

No. 639,019.

Patented Dec. 12, 1899.

J. BUTCHER.
ELECTRIC CLOCK.

(Application filed May 18, 1899.)

(No Model.)

Fig. 1.

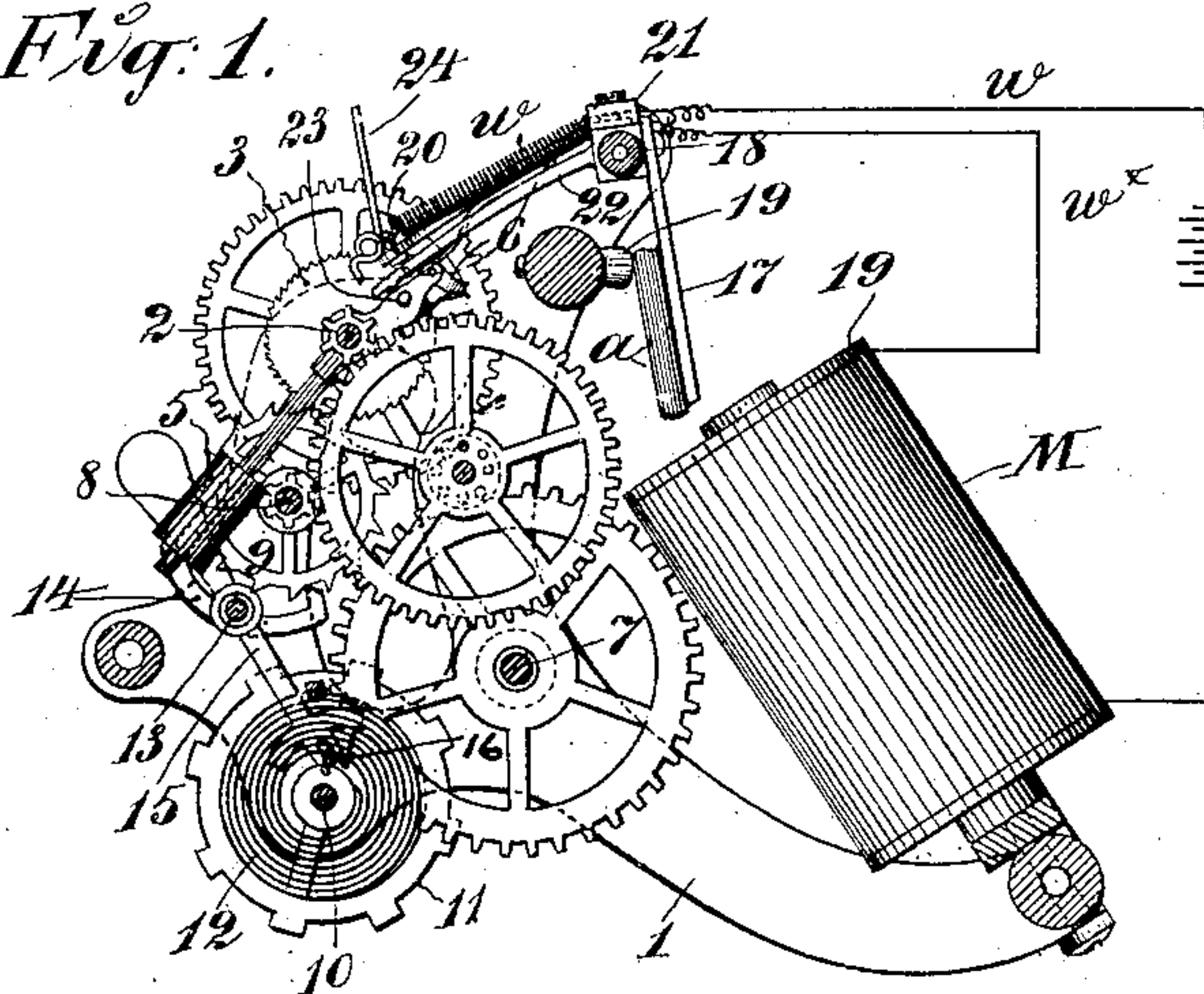


Fig. 2.

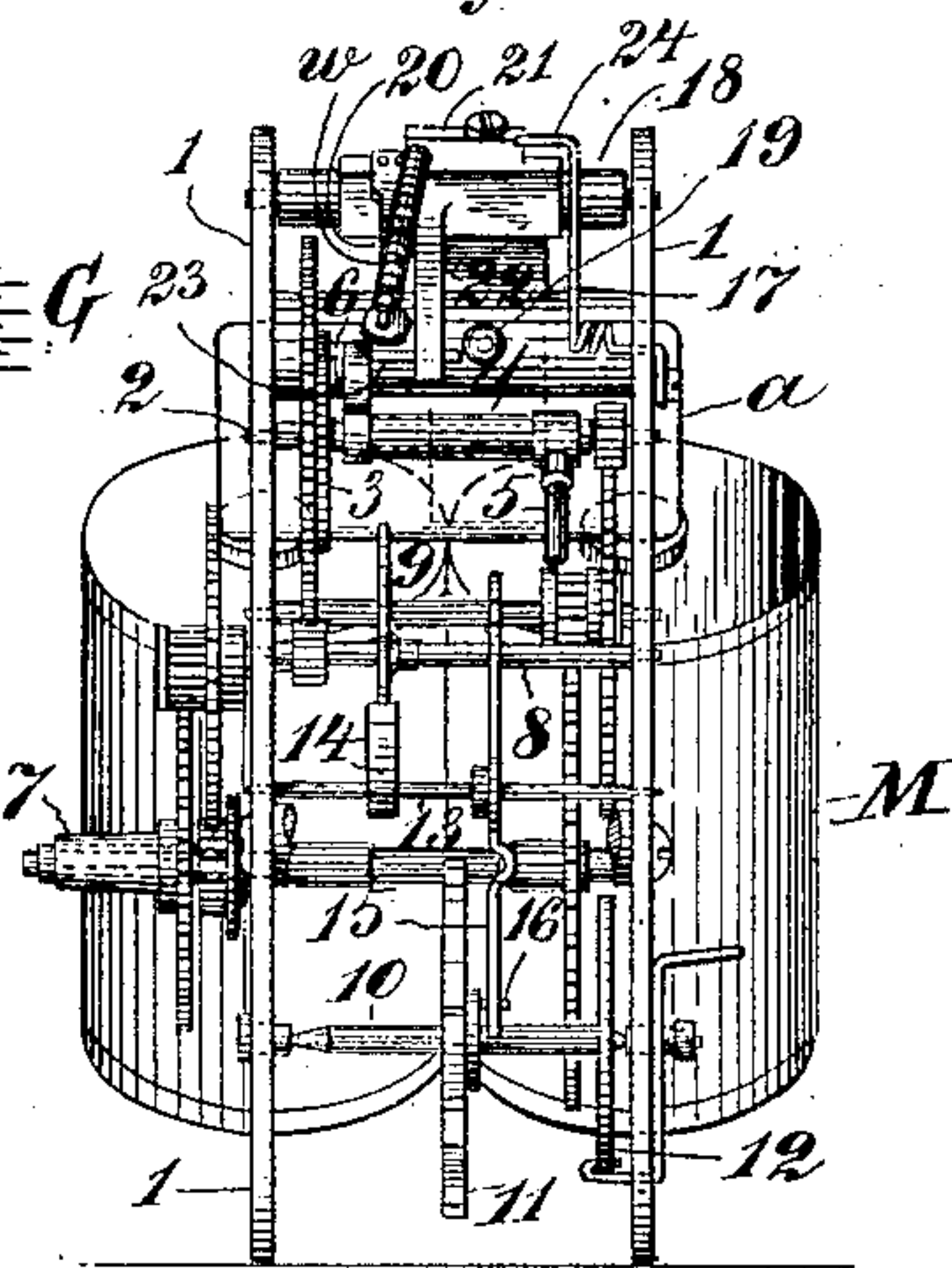


Fig. 1^a.

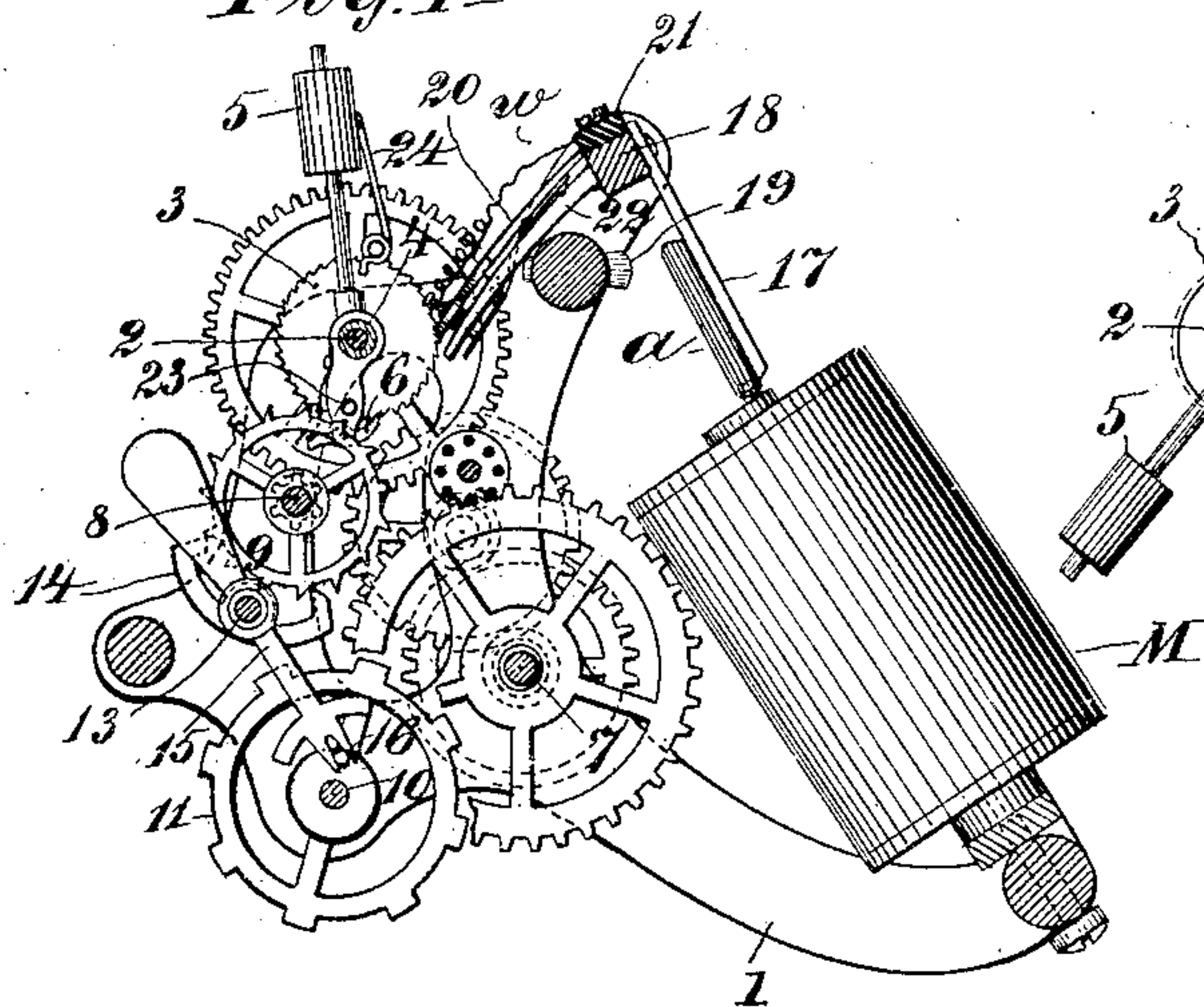


Fig. 3.

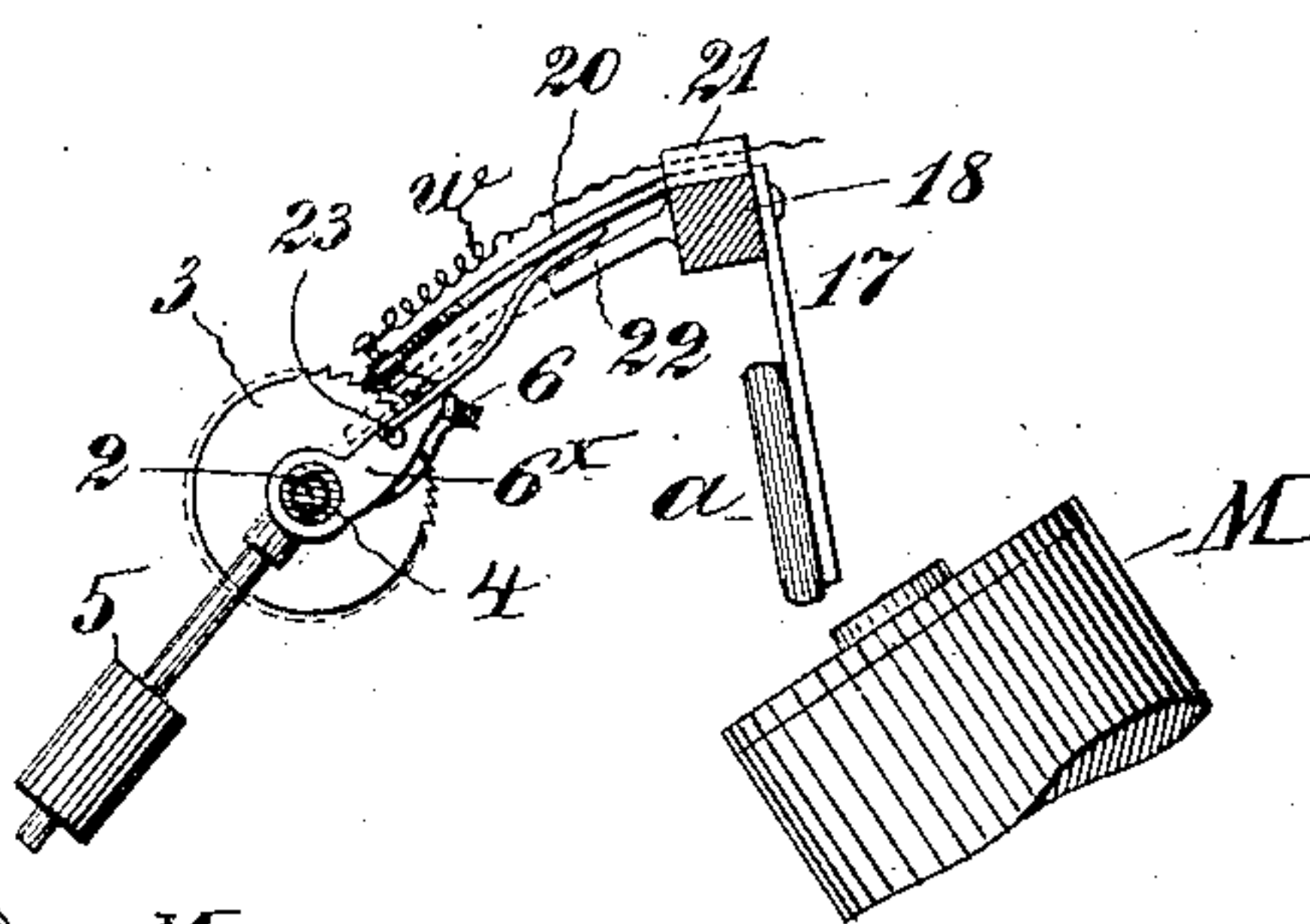
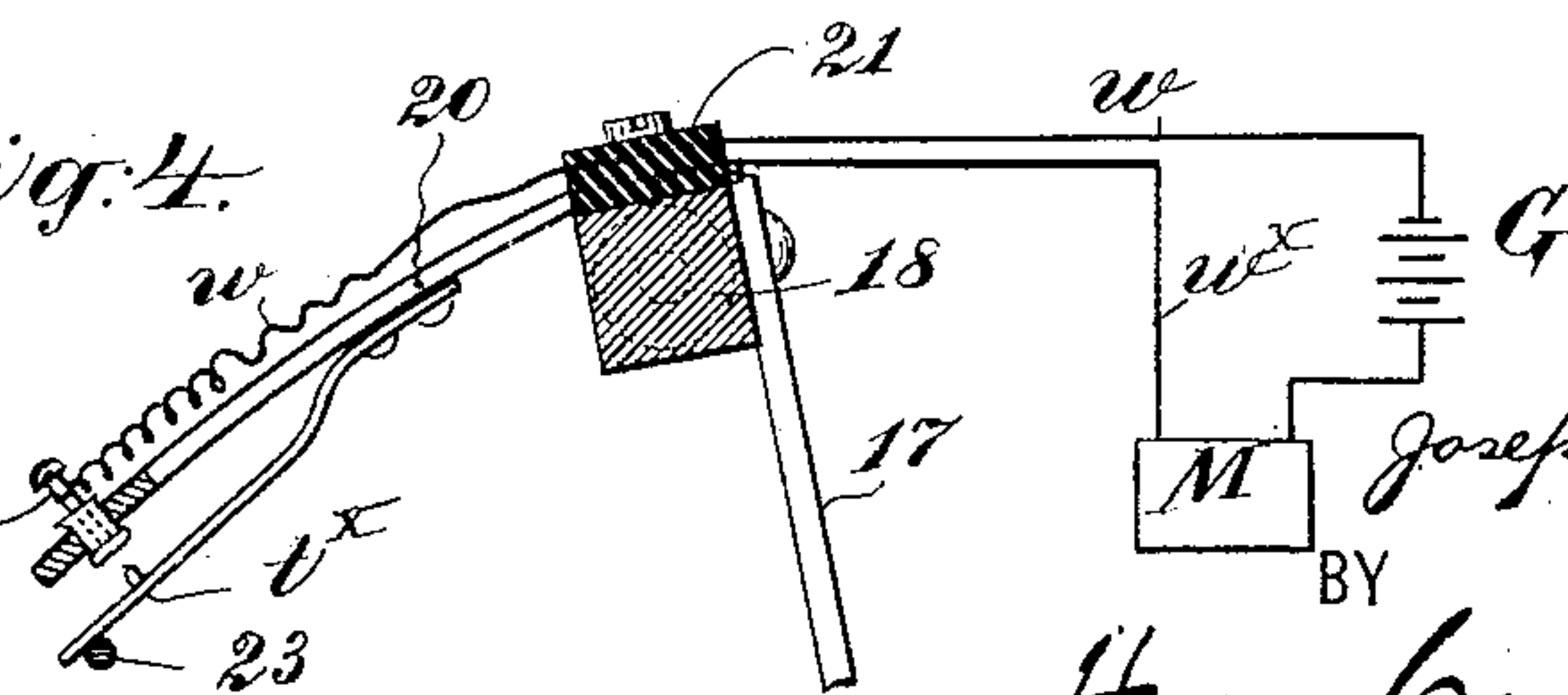


Fig. 4.



WITNESSES:

J. H. Hinant
Peter A. Ross

INVENTOR

Joseph Butcher

BY

Harry C. Smith
ATTORNEY

UNITED STATES PATENT OFFICE.

JOSEPH BUTCHER, OF JERSEY CITY, NEW JERSEY.

ELECTRIC CLOCK.

SPECIFICATION forming part of Letters Patent No. 639,019, dated December 12, 1899.

Application filed May 18, 1899. Serial No. 717,355. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH BUTCHER, a citizen of the United States, residing in Jersey City, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Electric Clocks, of which the following is a specification.

This invention relates to that class of electric clocks wherein the hands are driven by a weighted arm or lever which is raised at intervals by the closing of an electric circuit through an electromagnet; and the object of the present invention is, in the main, to adapt this means of driving to a movement wherein the escapement is controlled by a balance-wheel and hair-spring as distinguished from a pendulum.

In the accompanying drawings, which illustrate an embodiment of the invention, Figure 1 is a rear elevation of the clock mechanism as seen from the right in Fig. 2, the rear plate of the frame being omitted the better to illustrate the moving parts. Fig. 1^a is a view similar to Fig. 1, but showing the moving parts in a different position. Fig. 2 is a side elevation as seen from the left in Fig. 1. The weighted lever is partly broken away in this view. Fig. 3 is a fragmentary view designed to illustrate the contacts. Fig. 4 is a somewhat diagrammatic view illustrating the circuit connections.

1 represents the frame of the clock-movement, in which is rotatively mounted the usual clock-train.

2 is the main driving-arbor, on which is fixed a ratchet-wheel 3. On the arbor 2 is loosely mounted a sleeve 4, which carries a weighted arm 5 and a spring-pawl 6, which plays over the teeth on the ratchet when the weighted arm is thrown up and engages said teeth and drives the arbor 2 when the weighted arm descends.

7 is the arbor which carries the hands of the clock.

8 is the arbor on which is fixed the escapement-wheel 9.

10 is the arbor carrying the balance-wheel 11 and to which is connected the hair-spring 12, and 13 is the arbor of the escapement 14, the pallets of which engage the teeth on the escapement-wheel. This arbor 13 also carries the lever 15, the forked end of which engages

a pin 16 in the boss of the balance-wheel, as clearly shown in Fig. 1^a, from which the hair-spring has been omitted, so as to better show this feature.

Mounted in an inclined position in the frame 1 is an electromagnet M, the armature *a* of which is mounted on an arm 17, fixed to an arbor 18, mounted in rocking bearings in the upper part of the frame. Normally the armature hangs in the nearly-vertical position seen in Fig. 1; but when the magnet M is excited its attraction draws said armature into substantially the position seen in Fig. 1^a, rocking the arbor 18 in its movement. When in its normal position, Fig. 1, the armature rests against a cushion 19 in the frame.

G represents a battery or any other suitable electric generator, and *w w*^x the conductors of an electric circuit, including said generator and the electromagnet M. Fig. 4 best illustrates the circuit-terminals. *t* is the terminal of the conductor *w*, and *t*^x the terminal of the conductor *w*^x. The terminal *t* is in the nature of a pin set in an insulating-block in a metal arm 20, carried by the arbor 18, and the terminal *t*^x is in the nature of a leaf-spring secured to the under side of the arm 20, with its free end slightly out of contact, normally, with the terminal *t*. For convenience a block 21 of insulating material is mounted on the rocking arbor 18, and the circuit-wires are brought to this point, where the connections are made in a well-known way.

On the arbor 18, at the side of the arm 20, is an operating-arm 22, and in the arm 6^x, which carries the pawl 6, is a laterally-projecting pin 23, the function of which will appear from the description of the operation following.

Starting from the position of the parts seen in Fig. 1^a, which shows the weighted arm 5 elevated to a nearly-vertical position, the weight descends gradually, driving the clock-train as fast as the escapement will permit. When it shall have descended to the position seen in Fig. 3, the pin 23 in the pawl-arm 6^x takes under the terminal spring *t*^x and presses it upward into contact with the terminal *t*, thus completing the circuit through the magnet M. At the same moment the pin 23 is brought up under the operating-arm 22, (partly broken away in Fig. 3,) and the instant the circuit is closed the magnet draws

the armature *a* to the position seen in Fig. 1^a with a sudden movement, which serves to cause the arm 22 to impinge upon the pin 23 and throw the weighted arm 5 up to the position seen in Fig. 1^a, the pawl 6 wiping over the teeth of the ratchet-wheel 3 and taking a position as at first. The circuit is now broken by the resiliency of the spring-terminal *t*^x, and the movement begins again to be repeated whenever the weighted arm descends to the proper extent. There may be a spring cushion or buffer 24 to limit the upward movement of the weighted arm.

The time occupied by the weight in its ascent is only a very small fraction of a second, and it is calculated to take place when the hair-spring is under tension, so that the movement of the clock is not in any way interfered with thereby.

The inclined position of the axis of the magnet *M* is important in that it allows the armature *a* to swing into its normal position by gravity, thus avoiding the necessity of a spring, which varies in tension with time and in such a situation would be very unreliable. The armature is not an operative weight and may be made as light as the conditions will permit. It falls back to its normal position at the instant the circuit is broken.

In Figs. 1 and 2 the part of the conductor *w* between the terminal *t* and the block 21 is represented as a close helical coil, such as is found convenient in electrical devices; but this is not important. In Fig. 1^a it is shown as an open coil.

Having thus described my invention, I claim—

1. In an electric clock, the combination with the balance-wheel, hair-spring, lever, escapement-wheel, driving-arbor, and intermediate train, of the weighted arm, and the pawl-and-ratchet mechanism through which said weighted arm rotates the driving-arbor, the electric circuit including a generator, the electromagnet having its coils in said circuit,

a rocking arbor, the armature-lever and armature suspended from said rocking arbor in such position that said armature may swing across the poles of the magnet, an arm on said rocking arbor carrying the circuit-terminals, and means substantially as described for bringing the circuit-terminals together when the weighted arm descends, substantially as set forth.

2. In an electric clock, of the character described, the combination with the inclined electromagnet *M*, of a rocking arbor 18, above the poles of the magnet, the armature-lever 17, suspended from said arbor, the armature *a* on said lever, the arm 20, fixed to said arbor and extending therefrom at an angle with the lever 17, an open electric circuit including a generator and the coils of said magnet, one of the terminals of said circuit being set in said arm 20, and the other a spring, carried by said arm, substantially as set forth.

3. In an electric clock, the combination with the balance-wheel, hair-spring, lever, escapement, escapement-wheel, driving-arbor, and intermediate train, of the ratchet-wheel on said arbor, the sleeve 4 on said arbor, the pawl carried by said sleeve, the weighted arm carried by said sleeve, the electric circuit, including a generator, the terminals *t* and *t*^x of said circuit, the arbor 18, the arm 20, on said arbor and carrying said terminals, the operating-arm 22, carried by said arbor, the pin 23, carried by the sleeve 4, and adapted to complete the circuit, the inclined electromagnet *M*, in said circuit, and the armature *a*, suspended from the arbor 18, substantially as set forth.

In witness whereof I have hereunto signed my name, this 17th day of May, 1899, in the presence of two subscribing witnesses.

JOSEPH BUTCHER.

Witnesses:

HENRY CONNETT,
PETER A. ROSS.