No. 708,886

Patented Sept. 9, 1902.

# C. HOUR.

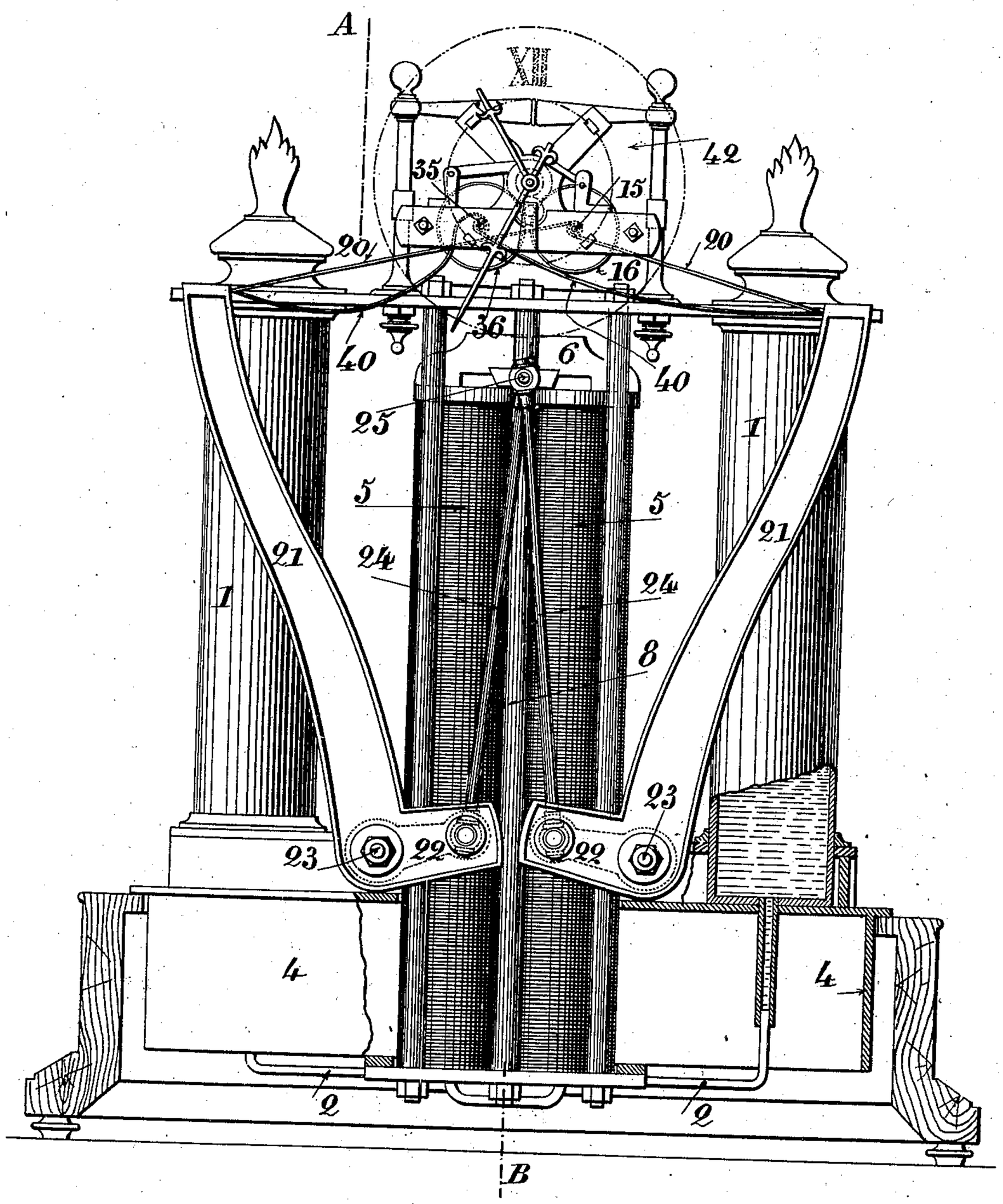
## SELF WINDING CLOCK.

(Application filed Dec. 17, 1901.)

(No Model.)

3 Sheets—Sheet 1.

FIG. 1.




WITNESSES:

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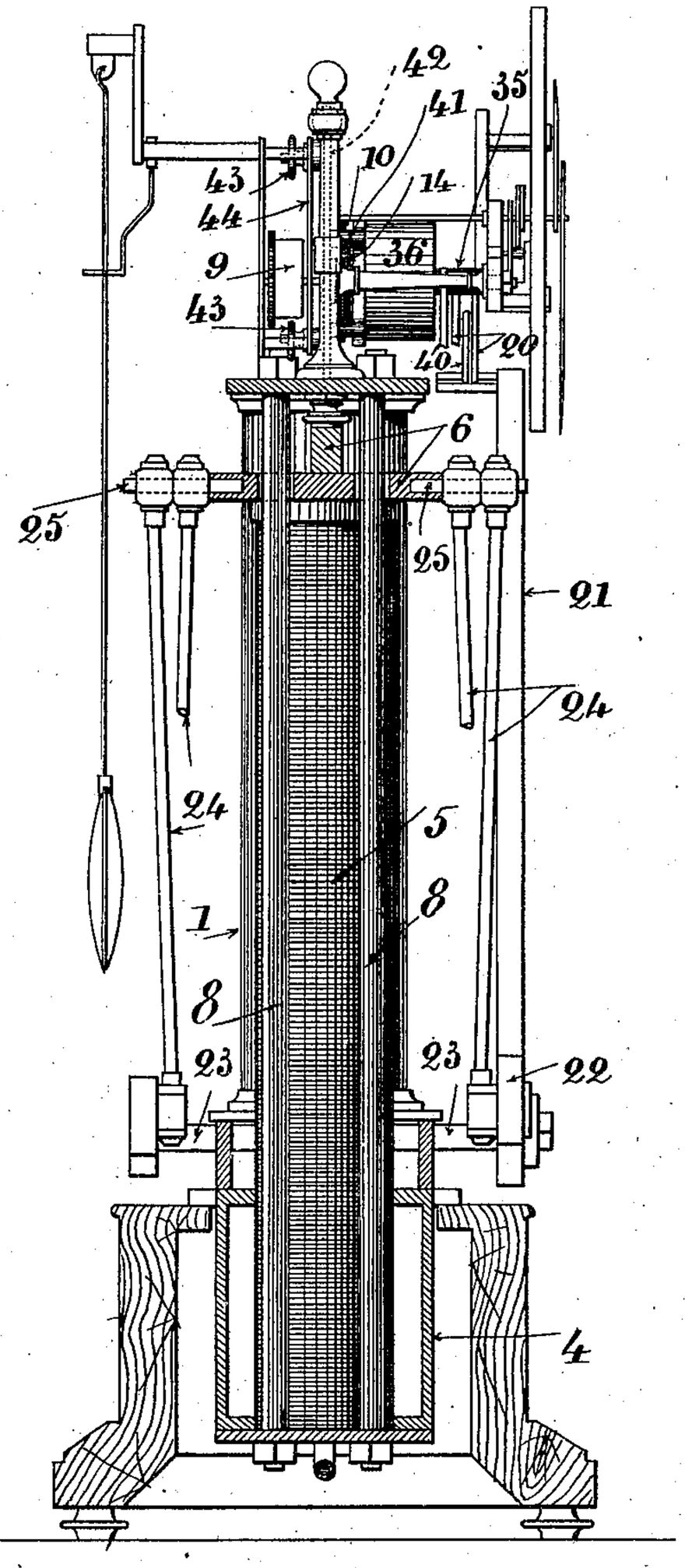
FIG. 2.

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(No Model.) 3 Sheets—Sheet 3.

FIG. 3.

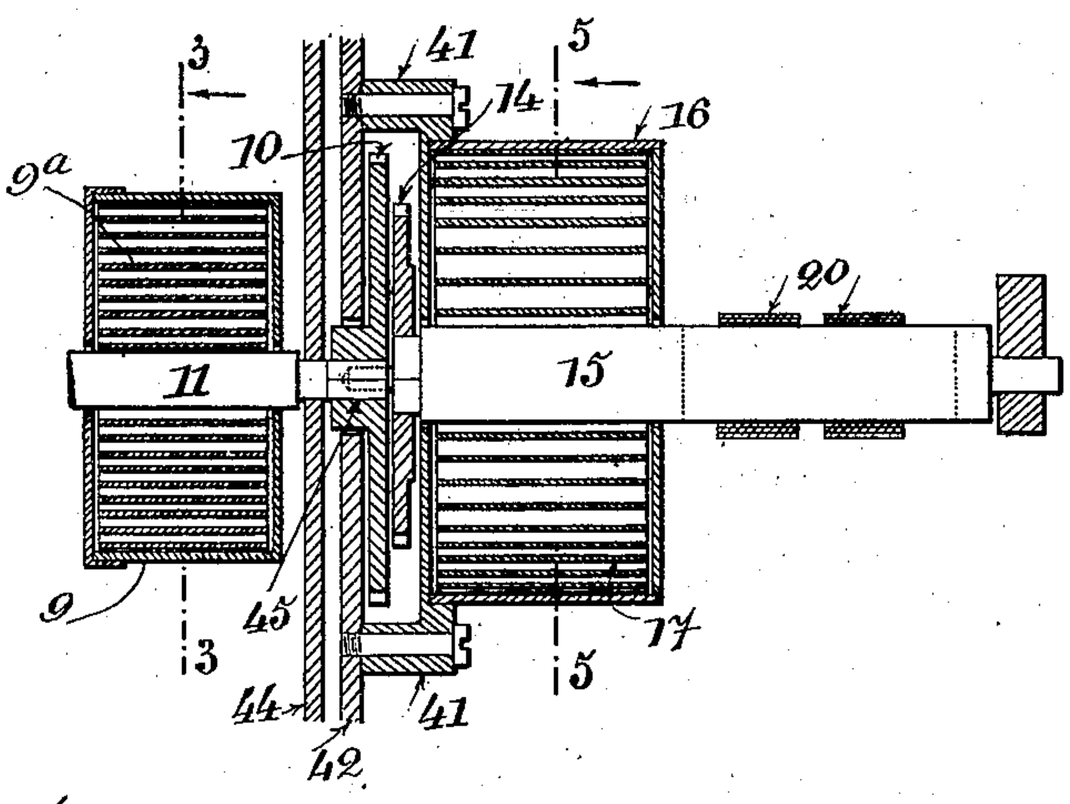



FIG. 4.

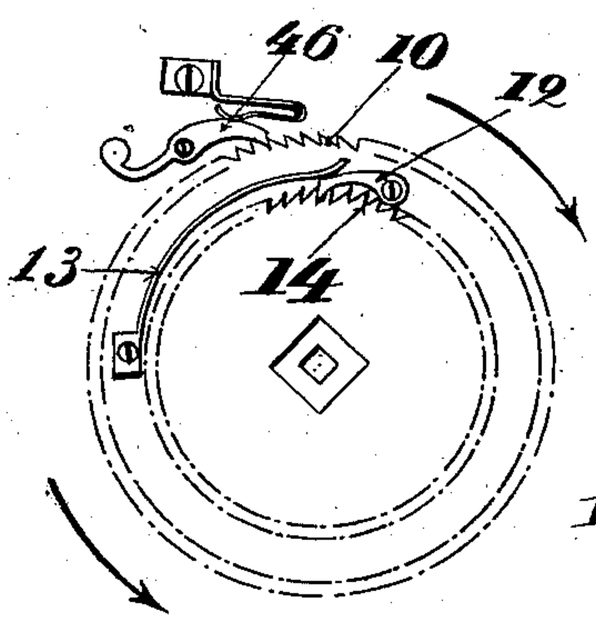



FIG. 3A.

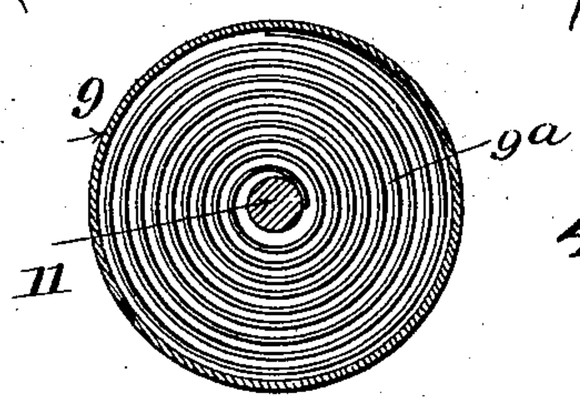



FIG. 5.

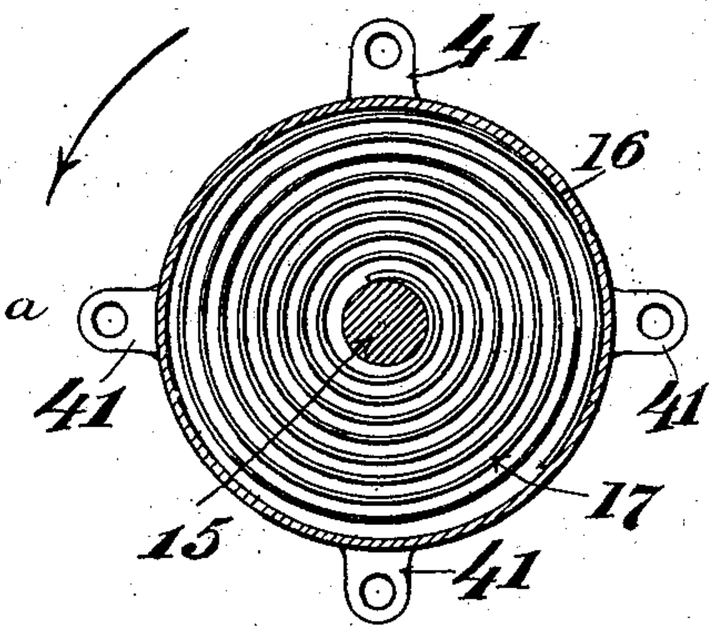



FIG. 6.

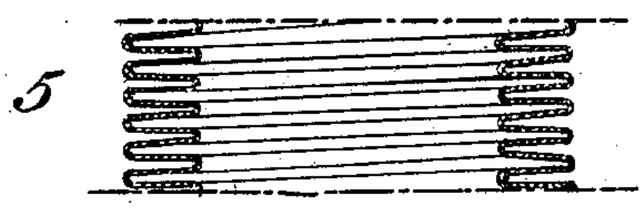
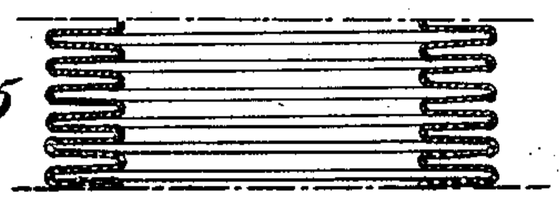



FIG. 7.

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# UNITED STATES PATENT OFFICE.

CHARLES HOUR, OF PARIS, FRANCE.

## SELF-WINDING CLOCK.

SPECIFICATION forming part of Letters Patent No. 708,886, dated September 9, 1902.

Application filed December 17, 1901. Serial No. 86,235. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES HOUR, manufacturer, a citizen of the Republic of France, residing at 7 Rue St. Anastase, Paris, in the Republic of France, have invented certain new and useful Improvements in Automatically-Wound-Up Clocks, of which the following is a specification.

My invention relates to a clock which is automatically wound up by means of device which works under the sole influence of the variations in the temperature of the atmosphere. The well-known principle on which the operation or working of the said device is based is that liquids possess the property of expanding and contracting under the action of the variations of temperature, while the said liquids are practically incompressible. However, no practical use of this principle has ever been made heretofore to actuate clocks, by reason of the material difficulties to be got over in order to convert the very slight change in the volume of the expansible liquid into a sufficient amount of rotation of the driving-barrel of the clock. The particular arrangements to be described with reference to the accompanying drawings permit, on the contrary, of obtaining by means of mechanical parts simple in construction and of a practical size the certain operation of either a silent or striking clock under the influence of variations of temperature not exceeding 1° centigrade—for example, from one day to another—and the said arrangements also permit of preventing much greater variations in temperature than that of 1° from producing an accumulation of energy which might endanger the resistance of the clock.

In the drawings, Figure 1 is an elevation of one form of my novel clock, part of the recipient containing the alcohol being shown in section. Fig. 2 is a vertical section through the center of Fig. 1 and showing diagrammatically in elevation the clockwork, the plane of the section being indicated by the dotted line A B of Fig. 1. Fig. 3 is a section through an ordinary spring-barrel and an auxiliary barrel. Fig. 3ª is a transverse section on the line 3 3 of Fig. 3. Fig. 4 is an elevation of the ratchet-wheels which connect the arbor of the auxiliary barrel with the arbor of an ordinary spring-barrel. Fig. 5 is a section on the line 5 5 of Fig. 3. Figs. 6 and 7 are central sections through extensible tubes.

The clock comprises a recipient for alcohol composed of a rigid part and an extensible part. The rigid part comprises two hollow pillars 1, hermetically closed and fixed to frame 4. The extensible part is formed by two tubes 5, the wall of which presents very deep and very close corrugations, so that the tubes can expand to a notable extent without going beyond the limit of the elasticity of the metal of which they are made. Figs. 6 and 7 show that the said corrugations may be arranged either in parallel circles, Fig. 7, or in helical coil of very low pitch, Fig. 6, provided they are deep and close. The lower part of tubes 5, fixed to frame 4, communicates with pillars 1 through tubes 2. The tubes and the pillars are completely filled with alcohol, so that under the influence of the variations in temperature the upper part of tubes 5 is caused to move up and down as the alcohol expands or contracts. Fixed vertical rods 8 serve as guides for the tubes 5, on the upper part of which is a cross-piece 6, provided with journals or trunnions 25. By means of links or pitmen 24 the said trunnions are connected to bell-crank levers having two arms 21 22 and which are pivoted at 23 to the frame. To each of the said levers are fixed two ribbons 20 and 40, the ends of which are wound around and fixed to the rotary axes 15 and 35 of two fixed barrels or drums 16 and 36. Spiral springs 17 are fixed at one end to the axes or spindles 15 and 35 and at the other end to barrels 16 and 36, so that the tension of the said springs is increased by the said ribbons 20 and 40 when the latter are pulled by the levers 21 22—that is to say, when the alcohol expands and causes the cross-piece 6 to move upward, together with the rods or links 24. Each barrel 16 or 36 is fixed by lugs 41 to a plate 42, which is permanently fixed to the frame of the clock, and on the said plate is removably fixed, as by nuts 43, a second plate 44, which carries a well-known system of minute and striking wheels, together with their usual barrels or spring-boxes 9, the latter containing the usual spring 9ª, as shown by Figs. 3 and 3ª. The axes or spindles 11

of the said barrels terminate, as usual, in square parts 45. The latter project through apertures in the fixed plate 42, and ratchet-wheels 10 are mounted on the said projections between the plate 42 and the fixed drums 16 and 36. Pawls 46, mounted on the said plate 42, prevent the wheels 10, and consequently the axes 11 of the barrels 9, from revolving backward. Each wheel 10 carries a pawl 12, which is held by a spring 13 against a ratchet-wheel 14, fixed on axis 15 or 35, so that when the spring of one of the drums 16 or 36 slackens and causes its axis 15 or 35 to revolve the said wheel 14 brings about the rotation of pawl 12, wheel 10, and axis 11. On the contrary, when axis 15 or 35 is revolved, so as to tighten the intermediate spring 17, the wheel 14 revolves without causing the wheel 10 to revolve, the latter wheel being, moreover, held by the pawl 46. Ribbons 20 and 40 are wound on the axes 15 and 35 in the same direction as the springs $9^a$ of the barrels 9, and springs 17 are wound in an opposite direction to the latter. As the ribbons 20 and 40 are free to give way when they are not tight, it will be understood that the intermediate springs 17 might remain tight, even if the levers 21 move toward each other, should the said springs meet with great resistance on the part of the axes 11, as might happen when the springs of the barrels 9 are completely wound up or when the wheels are accidentally prevented from revolving. It will also be understood that the axes 15 and 35 are completely independent of each other and that one of the intermediate springs 17 can slacken more slowly or not slacken at all without interfering with the slackening of the other and the winding up of the corresponding barrel 9. In no case, therefore, can the resistance of the ribbons, springs, and connected parts be endangered by the stoppage of the minute or striking wheels, however frequent may be the variations in temperature acting on the system.

The hereinbefore-described construction of the plate 44 in rendering the latter independent of plate 42 allows of the said plate 44 being easily taken out, together with all the parts carried by the same, so that although the axis 11 of the barrels come out of the wheels 10 the latter remain held on the plate 42, together with the wheels 14 and the axes 15 and 35, the result being that the winding position of the intermediate springs relatively to the position of the levers 21 can be found at once when the clockwork has to be wound up and that consequently there is no danger of exceeding the highest tension provided for in the said springs and which corresponds to the highest temperature to which the apparatus is likely to be subjected or exposed.

I will observe that there may be any number of barrels actuated independently of each other by the levers 21 22, all that is necessary being to use as many pairs of ribbons 20 or 40 as there are intermediate fixed spring-drums. There may also be any number of corrugated tubes 5, and the latter may be of any suitable length, according to the power required to overcome the friction of the wheelwork. I may also effect the winding up of the clock directly by the dilatation of tube 5 by utilizing, if necessary, any well-known means for limiting the tightening of a spring when wound up. I may also use my invention for actuating other mechanisms—for instance, music-boxes, gas-meters, water-meters, and the like.

I claim—

1. In a mechanism for rewinding a motor-spring, the combination of reservoir-receptacles, extensible corrugated receptacles in communication with said reservoir-receptacles, a cross-head actuated by the extension movement of said extensible receptacles, levers connected to said cross-head, and spring-arbors having flexible connections with said levers.

2. A mechanism for rewinding a motor-spring, comprising a reservoir-receptacle having an extensible tube, one end of which is fixed and in communication with said receptacle, bell-crank levers, rods or pitmen connecting the movable end of said extensible tube with the bell-crank levers, the spring-arbors each having a spiral spring, flexible ribbons connecting said levers with said arbors and adapted to actuate the arbors on the extension movement of said tubes, and means actuated by the arbors for winding a clock-barrel or spring-box on the recoil of said springs.

3. A mechanism for rewinding a motor-spring, comprising two springs, each having one of its ends fixed, arbors to which are secured the other ends of said springs, extensible tubes adapted to contain a liquid, levers connected with said tubes, ribbons connecting said levers with one of said arbors, other ribbons connecting the same levers with the other arbors, and means for separately actuating the motor-springs by the recoil of the springs on the arbors.

4. A mechanism for rewinding a motor-spring, comprising a frame, an extensible tube having one end fixed to said frame, levers pivoted to the frame and connected operatively with the tube, a barrel or spring-box pivoted to a plate on said frame, an arbor in said barrel, a spiral spring connecting said arbor and the barrel, flexible ribbons attached to the arbor and the levers, a removable plate attached to the first-named plate, a motor-spring supported by said removable plate, and ratchet-wheels and pawls on the first-named fixed plate and disposed to actuate the motor-spring by the slackening movement of the springs on said arbors.

5. An automatically-wound clock, comprising a receptacle, an extensible tube adapted to receive a liquid dilatable by heat and to lengthen and contract according to variations of the temperature, an arbor, an intermedi-

ate spring having one end attached to the arbor, and its other end fixed to a suitable device, a flexible ribbon, means for connecting said ribbon to said arbor and to the extensible tube, a clock barrel-spring, and means connecting the clock barrel-spring with said arbor and adapted to wind the barrel-spring by the rotation of the arbor, said rotation being produced by the uncoiling of the intermediate spring; said flexible ribbon adapted to become slack on contraction of the extensible tube, and the intermediate spring adapted to remain tight after a previous winding, whereby the extensible tube can subsequently dilate without coiling the intermediate spring until the flexible ribbon shall have been again stretched.

6. An automatically-wound clock comprising a receptacle, an extensible tube in communication therewith, an intermediate spring, means for connecting said spring with said tube and consisting of a flexible ribbon, a clock barrel-spring, and ratchet-wheels connecting the said springs so as to wind the last spring by the slackening of the first spring.

7. An automatically-wound clock comprising a frame, a receptacle thereon, an extensible tube in communication with the receptacle, a transmission-shaft, a flexible connection between said tube and said shaft, a plate secured on the frame, an intermediate spring attached to the frame and said shaft, another plate removably secured to the first plate, a clock-movement supported on said removable plate, and ratchet-wheels mounted on the fixed plate and arranged to connect the transmission-shaft with the shaft of the spring-barrel of the clock-movement.

8. In a mechanism for rewinding a motor-spring or the like, the combination of a reservoir, an extensible tube in communication therewith, a cross-head controlled by said tube, a work-shaft, and a lever linked to the cross-head and having a flexible connection with the work-shaft.

9. In a mechanism for rewinding a motor-spring or the like, the combination of a cross-head, thermostatically-actuated mechanism for imparting slidable travel to said cross-head, separate work-shafts adapted to actuate suitable transmitting devices, and levers actuated by the cross-head and each having independent flexible connections with said separate work-shafts.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

CHARLES HOUR.

Witnesses:
EUGÉNE WATTIER,
EDWARD P. MACLEAN.