

(No Model.)

2 Sheets—Sheet 1.

E. B. SHAFER.  
TELEGRAPH APPARATUS.

No. 420,393.

Patented Jan. 28, 1890.

Fig. 1.

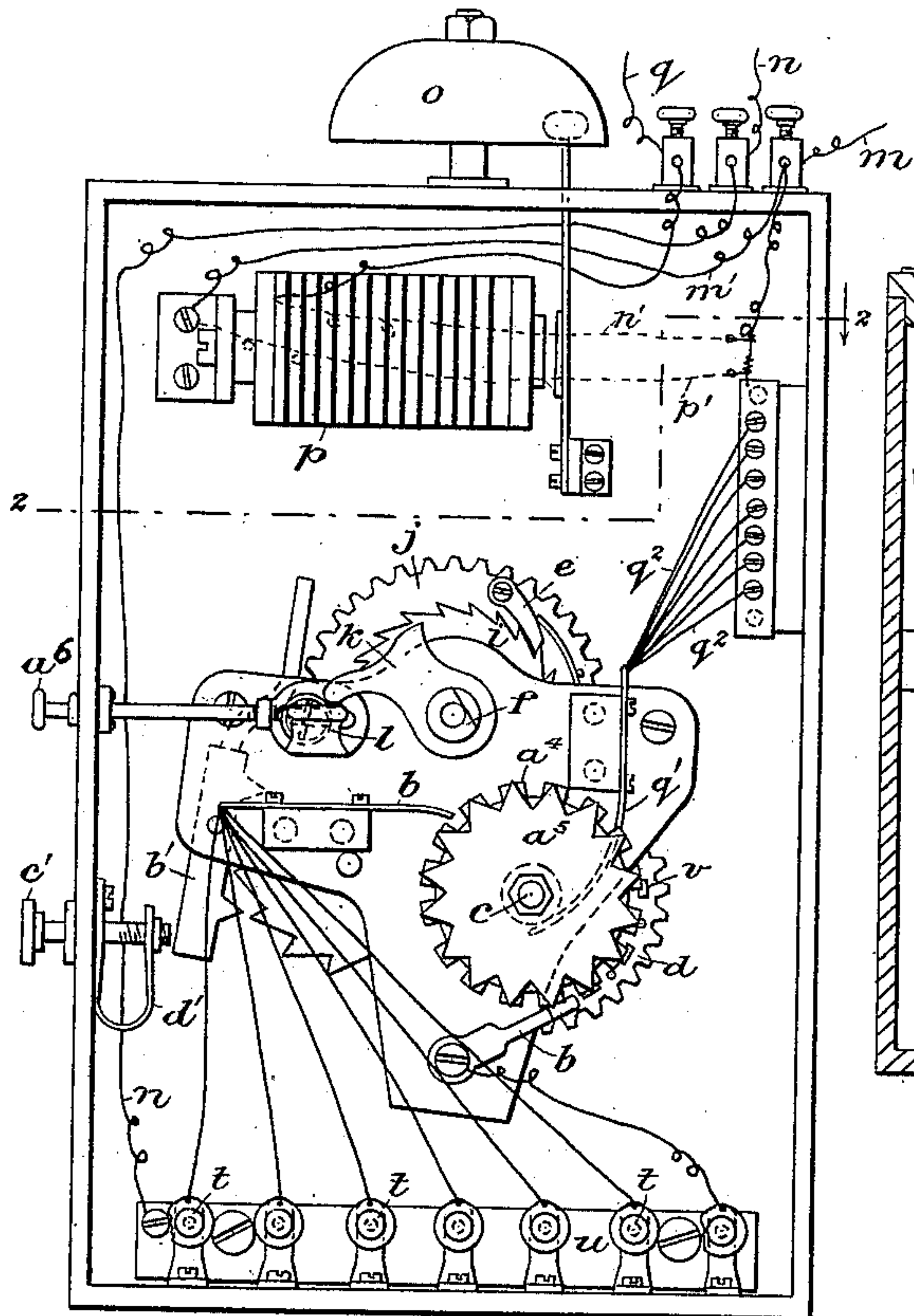


Fig. 2.

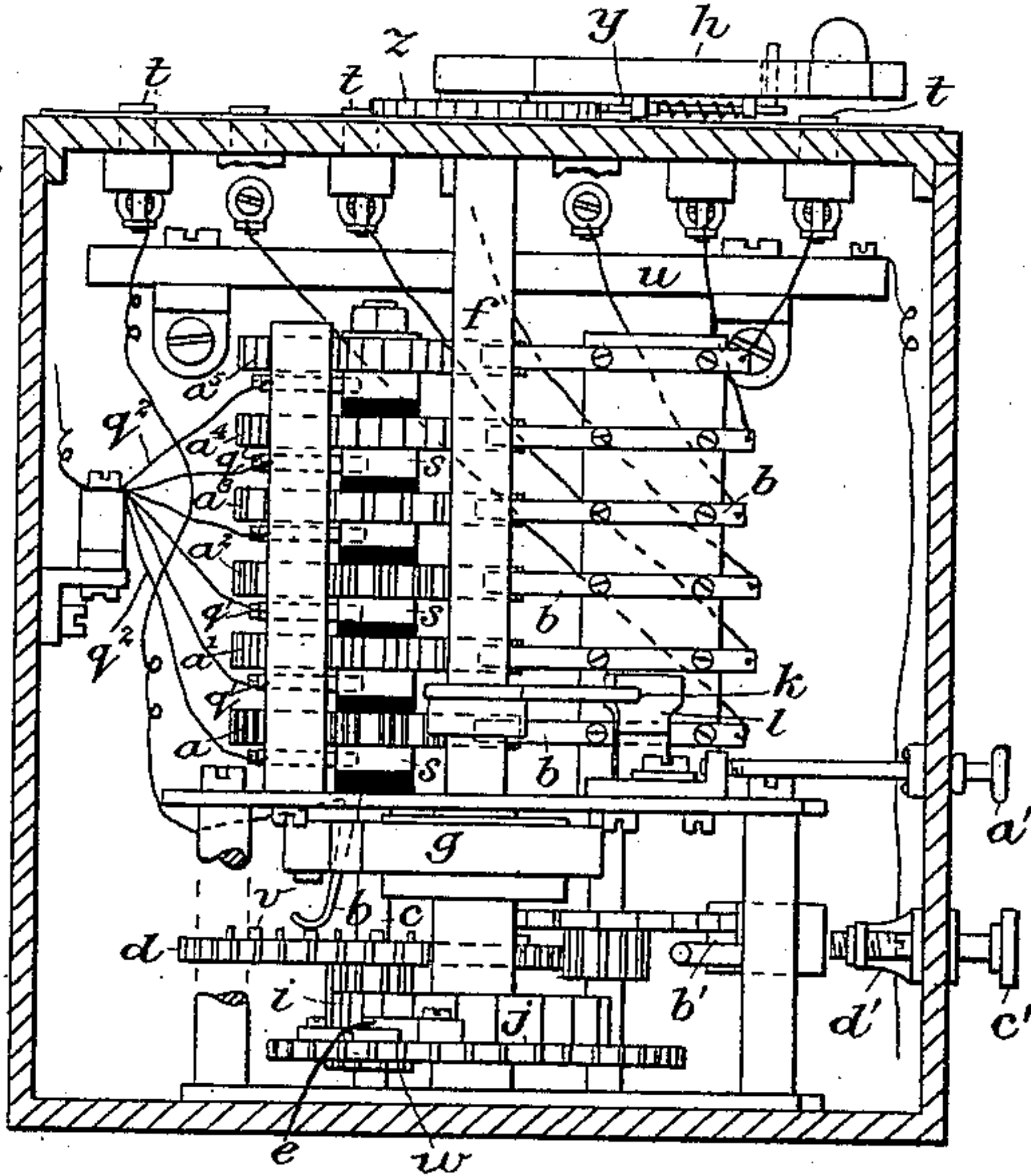
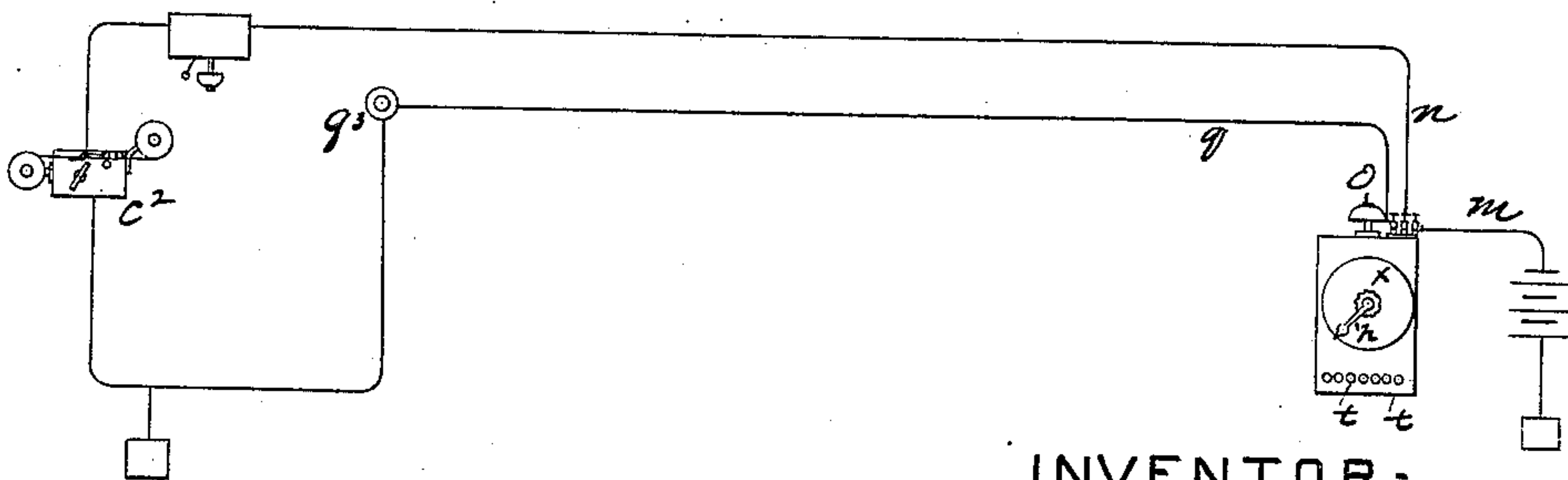


Fig. 10.



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INVENTOR:

*Ebenezer B. Shafer.*

By *A. P. Thayer.*  
*His Atty.*

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Fig. 3.

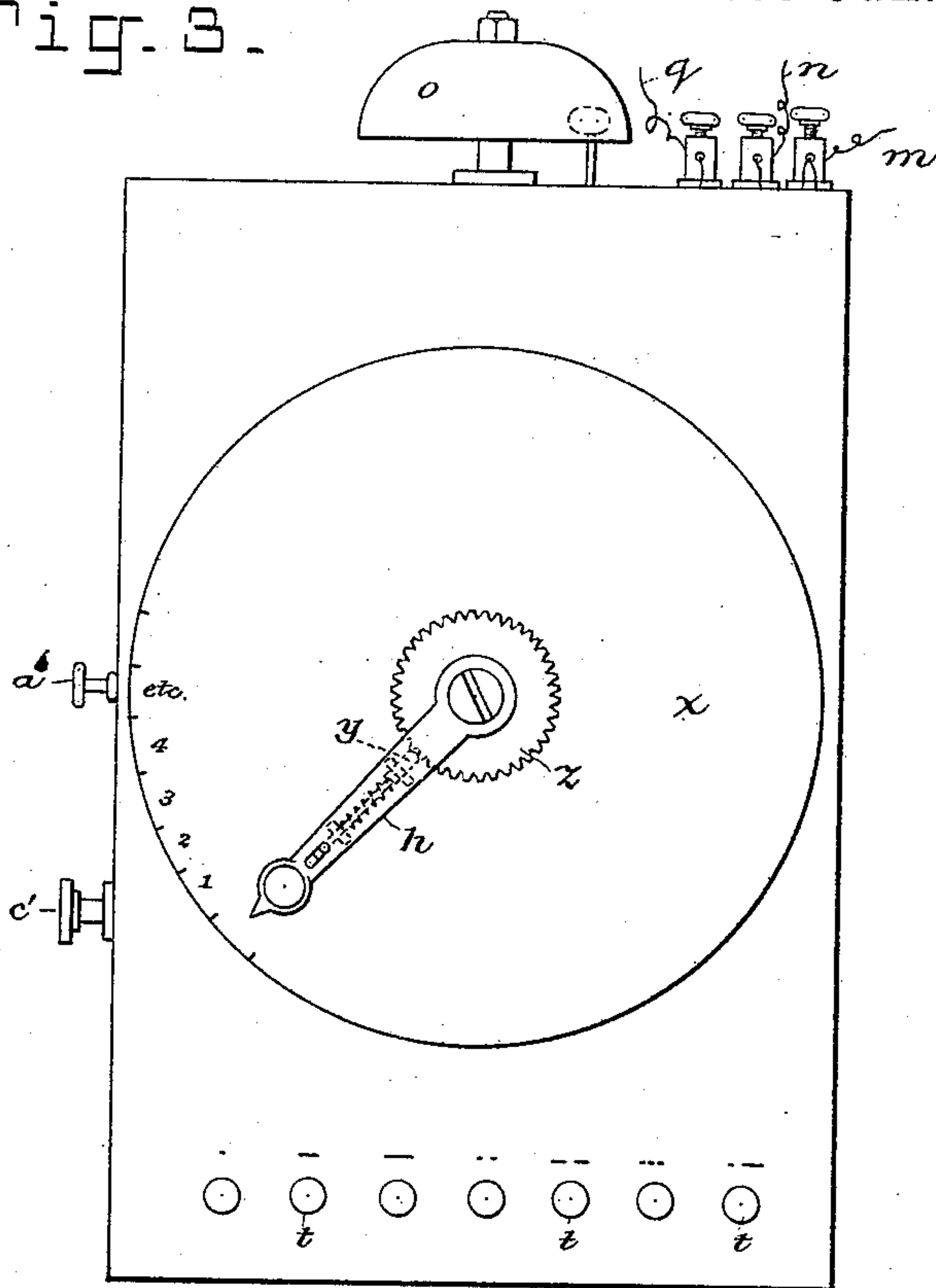


Fig. 4.

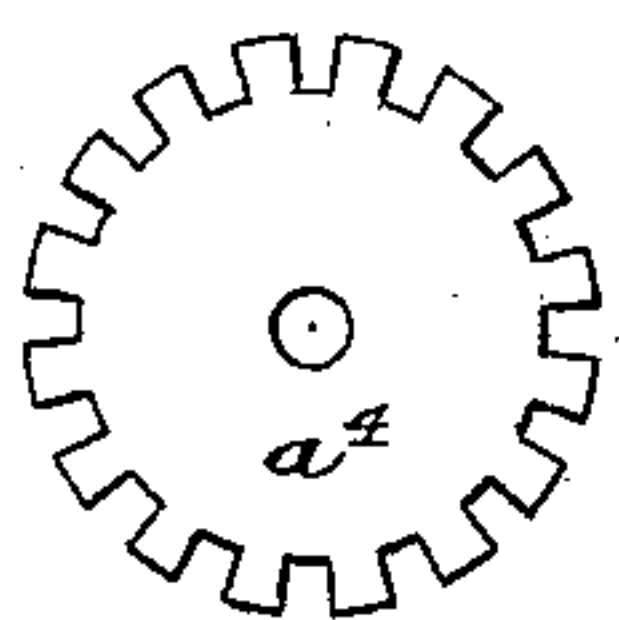


Fig. 5.

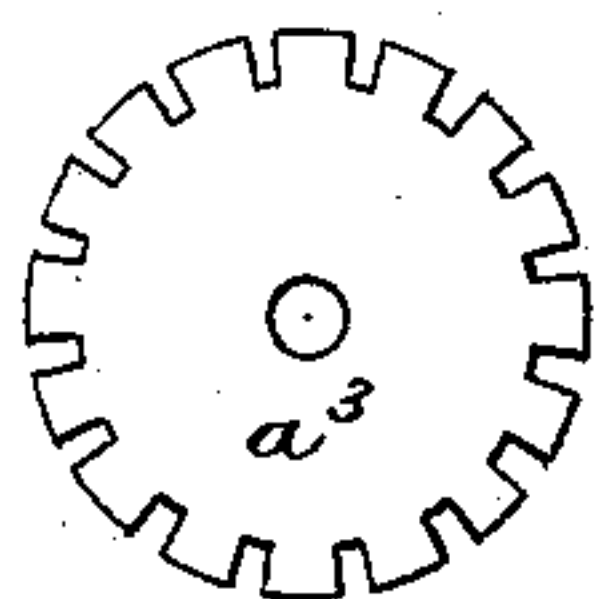


Fig. 6.

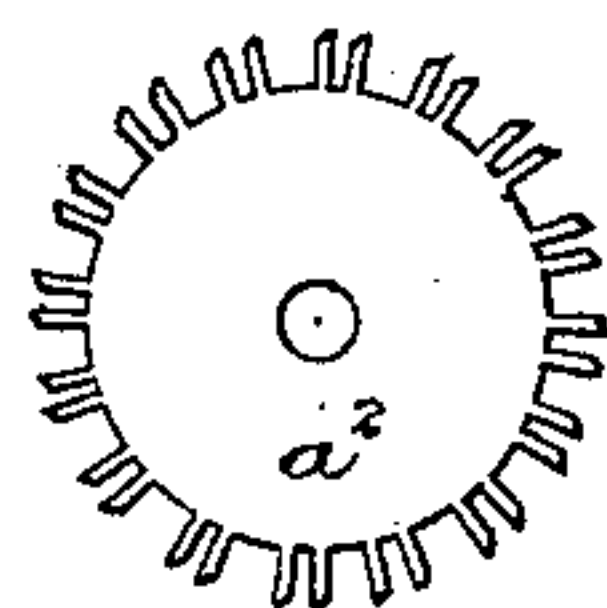


Fig. 7.

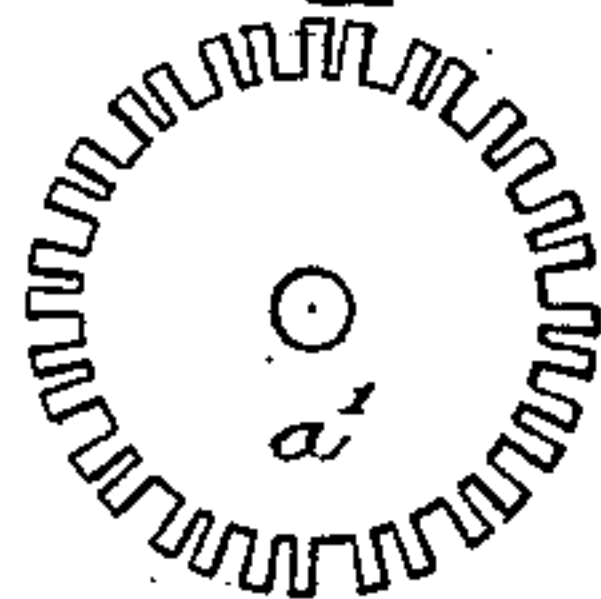


Fig. 8.

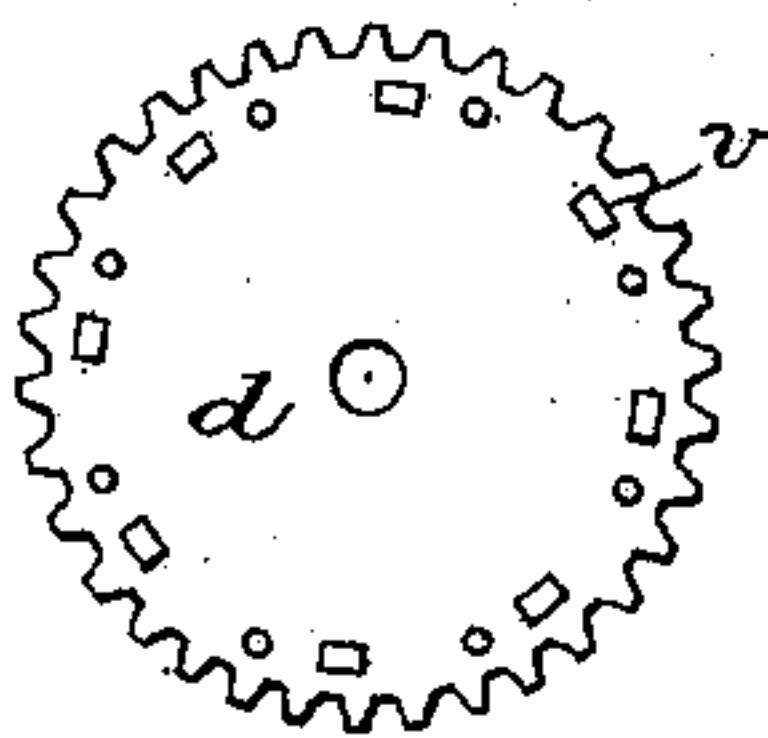
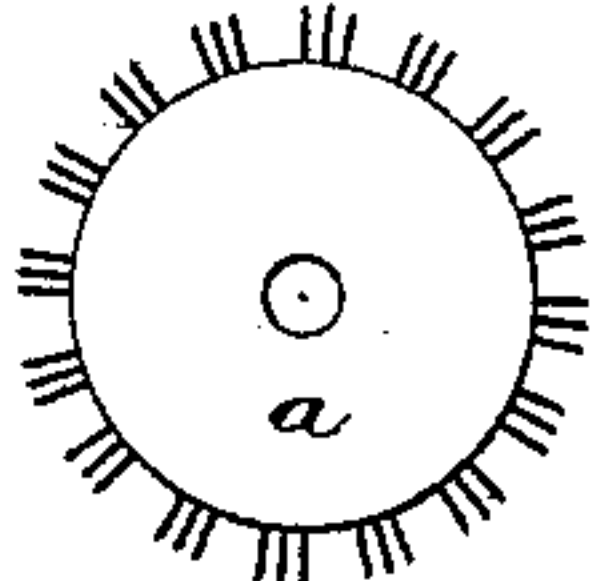


Fig. 9.



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# UNITED STATES PATENT OFFICE.

EBENEZER B. SHAFER, OF NEW YORK, N. Y.

## TELEGRAPH APPARATUS.

SPECIFICATION forming part of Letters Patent No. 420,393, dated January 28, 1890.

Application filed February 14, 1889. Serial No. 299,858. (No model.)

*To all whom it may concern:*

Be it known that I, EBENEZER B. SHAFER, a citizen of the United States, residing at New York city, in the county and State of New York, have invented certain new and useful Improvements in Telegraph Apparatus; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention is an improvement of automatic telegraph apparatus, whereby it is designed to provide a system of telegraphy available for general use and capable of being operated by persons unskilled in telegraphy of the present intricate system, as hereinafter fully described, reference being made to the accompanying drawings, in which—

Figure 1 is a front elevation of my improved instrument with the front of the case removed. Fig. 2 is a sectional elevation. Fig. 3 is a front elevation of the complete instrument. Figs. 4 to 9, inclusive, represent different forms of circuit-wheels employed in the machine; and Fig. 10 is a diagram of the electrical circuit.

For the basis of the apparatus I employ the well-known apparatus in which there is a circuit making and breaking spring-power-driven wheel *a*, connected in an electric circuit through a contact-brush *b*, which transmits signals in accordance with the teeth or notches in the face of the wheel, making and breaking the circuit through the brush. This circuit-wheel is mounted on the shaft *c*, which is geared by a pinion *w* on it, and the large driving-wheel *j* on shaft *f*, with the driving-spring *g*, connected with said shaft for driving said circuit-wheel when the shaft is turned by the crank *h*, suitably for winding up the spring and then let go. The wheel *j* is connected with the crank-shaft *f* by the pawl *e* on it, and the ratchet-wheel *i* on said shaft to allow the shaft to be turned for winding up the spring without turning the circuit-wheel backward. The crank-shaft is turned backward one or more teeth of ratchet *i* along the pawl *e*, according as the number of contacts circuit-wheel *a* is to make for transmitting the required signal, or several signals with interruptions, as hereinafter described.

The shaft *f* has a stop-arm *k*, which comes in contact with a stop *l* when the said shaft returns to the starting-point and arrests the same and holds it ready for another operation, the driving-spring being still under tension.

The circuit-wheel *a* is connected with the battery-wire *m*, and the contact-brush is connected with the line-wire *n*.

The line-wire connected with the register, sounder, or other receiving-instrument *c*<sup>2</sup> in the station transmits thereto but one form of signal—as dots or dashes—corresponding to the impulses transmitted by the circuit-wheel and due to the form of teeth making the contact. The machine is therefore so limited in capacity that it only serves for a few arbitrary calls or signals; but with my improvements, which I will now describe, it is rendered available for general use and with considerable rapidity, though not as rapidly as by the common system of expert telegraphy, and still may be used by unskilled persons.

I employ a series of two or more contact-wheels, as *a* *a'* *a*<sup>2</sup> *a*<sup>3</sup> *a*<sup>4</sup> *a*<sup>5</sup>, &c., on said shaft *c*, but insulated from it and from each other, and each adapted in the form of its teeth for making signals distinguishable from the signals of the rest, as represented more particularly in Figs. 4 to 9, inclusive, with a brush *q'* and branch wire *q*<sup>2</sup> connecting each separately with the battery-line through the hub *s*, and a contact-brush *b*, to take the circuit from the teeth each separately, same as described for the wheel *a*, but instead of being connected directly with the line-wire they are connected, respectively, with a button or key *t*, which only makes connection with the line-wire when pressed against the bar *u*, so that the circuit may be sent through either circuit-wheel at will, all being turned together; and I also utilize wheel *d* of the driving mechanism for another contact-wheel by providing the upper surface with suitable teeth *v*, also having connection with the battery-wire and also having a contact-brush *b* similarly connected with the bar *u* through a push-button *t*.

The wheel *a*<sup>5</sup>, Figs. 1 and 2, has its teeth adapted to make dots, and is brought into connection with the wire by the push-button or key-stud indicated by a dot in the front



view, Fig. 3. The other circuit-wheels have their teeth differently shaped in accordance with the different characters used, and as indicated in connection with the rest of the push-studs, respectively, by which they are similarly brought into connection with the line-wire.

The contact-wheels are all set for use by the crank *h* alike, and the push-stud *t* of the one whose characters are to be used is held by the operator in contact with bar *u* while the wheel is turning, during which time all the other wheels are out of circuit. The crank is shifted around a gaged dial *x* for setting the circuit-wheels, and I have provided it with a spring stop-latch *y* to ride over and drop into the teeth of a stationary disk *z* under the crank for a retarder to facilitate stopping the crank at the right positions and for a regulator to the motion of the spring-power, the said retarder and regulator being so gaged that the latch is in the bottom of a notch when the crank is in the right position for stopping at any one point. But the latch is not intended for a positive stop. It is only to make such resistance as will be an aid to the operator by affording a little more resistance when in the bottom of a notch than elsewhere, but will not materially interfere with either the turning of the crank by hand for setting the instrument or by its operation by the driving-spring, except so as to regulate the motion of the same to some extent, as above stated. The power of this retarder may be varied by varying the tension of the spring holding the stop-latch in the notches of the disk.

I arrange the stop *l* so that it may be shifted out of range of the stop-arm *k*, and provide it with a shifting-stud *a'*, projecting out through the case, whereby the crank may be turned one or more times round for a longer run of the circuit-wheels, which is sometimes desired for signals of longer duration and more conspicuous note, the said stop being held out of range during as many turns as desired and then shifted back when the instrument is to be stopped. I also utilize the pallet-bar *b'* of the escapement-regulator common to this form of spring-powers for another stop by providing the push-stud *c'* to be pressed in against said bar and held so as to lock the train for short intervals of time by holding the pallet in engagement with the escapement-wheel when it may be desired to make longer intervals of time between signals of any circuit than when it runs unobstructedly. For instance, if the code used consists of the signals of any one circuit-wheel, varied as to consecutive numbers of its signals, the driving-spring may be wound up one or more turns and the signals may be given in the order of the code by interrupting the movement of the driving-train accordingly. A spring *d'* is provided to shift and hold the push-stud *c'* out of range of the pallet-bar when the stop is not to be used.

The bell *o* is arranged for two purposes—first, to ring when the message or call is sent and strike for each break of the circuit and denote to the sender the sending of the call or message, for it will not ring unless the circuit is complete and in working order. For this purpose the magnet *p* is connected in the circuit by the wires *p'*. For the second purpose it is to be used independently of the sending-instrument to signal back from the receiving-station, the magnet being in this case connected with the battery-wire *m* by the wire *m'*, and also connected with the station by a separate line-wire *q*, having a button *q'* thereat for transmitting the return-signal. In this example I have represented the instrument as adapted for the open circuit; but it may be arranged for the closed circuit, if desired, the only difference being that the circuit-wheels shall have contact with the brushes *b* when at rest, the signals then being caused by the breaks of the circuit instead of the contacts.

I claim as my invention—

1. The combination of the series of toothed contact-wheels positively connected to a common shaft, a branch line and brushes and circuit-closer to each contact-wheel branch line, the connecting-bar of the main line common to all circuit-closers, and the driving-train connected with the contact-wheel shaft through the ratchet-and-pawl device and having the stop to produce any predetermined number of contacts with any one of the series of contact-wheels, according as the driver is set by the ratchet, substantially as described.

2. The combination of the series of toothed contact-wheels connected to a common shaft, the branch line to each contact-wheel having a brush in constant contact with a hub of said wheel and a make-and-break contact-brush to the teeth, a circuit-closer to each contact-wheel branch line, the connecting-bar of the main line connected to all the circuit-closers, and the driving-train connected with the contact-wheel shaft through the ratchet-and-pawl device and having the stop to produce any predetermined number of contacts with any one of the series of contact-wheels, according as the driver is set by the ratchet, substantially as described.

3. The combination, with the stop-arm *k* of the spring-power driver and one or more circuit making and breaking wheels of the shifting-stop *l*, and the stud-shifter *a'* therefor in the described arrangement for allowing one or more uninterrupted turns of the stop-arm *k*, substantially as described.

4. The combination of the retarding spring-latch arranged to slide forward and backward on the crank-arm and the stationary notched disk on the axis of the crank-shaft, with the crank-arm of the spring-power circuit making and breaking wheel driver, substantially as described.

5. The combination of the series of toothed



contact-wheels positively connected to a common shaft, a branch line and brushes and circuit-closer to each contact-wheel, the connecting-bar of the main line common to all  
5 the circuit-closers, the driving-train connected with the contact-wheel shaft through the ratchet-and-pawl device and having the stop to produce any predetermined number of contacts with any one of the series of con-  
10 tact-wheels, according as the driver is set,

and the bell connected in the circuit and also connected with the station through a separate wire.

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

EBENEZER B. SHAFER.

Witnesses:

W. J. MORGAN,

W. B. EARLL.