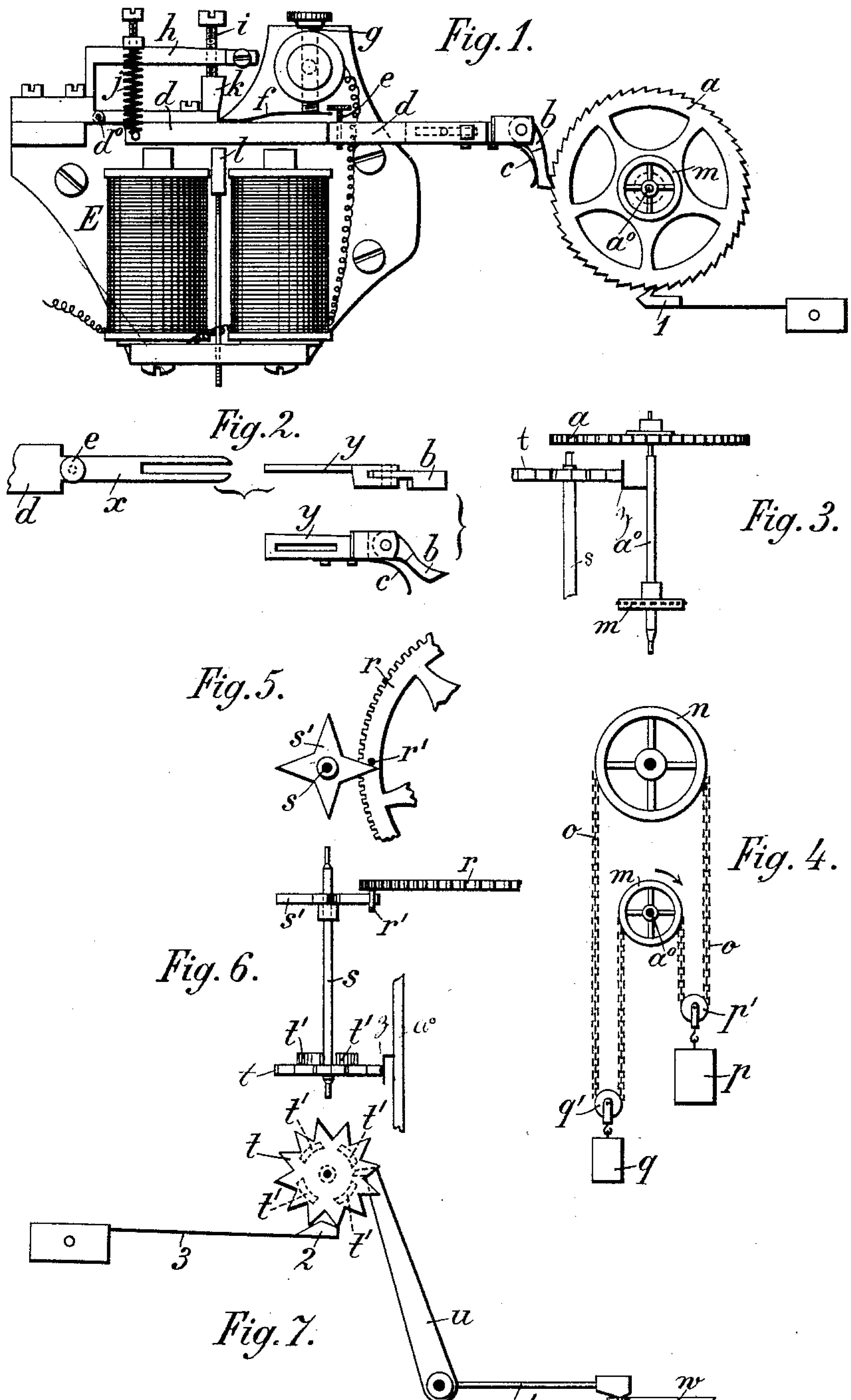
(No Model.)

M. VIAU.

ELECTRIC APPARATUS FOR WINDING CLOCKS.

No. 383,786. Patented May 29, 1888.



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ELECTRIC APPARATUS FOR WINDING CLOCKS.

SPECIFICATION forming part of Letters Patent No. 383,786, dated May 29, 1888.

Application filed October 18, 1887. Serial No. 252,733. (No model.) Patented in England September 27, 1887, No. 13,091; in Belgium September 28, 1887, No. 79,028; in France September 30, 1887, No. 186,143; in Italy October 5, 1887, No. 22,429; in Spain November 20, 1887, No. 11,752, and in Austria-Hungary January 26, 1888, No. 44,130 and No. 50,189.

To all whom it may concern:

Be it known that I, MARIANO VIAU, a subject of the Republic of France, residing at the city of Bilbao, in the Kingdom of Spain, have invented certain new and useful Improvements in Electric Apparatus for Clocks, (for which patents have been obtained in the following countries, viz: in Belgium, No. 79,028, dated September 28, 1887; in England, No. 13,091, dated September 27, 1887; in France, No. 186,143, dated September 30, 1887; in Italy, No. 22,429, dated October 5, 1887; in Austria-Hungary, No. 44,130 and No. 50,189, dated January 26, 1888, and in Spain, No. 11,752, dated November 20, 1887,) of which the following is a specification.

My invention relates to an improvement in electrical motors or apparatus more especially adapted for use in winding clocks and the like; and my invention consists in certain novel features of construction and combinations of parts more fully described hereinafter, and particularly pointed out in the claims.

It has been generally customary, when employing electricity as a motor for clocks, to substitute for the motive power obtained by means of springs or weights the power obtained from electricity in itself as the only power for actuating the mechanism to be driven; but these devices have never been perfectly successful nor given entire satisfaction in operation, for electricity requires, when it is directly applied as a motor, powerful elements and gives a small amount of power in proportion, which is very unsteady and irregular.

The object of my invention is to provide improved means for rendering this irregularity of electricity harmless when used for actuating the mechanism of clocks, and to provide a motor which will give a clock or other mechanism a perfectly regular action through the medium of a weight or spring which is kept constantly wound up by the action of the motor; and a further object is to provide a "Huyghens weight-elevator" to impart motion to the mechanism to be driven, to connect said elevator with a suitable rheotome mechanism whereby the elevator is operated, and to provide a circuit closer and breaker whereby the operation of the rheotome mechanism is started when the weight has passed downward a certain distance and is stopped when the weight has passed upwardly a certain distance.

If electricity has not always the same constancy and power, it has generally in exchange a great superfluity of velocity or speed. This velocity or speed being transformed in power and applied mechanically, the inconstancy of the electricity is made harmless to the working and a power gained which has not been hitherto found for the hereinbefore-mentioned purpose, because it was sought for in the electricity itself. Moreover, it is well known that power can be transformed by means of a series or train of large and small gear-wheels into speed, and by the same means, but in the reverse order, speed into power. The construction of the hereinafter described motor rests upon both of these principles. From this motor is obtained sufficient constancy and power for several industrial purposes without creating much cost for maintenance. Again, the necessarily powerful batteries used hitherto, which worked without interruption, are not required with the new motor. This only necessitates the employment of small batteries or only one weak element to obtain the power.

Referring to the accompanying drawings, Figure 1 is a side elevation of the rheotome mechanism and ratchet-wheel operated by the same; Fig. 2, a detail detached view of the armature of the rheotome mechanism; Fig. 3, a detail detached view of the shaft and wheel carried by the same which actuates the weight-elevator; Fig. 4, an elevation of the weight-elevator; and Figs. 5, 6, and 7, detail detached views of the circuit-closer and mechanism for operating the same.

The motor consists of an automatic rheotome mechanism—that is to say, one or more electro-magnets—the armature of which acts as an alternate maker and breaker of the circuit, and a so-called "Huyghens pulley-elevator," which is actuated by means of a ratchet-wheel operated by the motion of the said armature.

The automatic rheotome mechanism, as

shown in side elevation in Fig. 1, is different from the clicking arrangement of ordinary bell-magnets in the following particulars:

The armature *d* of the electro-magnet E has on one of its ends a pawl, *b*, which is caused by a spring, *c*, to take into a ratchet-wheel, *a*, which transmits the motion from the armature to a clock-work or to a pulley mechanism, as will be seen from the following.

The armature *d* is formed in two sections, *x* and *y*, as shown in Fig. 2, and the inner end of the section *x* is bifurcated, and the inner end of the other section, *y*, which carries the pawl upon its outer end, is reduced so as to fit in and be able to freely slide between the arms of the bifurcated end of section *x*. The sections are clamped together when in position by means of a screw or the like passing through the bifurcated and reduced ends of the sections, and the section which carries the pawl is rendered longitudinally adjustable by means of a slot in its reduced end, through which the clamping-screw passes. Thus the section of the armature which carries the pawl can be longitudinally adjusted in its relation to the body portion of the armature, and the engagement of the pawl *b* with the teeth of the ratchet-wheel *a* can be accurately adjusted. The construction of the armature in two distinct parts enables the front (right) part of the said armature to be insulated from the back (left) part by means of wood plates or in any suitable manner in the joint of the two portions, so as to avoid the electrifying or magnetization of the ratchet-pawl, and also the ratchet-wheel and mechanism connected therewith.

In ordinary bell mechanism the armature has at its end a spring, by means of which it is either fixed to part of the base-plate or to a projection on the base-plate. The disadvantage of this spring arrangement is, that it does not allow the armature enough free play, and it is for this reason that in my automatic rheotome mechanism it is held by means of a hinge, d^0, Fig. 1, which enables the armature to have the required free motion. As it is advantageous for the armature always to move in the same curve and operate the ratchet-wheel in a regular manner, it is necessary for said armature in its up-and-down motion always to go to the same points. In its movement toward the magnets this object is attained by the screw *e*, which is located in the upper surface of the armature, and is preferably provided with a flanged or enlarged head adapted to engage the end of a circuit-closing spring, *f*, and draw it from contact with a screw, *g*, the moment the armature is actuated by the magnets, and thus break the circuit, and then the spring immediately flies to its normal position, in contact with the screw *g*, drawing with it the armature. Thus it is clearly evident that the circuit will always be broken at the same point, and that the armature will always follow the same path when in operation, and that the limits of its up-and-down movement will be constant quantities unless changed by the screws. At the rising of the armature the same object is attained by arranging a bridge, *h*, on the base-plate over the armature, which bridge carries a set-screw, *i*, for always stopping the armature at exactly the same point. Moreover, the armature is connected to the bridge *h* by means of a spiral spring, *j*, which has a continual tendency to draw the armature toward it.

It remains to mention that for the purpose of damping the blow of the armature two india-rubber blocks, *l* and *k*, are provided, against which the armature presses alternately in its motion.

The ratchet-wheel *a*, moved by means of the armature of the electro-magnets, is prevented from moving in a backward direction by a stop or click pawl, 1, and carries on the other end of its spindle a^0 a chain-wheel, *m*, Fig. 3, which forms the lower wheel in the well-known Huyghens weight-elevator. (Shown in Fig. 4.) The upper large wheel, *n*, of this one is also constructed as a chain-wheel, the weights *p* and *q* being carried by a sprocket-chain, *o*. The rollers or pulleys *q′ p′*, on which the weights hang, move freely on the chain. The small chain-wheel *m* is prevented, by means of a ratchet-pawl thereon, from moving in the direction of the arrow, so that the wheel *n* will be rotated by the weight—that is, the weight resulting from half the difference of the active weights.

When the automatic rheotome mechanism is in operation and the ratchet-wheel *a* is rotated, it follows that the chain-wheel *m* also rotates, and so the large weight *p* of the elevator rises and the small one *q* falls, unless during the raising of the weight the wheel *n* ceases to rotate. This wheel *n* is in connection with the train of a pendulum-clock or of a balance-clock, and secures to the clock to which it is applied a perfectly regular motion. Supposing the period of falling of the large weight is five minutes, the proper electrical motor need only be in activity for five minutes, and only so long as is necessary to again raise the large weight to the required height and to allow the small weight to sink, so that the large wheel *n* is never without the power required to keep up its motion. For the purpose of obtaining this periodical work of the motor arrangements must be made by which the circuit of the motor is broken and made again at the proper time. The following is a description of an advantageous mode of doing this: The first wheel, *r*, Figs. 5 and 6, of the clock-work, which receives its motion from the weight-elevator, and makes, for example, one revolution in five minutes, carries a pin, *r′*, projecting from the side. Next this wheel *r* is a star-wheel, *s′*, with four teeth arranged on a shaft, *s*, so that the teeth of it sometimes must come in the way of the pin *r′*, when the wheel *s′* is correspondingly rotated. The wheel *s′* is moved, as hereinafter explained, and then again kept still, so that at the time of the passing of the pin *r′* one tooth of the star-wheel s' has reached so far into the way of the pin r' that it can only move the star-wheel s' one-twelfth of a revolution. The motion thus given to the star-wheel s' will be transmitted to the wheel t on the same shaft, Figs. 6 and 7, said wheel being provided on its periphery with twelve teeth and on its side with four circular ribs, t', as shown. These ribs t' allow a nose of a lever, u, or, rather, the left arm of it, which reaches into the way of them, to ride out of the gap between two of the ribs onto the periphery of one of the ribs as soon as the wheels s' and t are moved one-twelfth of a revolution by means of the pin r'. The lever u is in this manner so moved that its under arm, u', presses together the ends w w' of the circuit conducting-wires of the motor, which are arranged one over the other, and brings the said ends w w' into contact, so that the circuit is thereby completed.

As long as the left arm of the lever u rests on one of the ribs t', the electric circuit will remain completed and the wheel m of the weight-elevator will rotate; but as soon as the weights of the said elevator have arrived at their highest or lowest position the circuit must again become broken—*i. e.*, the end of the lever u slides off the rib t' and drops in between two of the ribs into a gap. This is carried out in the following manner: The large wheel n, Fig. 4, of the weight-elevator makes (being put in motion by the weight) one revolution in five minutes, while the weight descends from the highest to the lowest point, and the small wheel m being only half as large as the wheel n, the wheel m has to make two revolutions for the purpose of again raising the weight. Under these considerations, therefore, the electrical motor only has to work until the wheel m has completed two revolutions, and it must then immediately stop. For this purpose an angle or knee, z, Fig. 3, is arranged on the shaft a^0, which is the axle both of the ratchet-wheel a and of the little wheel m. Said knee z reaches to the intermediate wheel, t, Figs. 6 and 7, and can take into its teeth, so that when the wheel t has revolved one-twelfth of a revolution and the motor has commenced working the knee z, after the first revolution of the shaft a^0, moves the intermediate wheel, t, the distance of one tooth, and after the second revolution of the said shaft moves it round a second tooth. Now, while the knee is moving the first tooth of the wheel t, the lever u remains resting on the rib t', which is opposite to it, and slides on its periphery; but as soon as the knee z moves the second tooth of the wheel t, the lever u slides by its own weight off the rib t' into the gap between two ribs, thereby releasing the contacts w w', breaking circuit, and causing the motor to stop immediately. At the same time a tooth of the star-wheel s', Figs. 5 and 6, has arrived within reach of the pin r', and the before-described motions take place again after five minutes have passed.

It is not always necessary that the pin r' on the wheel r, Figs. 5 and 6, should move the star-wheel s' one-twelfth of a revolution, as it may be desirable, in order to avoid the disadvantageous stopping of the clock-work, that the pin r' on the wheel r should only move round the star-wheel a little more than one twenty-fourth of a revolution, and that the necessary further rotation for the entire one-twelfth revolution may be executed by the pawl 2, employed to prevent the backward motion of the wheel t. To obtain these results, the teeth of the wheel t must be made equilateral and equiangular, and the pawl 2, supported, as shown, by means of a strong spring, 3, must have the obtuse angled shape, as shown. Supposing the star-wheel s' is caused to make a little more than one twenty-fourth of a revolution by means of the pin r', the pressure of the spring 3 will be overcome and the pawl 2 will be raised so far out of the teeth of the wheel t that the top of the pawl 2 will come together with the top of the next following tooth of the ratchet-wheel t, and then slide a little over the top. The force of the spring 3 will now move the wheel t farther round until the pawl 2 snaps into the next space, whereby the left arm of the lever u has arrived on one of the ribs t', and so the circuit has been completed by means of the contacts w w'. The rest of the operation is as before described.

The number of teeth and the size of the wheels can be varied as desired, the above being only given as an example. Moreover, the circuit can be made and broken by any other suitable means instead of by the lever u.

The entire mechanism works briefly in the following manner: The electricity causes the armature of the automatic rheotome mechanism to move to and fro. Said armature moves the ratchet-wheel, and this transfers its motion onto the weight-elevator, which transforms speed into power, whereby the mechanism itself controls or directs the electricity to produce a regular motion.

By this invention a motor is obtained which can be employed for clock mechanism, as also for other industrial purposes requiring small power.

It is clearly evident that numerous slight changes might be made in the form and arrangement of the parts described without departing from the spirit and scope of my invention; hence I do not wish to limit myself strictly to the precise construction herein set forth, but consider myself entitled to all such changes.

Having now particularly described and ascertained the nature of this invention and in what manner the same is to be performed, I declare that what I claim is—

1. The combination, with a rheotome mechanism, of the herein-described weight-elevator, one wheel or pulley of the same communicating motion to the mechanism to be driven and its other wheel or pulley adapted to be driven by the armature of the rheotome mechanism, substantially as set forth.

2. The combination, with a weight-elevator, of a shaft carrying a ratchet-wheel and a wheel or pulley to operate the weight-elevator, and an automatic rheotome mechanism, the armature of the rheotome mechanism being adapted to operate the ratchet-wheel, and hence the elevator, substantially as described.

3. The combination, with an automatic rheotome mechanism, of a shaft adapted to be driven by the armature of the same, a wheel or pulley on said shaft, a weight adapted to be raised by the rotation of said pulley or wheel, and an additional wheel or pulley communicating motion to the mechanism to be driven and connected with and operated by the downward pull of said weight, substantially as described.

4. The combination, with an automatic rheotome mechanism, of a wheel or pulley intermittently rotated by the armature of the rheotome mechanism, a wheel or pulley imparting motion to the mechanism to be driven, and an endless chain or the like carrying weights, whereby the wheel immediately connected with the rheotome mechanism is adapted to operate the chain and weights independently of the other pulley, which is operated by the weights independently of the pulley which raises the weight, substantially as described.

5. The combination, with an automatic rheotome mechanism, of the herein-described weight-elevator, one wheel or pulley of the same communicating motion to the mechanism to be driven, and its other wheel or pulley adapted to be driven by the armature of the rheotome mechanism, and an automatic circuit breaker and closer connected with the wheels or pulleys of the elevator, whereby the operation of the rheotome mechanism is stopped and started automatically, as set forth.

6. The combination, with an automatic rheotome mechanism, of a weight-elevator communicating motion to the mechanism to be driven and intermittently operated by the armature of the rheotome mechanism, an automatic circuit breaker and closer, gearing connecting said breaker and closer with the weight-elevator, whereby the operation of the rheotome mechanism is stopped when the driving-weight has passed upwardly a certain distance, and gearing connecting said circuit breaker and closer with the mechanism operated by the weight, whereby the operation of the rheotome mechanism is started when the weight has passed downward a certain distance, as set forth.

7. The combination, with a rheotome mechanism and a weight-elevator, of a shaft rotated by the armature of the rheotome mechanism and adapted to operate the weight-elevator, an automatic circuit breaker and closer for the rheotome mechanism, gearing connected with said circuit breaker and closer, a lug or projection upon the shaft, adapted to operate said gearing when the shaft rotates, additional gearing connected with the circuit breaker and closer, and a wheel actuated by the downward pull of the weight and provided with a lug or projection to engage and operate said last-mentioned gearing, for the purpose set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

MARIANO VIAU.

Witnesses:
E. VALERO HEIN,
JOSÉ DE ARNIBABRY.