No. 679,546. Patented July 30, 1901.

T. H. WURMB & R. BAUMANN.

SECONDARY ELECTRIC CLOCK.

(Application filed Jan. 26, 1900. Renewed May 2, 1901.)

(No Model.) 3 Sheets—Sheet 1.

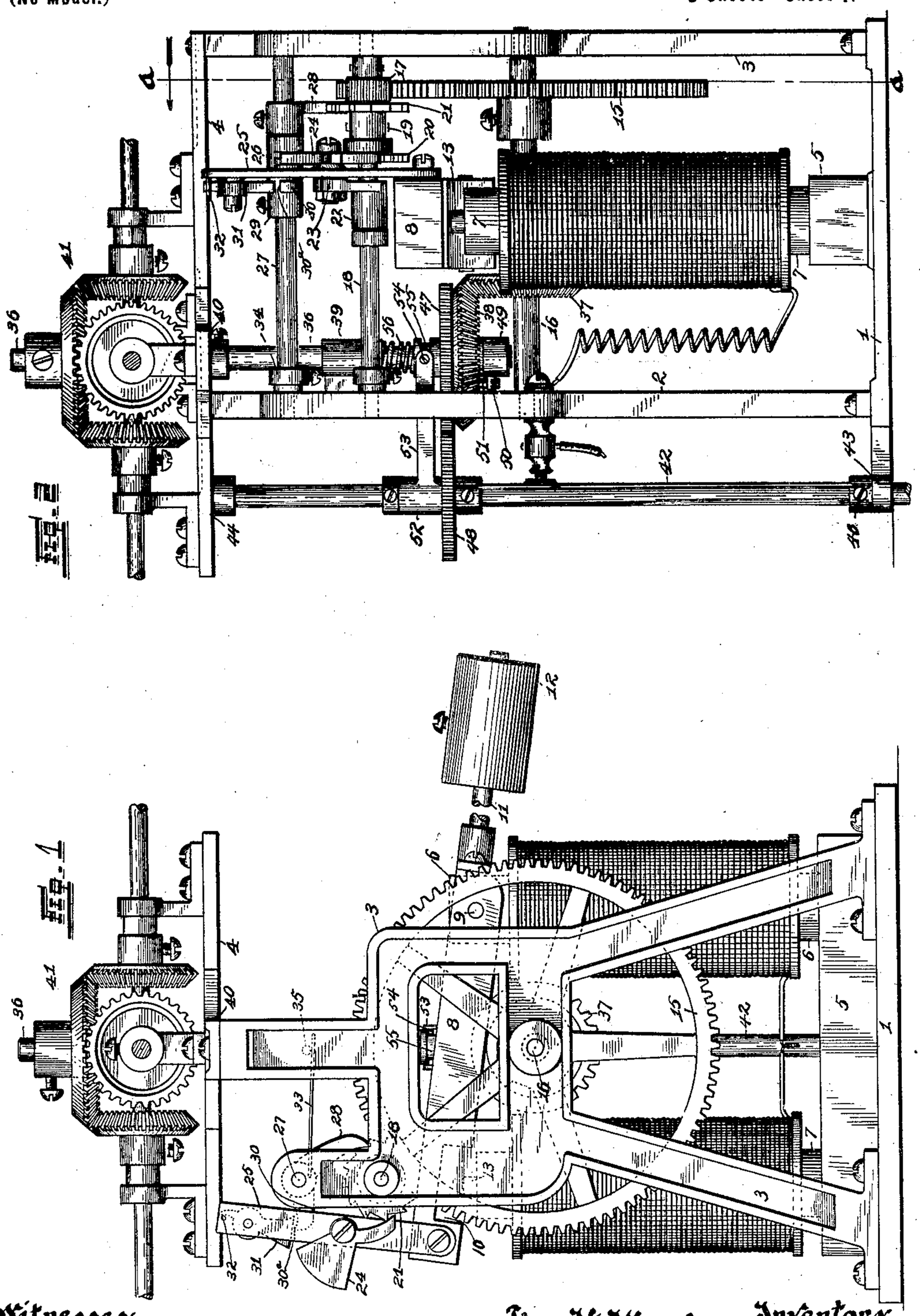


FIG. 2

FIG. 1

Witnesses:
Alfred A. Ricker
J. H. Rippey

Inventors:
Theo. H. Wurmb
Robert Baumann.
By. Higdon & Longan, Attys.

No. 679,546. Patented July 30, 1901.

T. H. WURMB & R. BAUMANN.

SECONDARY ELECTRIC CLOCK.

(Application filed Jan. 26, 1900. Renewed May 2, 1901.)

(No Model.) 3 Sheets—Sheet 2.

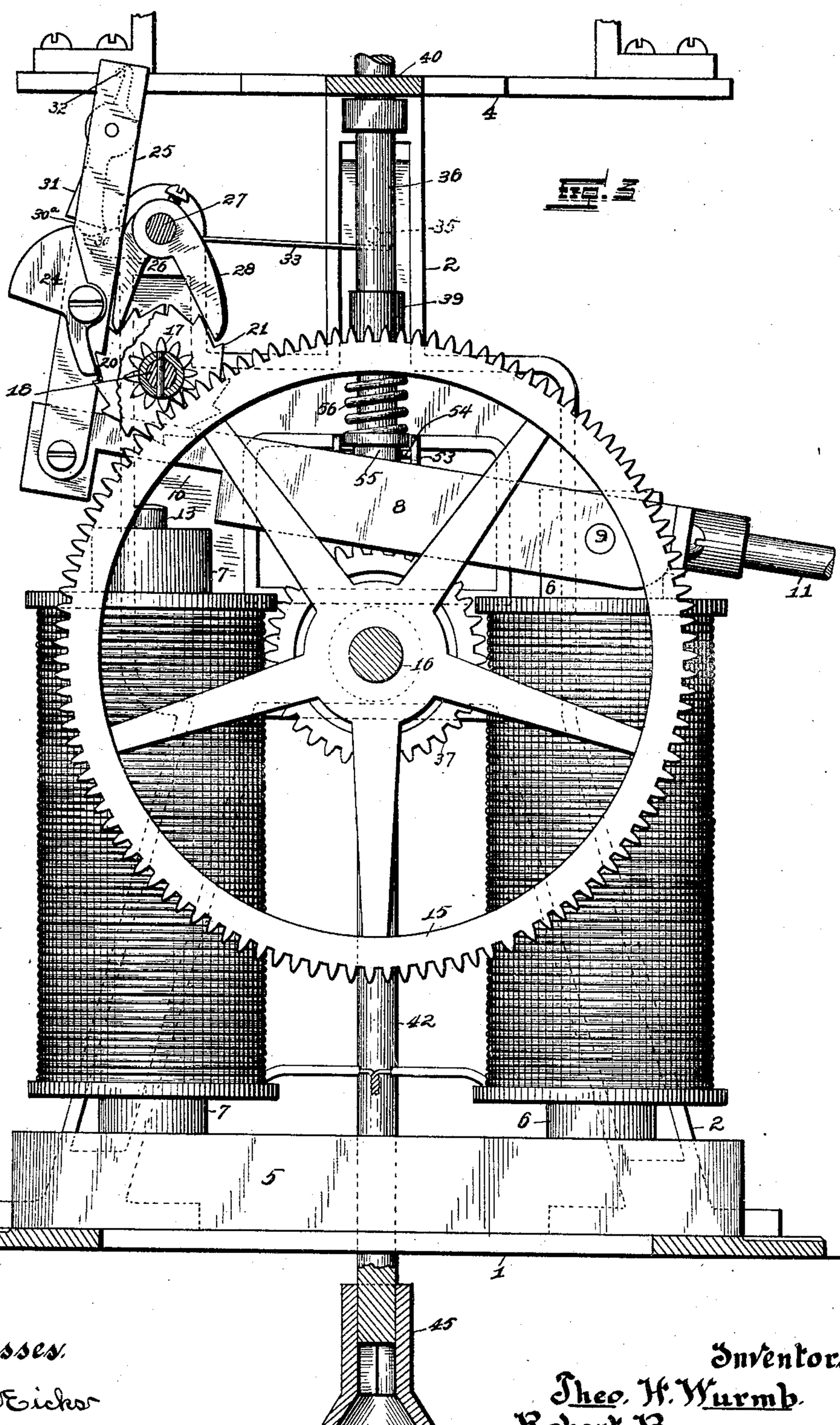


FIG. 3

Witnesses.
Alfred A. Eickes
J. D. Rippey

Inventors.
Theo. H. Wurmb.
Robert Baumann.
By Higdon & Longan, Attys.

No. 679,546. Patented July 30, 1901.

T. H. WURMB & R. BAUMANN.

SECONDARY ELECTRIC CLOCK.

(Application filed Jan. 26, 1900. Renewed May 2, 1901.)

(No Model.) 3 Sheets—Sheet 3.

FIG. 4

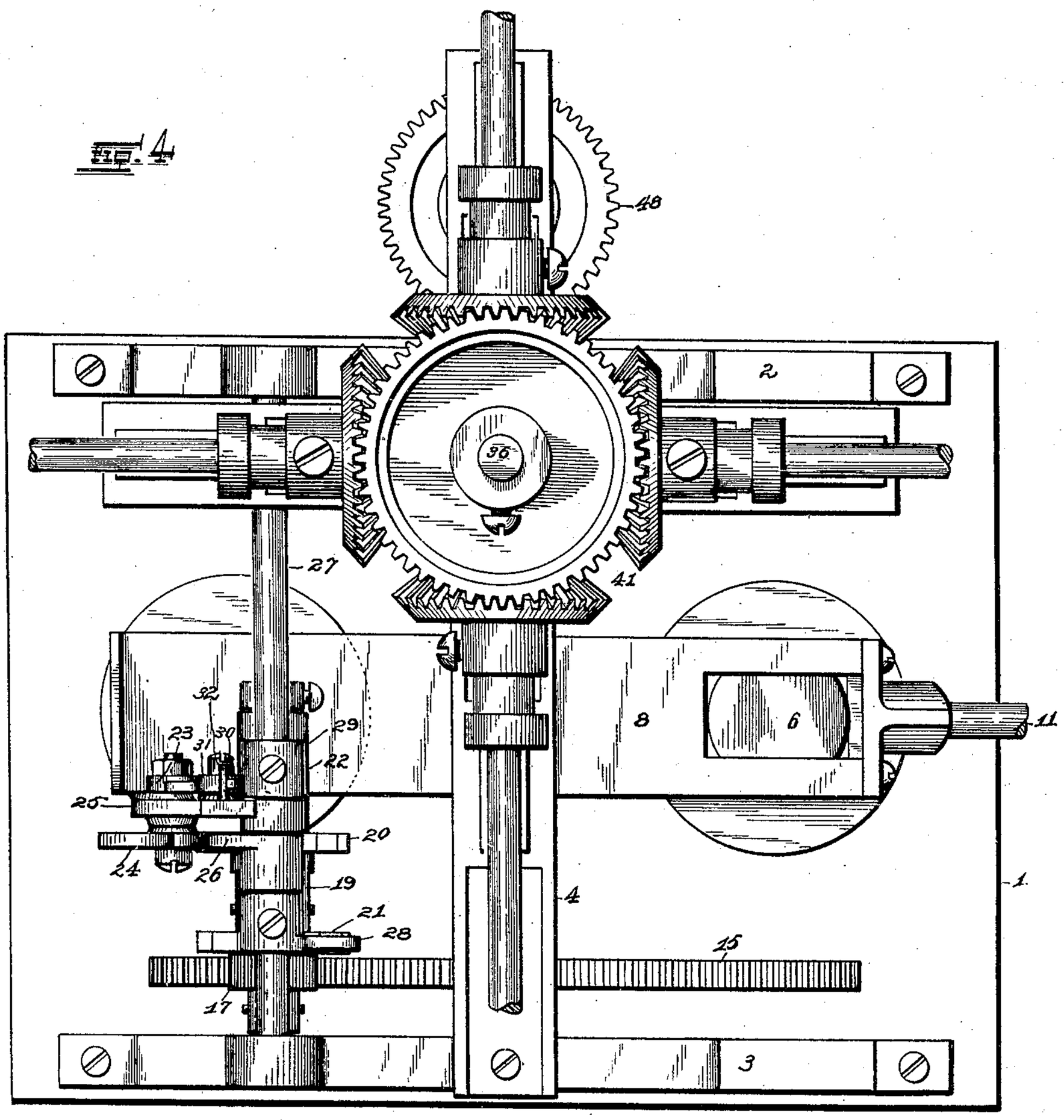


FIG. 5

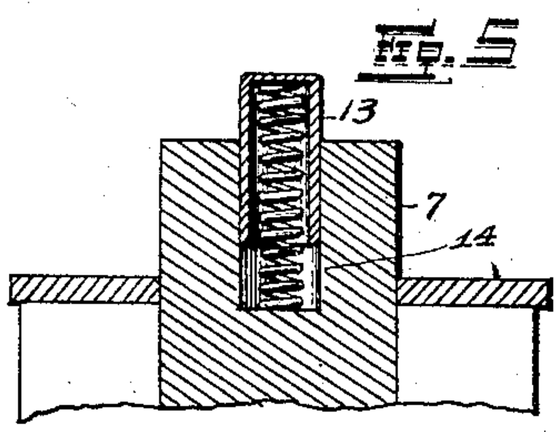
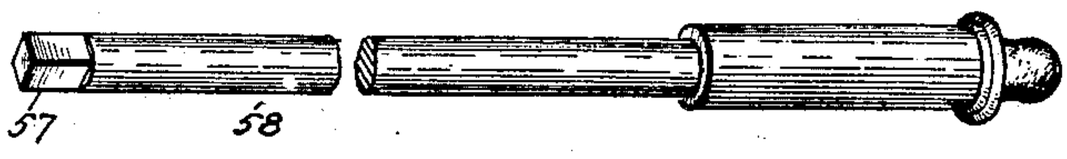


FIG. 6



Witnesses.

Alfred A. Eichor

J. D. Rippey

Inventors,

Theo. W. Wurmb.

Robert Baumann.

By Higdon & Longan. Atty's.

UNITED STATES PATENT OFFICE.

THEODORE H. WURMB AND ROBERT BAUMANN, OF ST. LOUIS, MISSOURI.

SECONDARY ELECTRIC CLOCK.

SPECIFICATION forming part of Letters Patent No. 679,546, dated July 30, 1901.

Application filed January 26, 1900. Renewed May 2, 1901. Serial No. 58,498. (No model.)

To all whom it may concern:

Be it known that we, THEODORE H. WURMB and ROBERT BAUMANN, of the city of St. Louis, State of Missouri, have invented certain new and useful Improvements in Electric Clocks, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

This invention relates to electric clocks; and it consists of the novel construction, combination, and arrangement of parts hereinafter shown, described, and claimed.

One object of this invention is to construct a clock to be operated by electricity, which clock is especially adaptable for use in places that are exposed to severe atmospheric conditions and extreme changes of temperature, such as street-sign clocks and tower-clocks.

Another object is to provide an improved electromagnet and an improved mechanism which will positively lock the hands of the clock both ways while at rest and which positively prevents their being turned farther than intended by any external force, such as high winds or by their own momentum.

Figure 1 is a side elevation showing the arrangement of the magnets. Fig. 2 is a side view. Fig. 3 is a sectional view taken on the line *a a* in Fig. 2. Fig. 4 is a top plan view. Figs. 5 and 6 are views showing different parts made use of in carrying out our invention.

In the construction of this improved device we provide a suitable framework, comprising the base 1, upon which are rigidly secured the side frame-plates 2 3, carrying on their upper ends the top plate 4. The electromagnet, as usual, is composed of the yoke 5, carried by the base 1, the two cores 6 7, and the armature 8. In devices of this kind two factors are of great importance—first, the economical use of the electric current supplying the power, and, second, nearly equal pull of the armature over its entire range of motion. Extended experiments have resulted in the production of an electromagnet, presently described, which has proven by practical tests to fulfil these requirements completely and more satisfactorily than any known form of electromagnet. The pole end of the core 6 projects a suitable distance between the bifurcated rear end of the armature, which is pivotally secured there by the pin 9. The core 7 projects a distance equal to the required range of motion of the armature, which is provided with a groove 10 to receive the projection, without coming in actual contact therewith. From the rear end of the armature projects a rod 11, upon which is adjustably held a weight 12, which serves to slightly overbalance the weight of the armature and the free end of the same into normal position, as shown in Figs. 1 and 3. It is apparent that this arrangement of electromagnet reduces the air-gap to a minimum throughout the entire motion of the armature, resulting in the highest possible efficiency in the attractive power. The effects of the residual current are counteracted by the spring-actuated pin 13, which is held to operate vertically in a hole 14 in the top of the core 7. This pin when depressed by the closing of the armature projects above the core just enough to prevent actual contact between the armature and the pole. A gear 15, keyed upon the shaft 16, carried by the side frame-plates 2 3, is made to mesh with a small gear 17, carried by the shaft 18. The collar or sleeve 19, mounted on the shaft 18, is provided with a pair of relatively opposite ratchet-wheels 20 21, the former of which is right-handed and the latter left-handed. Integral with the collar 22, mounted loosely on the shaft 18, is an arm 23, to the outer end of which is pivotally secured a bar 25, the lower end of which is connected to the free end of the armature 8, and to the side of which opposite from the arm 23 is secured a pawl 24, the said pawl operating on the ratchet-wheel 20, Figs 2 and 3. Any suitable means, such as set collars, may be made use of to prevent lateral displacement of the collar 22 on the shaft 18. A stop-pawl 26, engaged with and intended to prevent the ratchet-wheel 20, and in consequence the hands of the clock, from turning backward, is held to turn free upon the shaft 27. A like pawl 28 is rigidly carried on the shaft 27, engages with the ratchet-wheel 21, and prevents the same, and consequently the hands of the clock, from being turned farther forward than the desired distance. By this means it may be seen that

the hands of the clock are deadlocked, and in order to turn them forward the pawl 28 must be lifted out of engagement with the ratchet-wheel 21.

From the collar 29, rigidly secured upon the shaft 27, projects an arm 30 at any suitable angle, provided on its upper side and at its outer end with a flat surface 30ª, which is adapted to be engaged by the trip-pawl 31, pivotally carried by the upper end of the bar 25 and held in normal position by the stop-pin 32, projecting from said bar. When the armature is lowered, the lower end of the pawl 31 engages and depresses the outer end of the arm 30, thereby turning the shaft 27 slightly and lifting the pawl 28 out of engagement with the ratchet-wheel 21. The pawl 28 is kept normally pressed against the periphery of the ratchet-wheel 21 by means of a spring 33, projecting from a collar 34, rigidly held by the opposite end of the shaft 27 from that on which the parts above described are secured. The free end of the said spring rests against a pin 35, the same projecting inwardly from the frame-plate 2.

Motion is imparted from the main shaft 16 to the vertical shaft 36 by means of the beveled gear 37, carried on the shaft 16, meshing with a like gear 38, keyed on the lower end of the shaft 36. The said vertical shaft is rotatably journaled in bearings 39 40, integral with the frame-plate 2 and the top plate 4, respectively. The arrangement of the center gearing 41 and that of the connection between the same and the dial-gearing is well known and needs no further comment. The electric circuit supplying the power is closed at suitable intervals by any suitable circuit-closing device attached to the master-clock, the same being located inside the building, where it is least subjected to extreme changes of temperature.

As usual in clocks of large size, we provide a means for adjusting or setting the hands independently of the driving mechanism. A shaft 42 is held to turn and to slide vertically in bearings 43 and 44, integral with the base 1 and the top 4, respectively, the vertical movement being regulated by set collars 45 46, the lower part of the aperture through the collar 45 being square. A gear 47 is secured upon the hub of the bevel-gear 38 and is in mesh with a like gear 48, carried rigidly upon the shaft 43. From the collar 49, secured upon the lower end of the vertical shaft 36, projects an arm 50, which carries a pin 51, which extends through apertures through the gears 38 and 47. The collar 52, rotatably carried by the shaft 43, is provided with an integral arm 53, the free end of which is bifurcated, each fork of which carries a pin 54, which at all times engages in a groove 55 in the hub of the gears 38 and 47. The coil-spring 56, mounted on the shaft 36, serves to hold the bevel-gear 38 down in normal position and in gear with its mate 37. Pushing up the shaft 43 causes through its connections the hub of the gears 47 and 38 to slide upward on the shaft 36, the pin 51 being of such length that it never disengages from the gear 38. In order to set the clock, the squared end 57 of the rod 58 is inserted into the squared aperture in the collar 45, then pushed and held up and turned either left or right until the hands are in the desired position, when the rod is withdrawn and the parts affected will return into their normal position.

The operation of the device is as follows: The armature upon being attracted carries the bar 25 with it downwardly, the upper part of the bar swinging outwardly in an arc of about twenty degrees. The dog 31 depresses the arm 30 far enough to turn the shaft 27 and the pawl 28 slightly, thereby permitting the pawl 24 to turn the ratchet-wheel 20. The free end of the arm 30 and the lower end of the dog 31 in their descent move apart and separate immediately after the pawl 24 has started to turn the ratchet-wheel 20. At the instant of the parting of said parts the tension of the spring 33 causes the pawl 28 to engage again in the face of the ratchet-wheel 21, and the next tooth of same forms a stop against the free end of the pawl, preventing thereby the hands to be turned farther than one-half minute and prevents them absolutely from being turned forward by the action of high winds. Backward action from this source is made impossible by the stop-pawl 26. The distance of the range of motion of the armature at its free end is about equal to one and one-half the length of one tooth to the other of the ratchet-wheel. This arrangement allows sufficient time for the pawl 28 to rise before the pawl 24 begins to push.

It has been demonstrated by practical tests that a two-ampere current of four volts or a current generated by three cells connected in series is capable of operating a machine of this kind for driving the hands of four open-faced dials of thirty-six inches in diameter each against the severest weather.

We claim—

1. In an electric clock, a shaft, a driving ratchet-wheel rigid upon said shaft, a pawl operating on said ratchet-wheel, a second ratchet rigid with the said shaft, a pawl operating on said ratchet, a spring for holding the said pawl upon the ratchet, a gear carried upon said shaft, means for rotating said shaft and gear, a second shaft, having a gear keyed thereon and meshing with the first-mentioned gear whereby said shaft is rotated, suitable dial mechanism and means for operating the said dial mechanism when the second-mentioned shaft is rotated, substantially as specified.

2. In an electric clock, an operating-shaft, means rotating said shaft, a ratchet rigid with said shaft, a pawl for propelling said ratchet, a second pawl to prevent said ratchet from

turning backward, a second ratchet carried by the said shaft, a pawl operating upon said ratchet, means for holding said pawl upon said ratchet, means for removing it therefrom, a suitable dial mechanism and means for operating the said dial mechanism when the said shaft is rotated, substantially as specified.

In testimony whereof we affix our signatures in presence of two witnesses.

THEODORE H. WURMB.
ROBERT BAUMANN.

Witnesses:
J. D. RIPPEY,
ALFRED A. EICKS.