and in so doing gradually depresses the lever *g*, and releases the same at the close of the hour, the lever being then forced upward by its spring *j*, and causing the pawl *k* to rotate the cylinder one step.

The let-off mechanism controlling the operation of the train *e* is composed of a shaft, *m*, parallel with the axis of the cylinder, to which shaft a pinion, *n*, forming a part of said train *e* is affixed, a wheel, *o*, affixed to the opposite end of the shaft *m* and provided with two laterally-projecting pins, *q q*, (see Fig. 2,) at opposite sides of its axis, a movable stop, *p*, which normally stands in the path through which said pins move when the shaft *m* rotates, so as to arrest each pin in succession and stop the shaft, and an electro-magnet, *r*, the armature *s* of which is connected to said stop *p*, so that when the electro magnet is energized the attraction of the armature will cause it to displace the stop *p*, and thus release the shaft *m*, the stop being restored to its normal position by the retracting-spring *t* of the armature when the armature is released, so that it is ready to arrest the other pin *q* when the shaft has made a half-rotation. The electro-magnet is energized once each minute by a suitable clock mechanism, so that the train or motor *e* is allowed to act once in each minute. It is obvious, however, that any other suitable mechanism—such as a mechanically-operated escapement controlled by a pendulum through a separate clock-train—may be employed to let off and arrest the motor at the desired periods without departing from the spirit of my invention.

A suitable governor is provided whereby the movement of the motor is regulated, said governor consisting in the present instance of a reservoir, *u*, containing oil, a shaft, *v*, having arms or paddles arranged to rotate in said

reservoir, and gearing *w x y*, connecting said shaft with the wheel *o*, which is made a gear-wheel for this purpose; hence the rotation of the shaft *m* rotates the paddle-shaft *v*, and the resistance of the oil to the rotation of the latter governs the rotation of the entire train. My invention is not limited, however, to this form of governor, as any other suitable device may be employed.

The shaft *m* is provided with a double spiral groove, *m'*, extending in one direction from one end to the other and in the opposite direction back to the starting-point, the convolutions of the two spirals intersecting, as shown.

On the shaft *m* is mounted a yoke or frame, *a'*, adapted to move lengthwise of the shaft in either direction, and provided with a pivoted dog or shoe, *b'*, (see Fig. 5,) which is adapted to enter one of the spirals of the groove *m'* and conform to the inclination thereof, so that when the shaft *m* rotates the engagement of the shoe *b'* with the groove *m'* will cause the shaft to move the frame or yoke *a'* in one direction or the other, according to the direction of the position of the spiral groove with which the shoe *b'* is engaged.

The yoke or frame *a'* is provided with a block, *c'*, of insulating material, in which are four metallic contact-points, *d'*, projecting slightly above the upper surface of the block. To the block *c* is pivoted an electrode, *f'*, one end of which is adapted to make contact, successively, with such electrodes or arms $a^2$ as may be placed in the longitudinal row of holes in the cylinder at the time connecting with the electrode *f'*. The contact of the electrode *f'* with one of the cylinder-electrodes causes the former to turn on its pivot and its rear end to come in contact with one or both of the contact-points *d* at the side toward which the rear end of the electrode *f'* is thus moved. A spring, *g'*, holds the electrode *f'* normally midway between the contact-points *d'* at one side and the contact-points *d'* at the opposite side, as shown in Fig. 1. The length of the cylinder-electrode $a^2$ acting on the electrode *f'* determines the extent of the swinging movement imparted to the latter; hence a cylinder-electrode of a given length will move the electrode *f'* far enough to cause it to make contact with one point *d'*, while a longer cylinder-electrode will give the electrode *f'* a longer swinging movement, and cause it to make contact with two points *d'*, one after the other. The contact-points *d'* are electrically connected, through a flexible wire or cable, *h'*, and suitable fixed wires forming a continuation of the flexible wire, with an electric gong, *i'*, or other suitable alarm mechanism, in a manner well understood, so that when the electrode *f'* is in contact at the same moment with one of the cylinder-electrodes and one of the points *d'* the circuit will be closed through the striking mechanism of the gong, and a signal will be given for each contact; hence when the electrode is moved by contact with one of the longer cylinder-electrodes two signals are given, while one of the shorter cylinder-electrodes causes but one signal to be given. The longer cylinder-electrodes are intended to give a warning-signal consisting of two blows on the gong at a given time—say one or two minutes before the departure of a train—while the shorter electrodes give one blow, which constitutes the actual starting-signal.

It is obvious that the number of contact-points *d'* may be increased, so that more than two signals may be given by each swinging movement of the pivoted electrode.

Each movement given to the yoke or carriage *a'* by a semi-rotation of the shaft carries the electrode *f'* from one hole *d'* in the cylinder to the next in the same longitudinal row, causing the electrode to make contact with the cylinder-electrode in one hole and stop just before it is moved by the electrode in the next hole, (assuming both holes to be provided with electrodes.) When the carriage *a'* reaches the point at either end of the shaft *m* where the direction of the spiral groove changes, the shoe *b'* is turned by change in the direction of the groove, and enters the opposite convolutions of the spiral, so that the direction of movement of the carriage is reversed, and the electrode *f'* is moved step by step in the opposite direction along the cylinder; but before the first backward or reverse movement of the electrode *f'* takes place the lever *g* is released by the cam *f*, and causes the pawl *k* to rotate the cylinder one step, thus bringing another longitudinal row of holes, representing the next hour, into coincidence with the electrode *f'*. The same operation takes place when the carriage *a'* reaches the opposite end of the shaft *m*. It will be seen, therefore, that the electrode *f'* is moved back and forth along the cylinder, and before each reversal of the movement of said electrode the cylinder is partially rotated, so as to bring a different row of holes into coincidence with the electrode *f'* each hour for twenty-four successive hours. In practice the first hole in each row corresponds to the sixtieth minute of the hour represented by the preceding row, so that in case a signal is to be given at the sixtieth minute the cylinder-electrode for such signal will be placed in the first hole, and the moving electrode *f'* will strike it on the commencement of the reverse movement of the carriage. The adjacent ends of the consecutive rows do not, therefore, correspond, a vacant space being left at the last end of each row, as shown in Figs. 1 and 4, representing the fifty-ninth minute after the electrode has passed the fifty-ninth-minute hole, and during the next minute the cylinder moves one step, bringing the first hole in the next row before the moving electrode just before the latter commences its reverse movement.

As above stated, the cylinder is provided with forty-eight longitudinal rows of holes. Twenty-four rows of holes are devoted to week-day use, and alternate with the other twenty-

four rows, which are devoted to Sunday use. Thus one row of holes corresponds to a given hour of any week-day, while the next row corresponds to the same hour of Sunday. Each step or partial rotation of the cylinder is equal in length to twice the space between two rows of holes; consequently when the apparatus is adjusted, as hereinafter described, for week-day use the rows of holes for Sunday use pass by the electrode $f'$ without stopping, and when the apparatus is adjusted for Sunday use the rows of holes for week-day use pass the electrode $f'$ without stopping.

The means whereby the apparatus is adjusted automatically for Sunday use at midnight on Saturday, and automatically readjusted for week-day use at midnight on Sunday, consist in the present instance of the devices described as follows:

$i'$ represents a ratchet-wheel having seven teeth, attached to a drum or disk, $j'$, having a single projection, $k'$. (See Fig. 6.) Said ratchet and drum are adapted to rotate on an arbor affixed to a support, $l'$. An arm, $n'$, affixed to the arbor of the cylinder $a$ strikes the ratchet $i'$ and rotates it with its drum $j'$ the length of one tooth, or one-seventh of a complete rotation, during every complete rotation of the cylinder $a$.

$o'$ represents a lever pivoted at $p'$ to a fixed support, and pressed by a spring, $q'$, against the drum $j'$. Said lever is connected by a rod, $r'$, with a rod, $s'$, which is connected by arms $t'$ $t'$ to a rock-shaft, $u'$, journaled in bearings $v'$ $v'$ on the base $c$. The carriage $a'$ is provided with an arm, $w'$, forked or slotted at its lower end and engaged with the rod $s'$, so that the rod when moved laterally will turn the carriage $a'$ on the shaft $m'$, and thus raise or lower the outer end of the electrode $f'$—viz., the end adjacent to the cylinder. The described rotation of the ratchet $i'$ and drum $j'$ one step in every twenty-four hours causes the cam or projection $k'$ on said drum to move the lever $o'$ away from the disk, thus moving the rod $r'$ longitudinally and the rod $s'$ laterally, causing the latter, by its engagement with the arm $w'$, to turn the carriage $a'$ on the shaft $m'$, and thus depress the electrode $f'$ a distance equal to the space between two adjacent rows of holes, thus causing the electrode to coincide with a row of Sunday-holes. The electrode $f'$ remains thus depressed for twenty-four hours, until the next partial rotation of the ratchet $i'$ and disk $j'$, when the cam $k'$ recedes from the lever $o'$, and allows the spring $q'$ to press said lever against the disk $j'$, and thus turn the carriage $a'$ upwardly and raise the electrode $f'$, so that it will again coincide with the week-day holes. The electrode $f'$ remains at this elevation during six successive rotations of the cylinder, and is again depressed at the end of the sixth rotation.

The cylinder may be suitably worked to indicate the hour to which each row of holes corresponds, and any desirable subdivisions of the hours, to enable the electrodes to be set in accordance with any desired schedule or time-table.

I prefer to arrange a clock-movement, $x'$, so that it can be operated by the arbor $w'$ of the motor $e$, said movement being of the common construction, and provided with a dial, $y'$, and hands $z'$. The apparatus is thus adapted to serve both as an automatic signal and as a clock, the hands moving one step each minute, as in an electric clock.

It will be seen that the apparatus is simple and effective, and is not likely to become deranged.

I am aware that a mechanically-impelled shaft having a double spiral groove has been used in synchronic printing or writing telegraph mechanism to impel a rider or point-carrier alternately in opposite directions; hence I do not claim, broadly, the combination of such shaft with an electrode operated thereby.

I claim—

1. The combination of a cylinder adapted to support electrodes, as described, a traveling electrode adapted to make contact with the electrodes on the cylinder, an electric circuit including a signal, contact of the traveling electrode with either of the cylinder-electrodes, mechanism whereby the traveling electrode is caused to travel step by step along the cylinder alternately in opposite directions, and is automatically reversed at each end of its movement, and mechanism whereby the cylinder is rotated one step at each reversal of the movement of the traveling electrode, whereby a different series of cylinder-electrodes is presented to the traveling electrode after each reversal of the movement of the latter, as set forth.

2. The combination of a cylinder adapted to support electrodes, as described, a traveling electrode adapted to make contact with the electrodes on the cylinder, an electric circuit, including a signal operated by said contact, a motor and a let-off mechanism, whereby the traveling electrode is caused to travel step by step along the cylinder alternately in opposite directions, and the cylinder is rotated one step at each reversal of the movement of the traveling electrode, as set forth.

3. The combination of a cylinder adapted to support electrodes, as described, a mechanically-impelled shaft arranged parallel with the cylinder and containing a double spiral groove, a carriage adapted to move on said shaft and engaged with the groove thereof, an electrode on said carriage adapted to make contact with the cylinder-electrodes when moved along the cylinder by the rotation of the shaft, contact-points on the carriage adapted to make contact with said electrode, and a motor and let-off mechanism, substantially as described, whereby said shaft is rotated step by step and caused to move the traveling electrode alternately in opposite directions along the cylinder, as set forth.

4. The combination of the cylinder having

two sets of electrodes or electrode-holders arranged in alternating longitudinal rows, as described, the traveling electrode, mechanism for moving the electrode back and forth along the cylinder and for rotating the cylinder at each reversal of the movement of the traveling electrode, and automatic mechanism whereby the traveling electrode is caused to coincide with the week-day set of cylinder-electrodes during six successive days, and with the Sunday set on the next day, and is automatically restored to its week-day position at the close of Sunday, as set forth.

5. The combination of the cylinder having two sets of electrode holders or holes arranged in alternating parallel longitudinal rows, the traveling electrode, mechanism for moving the traveling electrode back and forth along the cylinder and for rotating the cylinder at each reversal of the rotation of the traveling electrode, and mechanism whereby the traveling electrode is held in position during six successive days to coincide with cylinder-electrodes of the week-day set, and is automatically moved at the end of the sixth day to cause it to coincide with the electrodes of the Sunday set, and automatically restored to its former position at the close of Sunday, as set forth.

6. The combination of the cylinder having two sets of electrodes or electrode-holders arranged in rows extending longitudinally of the cylinder, as described, the traveling electrode, the carriage supporting said electrode, the spirally-grooved shaft arranged parallel with the cylinder, and adapted to move said carriage, the drum *j'*, having the projection *k'*, mechanism for moving said drum one step each day, and intermediate mechanism, substantially as described, whereby the drum is caused to control the position of the traveling electrode during six successive days, and the projection *k'* is caused to control the position of said electrode during the seventh day, as set forth.

7. The combination, with the cylinder having electrodes or electrode-holders, as described, of the slide or carriage having the pivoted electrode held normally in a given position, and adapted to be moved in either direction from its normal position by contact with the cylinder-electrodes, and one or more contact-points at each side of the rear or inner end of the electrode, adapted to make contact with the latter when it is moved from its normal position, said contact-points having electrical connections whereby a signal is given when the pivoted electrode makes contact with either of them, as set forth.

8. The combination, with the cylinder having longer and shorter electrodes, of the slide or carriage having the pivoted electrode held normally in a given position, and adapted to be turned on its pivot from its normal position by contact with any one of the cylinder-electrodes a distance determined by the length of the cylinder-electrode, and two or more contact-points at each side of the rear end of the pivoted electrodes having electrical connections, as described, said pivoted electrode being adapted to make contact with one of said contact-points when actuated by a shorter cylinder-electrode, and with more than one when actuated by a longer cylinder-electrode, as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 18th day of February, 1884.

JACOB P. TIRRELL.

Witnesses:
C. F. BROWN,
JAMES F. EMERSON.